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OBA | CONSULTING CIVIL & STRUCTURAL ENGINEERS

Senior Planning Officer
Land Use
Planning and Transportation Department
South Dublin County Council,

20/01/2022

Dear Sir/Madam,

Further Information: Millbrook Manor Nursing Home, Slade Road, Saggart, Dublin, D24A9RY; Additional floor area of 82sq.m ground floor and 35sq.m first floor to allow reconfiguration of 4 double rooms to 8 single rooms, new ground floor storeroom and enclosing fire exit stairs; relocation of 8 car parking spaces to extended existing car park; all associated site works; proposed material finishes to match previously approved changes to previously granted permission SD20A/0153.
Planning ref: SD21A/0301

Enclosed:

- 38-89A-C02 Revision B Foul & SW Drainage Layout Plan; and
- 38-89A-C05 Schematic of Developed Surfaces and SUDS Applications

Please find attached responses to engineering related items of the request for further information, dated 7th January 2022.

Since this development comprises of various storm water systems, with various approvals, based on various previous approved design criteria, we considered it beneficial to discuss the various systems and by process of elimination identify the system(s) that could be considered to be problematic with regards to having insufficient Sustainable Urban Drainage Systems (SUDS) and the reasoning for this. We have discussed each system in order of reducing development **footprint**. Please refer to OBA drawing 38-89A-C05 for further clarity.

Existing Development:

53% of the development (**existing** building roof, existing courtyard and existing road and parking west of the Camac culvert passing through the site) is served by 230m of 675mm diameter over-sized pipe attenuation, providing 82.4 m^3 of attenuation. This was constructed on foot of planning approval reference SD06A/0239, June 2006. The approved criteria were a discharge rate of 6 l/s and sufficient attenuation to accommodate a 30-year return storm.
Since this is existing and conforms to the relevant planning approval, this is not under consideration in this planning submission.

22% of the development (**existing** access road and parking area, east of the Camac culvert) is served by a soakaway, providing 8.3 m^3 of attenuation. This was constructed on foot of planning approval reference SD06A/0239, June 2006. The approved criteria were an infiltration rate of 3.8×10^{-5} m/s and sufficient attenuation to accommodate a 10-year return storm.
Since this is existing and conforms to the relevant planning approval, this is not under consideration in this planning submission.

Further notable information regarding the proposed development under current consideration is that a similar application was granted approval in December 2020, planning reference SD20A/0153, with the same SW systems proposed. The modifications (from that approved in December 2020) included in this application are as follows:

- The carparking area was relocated from south of the access road to adjoin the existing car parking area, footprint area increased by $12m^2$ from 266 to $278m^2$;
- Extension A, footprint area increased by $35m^2$ from 265 to $300m^2$;
- Extension B, footprint area increased by $30m^2$ from 73 to $103m^2$; and
- Extension C, footprint remained unchanged at $56m^2$; and
- 2 additional car parking spaces were added to the existing parking west of the Camac culvert.

10% of the development *(proposed new development)* (new fire access road) is to be constructed of SUDS compliant turfstone permeable surfacing, since it is fully permeable no attenuation is proposed for this. This has already received approval under planning register SD20A/0153, December 2020.
This is considered to be both SUDS compliant and adhering to current mandatory design criteria of the Greater Dublin Strategic Drainage Study (GDSDS).

6% of the development *(proposed development)* (new extended car parking area) is to be provided with a SUDS compliant soakaway. The approved criteria were an infiltration rate of 5.5×10^{-6} m/s and sufficient attenuation to accommodate a 30-year return storm, which is consider appropriate for a rural setting. This has already received approval under planning register SD20A/0153, December 2020.
This is considered to be both SUDS compliant and adhering to current mandatory design criteria of the GDSDS.

5% of the development *(proposed development)* (new building extension A) is to be provided with a SUDS compliant soakaway. The approved criteria are an infiltration rate of 5.5×10^{-6} m/s and sufficient attenuation to accommodate a 30-year return storm, which is consider appropriate for a rural setting. This has already received approval under planning register SD20A/0153, December 2020.
This is considered to be both SUDS compliant and adhering to current mandatory design criteria of the GDSDS.

4% of the development *(proposed development)* (new building extension B, C and additional 2 parking bays) is to be provided with a 70m (of 675mm diameter) extension (S3a-S3-EX.S1 and S5-S4a-S4) to the existing 675mm diameter over-sized pipe attenuation, providing an additional 25 m^3 of attenuation. The proposed design criteria are a discharge rate of 6 l/s and sufficient attenuation to accommodate a 100-year return storm (+ 20% for climate change), which is considered to be in line with mandatory GDSDS requirements. In essence this has already received approval under planning register SD20A/0153, December 2020, for a similar system.

This last item is highlighted in red indicating that it does not fully comply with the SUDS requirement. since over-sized pipe attenuation is not a true SUDS device.

To conclude and summaries the above: -

The large majority **(96%)** of the development is either existing (compliant with planning approval SD06A/0239, June 2006) or is fully compliant with the requirements of GDSDS (including attenuation volumes proposed) and is fully SUDS compliant.

A very small portion **(4%)** of the development is considered to be inextricably part of the existing 675mm over-sized pipe attenuation system which has been provided with additional attenuation volume in excess of the required 100-year return storm (+ 20% for climate change) by providing an additional 70m of 675mm diameter oversized-pipe attenuation, making it GDSDS compliant, But, *this 4% is not fully SUDS compliant*. This small portion received approval in December 2020 (ref. SD20A/0153) for similar extensions B and C.

In context, sufficient attenuation has been provided for the entire development, with only a very small portion that is considered to be inextricably part of an old system and hence it is unable to provide a true SUDS system for this.

Responses to Additional Information Request Item No.1:

(a) There are insufficient SuDS (Sustainable Drainage Systems) proposed for the development. Only in exceptional circumstance are oversized pipes accepted. The applicant is requested to submit a report and drawing showing what SuDS are proposed for the development. Show in the report what surface water attenuation in m3 is required and provided for proposed development. SuDS are recommended to attenuate surface water. Examples of SuDS are as follows and this is not an exhaustive list are:

- *Green roofs*
- *Tree pits*
- *Channell Rills*
- *Rain Gardens*
- *Permeable Paving*
- *Grasscrete*
- *Filter drains*
- *Swales*
- *Planter boxes*
- *Other such SuDS*

(b) *It is noted in report submitted that the discharge rate from 6 litres/second in previous development SD20A/0153 on the site is to increase to 7.9 litres/second in this application. This is not acceptable because the previous development was granted permission based on a discharge rate of 6 litres/second on the same site. Increasing the discharge rate would also increase the risk of flooding downstream of development. Water services estimate that proposed surface water attenuation of 100m3 is undersized by a factor of 3.5 for 1 in 100 year flood event and undersized by a factor of 2.2 for a 1 in 30 year flood event. The applicant is requested to submit a revised report to show what surface water attenuation is provided for in new and existing development. Submit a drawing to show where and what capacity (m3) proposed and existing surface water attenuation is and will provided for new and existing development. Contact Water Services in South Dublin County Council to discuss surface water attenuation calculations and attenuation proposed prior to submission of additional information.*

Response

(a) This response to be read with reference to the addendum and schematic drawing 38-89A-C05. attached:

As discussed in detail above, 96% of the existing and proposed development is fully SUDS compliant, with only the remaining 4% of the proposed development inextricably part of a previously approved and constructed oversized pipe attenuation system.

The attenuation volumes required and provided, in the existing and proposed developments, are given in Table 1.

(b) The discharge rate has been revised back to the 6 l/s per LA instruction. Attenuation volumes are as mentioned above, both in the report and attached addendum.

Addendum

Description	Area (m^2)	% of surfaced site	SUDS	Attenuation volume (m^3)	Planning Reference	Changes	Notes
Existing Development:							
Existing Roof, courtyard, remaining access road and parking	2636	53%	*Existing 230m of 675mm dia. oversized pipe attenuation	82.4	SD06A/0239	-	• 'As Built' • Approved by LA • Design criteria o Approved discharge = 6 l/s o 30-year return storm
Existing Parking and entrance access	1060	22%	Existing soakaway	8.3	SD06A/0239	-	• 'As Built' • Approved by LA • Design criteria o $f = 3.8 \times 10^{-5}$ m/s o 10-year return storm
Proposed Development:							•
Proposed firefighting access road	500	10%	Turfstone or similar permeable surfacing	Nil	SD20A/0153	Nil	
Proposed extended parking area	280	6%	Proposed soakaway	22.8	SD20A/0153	Relocated and increased by 12 m^2	• Design criteria o $f = 5.5 \times 10^{-6}$ m/s 30-year return storm
Proposed extended building, area 'A'	270	5%	Proposed soakaway	25.8	SD20A/0153	Footprint increased by 35 m^2	• Design criteria o $f = 5.5 \times 10^{-6}$ m/s 30-year return storm
Proposed extended building, area 'B' & 'C' and 2 parking bays	190	4%	*Extend 70m of 675mm dia. oversized pipe attenuation	25	SD20A/0153	Increased by 2 parking bays	• Design criteria o Approved discharge = 6 l/s 100-year return storm + 20% climate change
Total:	4936	100%					

- Overall site area (red line boundary) = 2 ha;
- Although over-sized pipes are not true SUDS elements, they do provide attenuation and as such have been listed.

Table 1

The required (oversized pipe) attenuation increase has been assessed by calculating the difference between the existing 100-year (+20%) volume and the proposed 100-year (+20%) volume.

159.96-176.66 = 16.7m^3

With 70m of new extended 675mm diameter oversized pipe attenuation proposed, providing 25 m^3, this requirement is deemed to have been met.

Soil infiltration rate (BRE digest 365)	
Length of trial pit,	l_{trial} = **500** mm
Width of trial pit,	b_{trial} = **500** mm
Depth of trial pit (below invert),	d_{trial} = **500** mm
Free volume (if fill used),	V_{trial} = **100** %;
75% depth of pit	d_{75} = (d_{trial} × 0.75) = **375.00** mm
50% depth of pit,	d_{50} = (d_{trial} × 0.50) = **250.00** mm
25% depth of pit,	d_{25} = (d_{trial} × 0.25) = **125.00** mm
Test 1 - time to fall from 75% depth to 25% depth,	T1 = **9** min
Test 2 - time to fall from 75% depth to 25% depth,	T2 = **253** min
Test 3 - time to fall from 75% depth to 25% depth,	T3 = **104** min
Longest time to fall from 75% depth to 25% depth,	t_g = max(T1, T2, T3) = **253** min
Storage volume from 75% to 25% depth	V_{p75_25} = (l_{trial} × b_{trial} × (d_{75} - d_{25})) × V_{trial} = **0.06** m^3
Internal surface area to 50% depth,	a_{p50} = ((l_{trial} × b_{trial}) + (l_{trial} + b_{trial}) × 2 × d_{50}) = **0.75** m^2
Surface area of soakaway to 50% storage depth	A_{s50} = 2 × (l_{trial} + b_{trial}) × d_{trial} / 2 = **0.500** m^2
Soil infiltration rate.	f = V_{p75_25} / (a_{p50} × t_g) = **5.49×10^{-6}** m/s

* Extract from Rankin Associates, "Engineers Report on Design for Drainage at Extension to Existing Nursing Home and Care Facility at Castle Rd, Coolmines, Dublin 24", January 2019 as submitted with approved planning register reference SD20A/0153

Soakaway Design DG365-2016

Storm Rainfalls for a range of storm durations

Storm Duration min	M_{30}-D min = R mm
10	19.30
15	22.70
30	28.80
60	36.40
120	46.20
240	58.50
360	67.20
720	85.10
1440	107.80
2880	120.90

Assumed values for a rectangular soakaway
length (L) = **12** m
depth (D)= **0.8** m
width (W) = **W** m
Road runoff coefficient = **0.9**

Calculate the design width of the soakaway (W):

Accumulative impermeable area = **278** m^2
Effective impermeable area (A) = **250.2** m^2

Inflow (I) = The inflow from the impermeable area drained to the soakaway
I = A x R ,where
A = Effective impermeable area
R = The total rainfall in a design storm for a specific duration

Outflow (O) = The outflow infiltrating into the soil during rainfall
$O = a_{s50} \times f \times d$,where
a_{s50} = The internal surface area of the Soakaway to 50% effective depth :this excludes the base
f = The soil infiltration rate determined in a trial pit
d = The storm duration

a_{s50} = 2 x (L + W) x (D /2)
= **9.6** + **0.8 W**

f = **5.49E-06** m/s as determined on site

Assume Modular units with 95% free volume shall be used to construct the soakaway

Storage (S) = 95% of the effective volume of soakaway, and **0.95**

Storage (S) = The required storage in the soakaway
S = I - O

30 year storm

Duration minutes	Rainfall mm	Inflow m^3	Outflow m^3	Storage m^3	W m
10	19.30	4.82886	0.03162 + 0.0026 W	9.12 W	0.5259
15	22.70	5.67954	0.04743 + 0.0040 W	9.12 W	0.6173
30	28.80	7.20576	0.09487 + 0.0079 W	9.12 W	0.7790
60	36.40	9.10728	0.18973 + 0.0158 W	9.12 W	0.9761
120	46.20	11.55924	0.37947 + 0.0316 W	9.12 W	1.2216
240	58.50	14.6367	0.75894 + 0.0632 W	9.12 W	1.5112
360	67.20	16.81344	1.13841 + 0.0949 W	9.12 W	1.7011
720	85.10	21.29202	2.27681 0.1897 W	9.12 W	2.0425
1440	107.80	26.97156	4.55363 + 0.3795 W	9.12 W	2.3599
2880	120.90	30.24918	9.10725 + 0.7589 W	9.12 W	2.1401

Therefore construct a Soakaway:
12 m long x **0.8** m deep x **2.5** m wide

Prepared by: A. Manthe

Soakaway Design DG365-2016

Storm Rainfalls for a range of storm durations

Storm Duration min	M_{30}-D min = R mm
10	19.30
15	22.70
30	28.80
60	36.40
120	46.20
240	58.50
360	67.20
720	85.10
1440	107.80
2880	120.90

Assumed values for a rectangular soakaway

length (L) = **8.5** m
depth (D)= **0.8** m
width (W) = **W** m
Roof runoff coefficient = **0.9**

Calculate the design width of the soakaway (W):

Accumulative impermeable area = **300** m^2
Effective impermeable area (A) = **270** m^2

Inflow (I) = The inflow from the impermeable area drained to the soakaway
$I = A \times R$,where
A = Accumulative impermeable area
R = The total rainfall in a design storm for a specific duration

Outflow (O) = The outflow infiltrating into the soil during rainfall
$O = a_{s50} \times f \times d$,where
a_{s50} = The internal surface area of the Soakaway to 50% effective depth :this excludes the base
f = The soil infiltration rate determined in a trial pit
d = The storm duration

a_{s50} = $2 \times (L + W) \times (D/2)$
= **6.8** + **0.8 W**

f = **5.49E-06** m/s as determined on site

Assume Modular units with 95% free volume shall be used to construct the soakaway

Storage (S) = 95% of the effective volume of soakaway, and **0.95**

Storage (S) = The required storage in the soakaway
$S = I - O$

30 year storm

Duration minutes	Rainfall mm	Inflow m^3	Outflow m^3	Storage m^3	W m
10	19.30	5.211	0.02240 + 0.0026 W	6.46 W	0.8029
15	22.70	6.129	0.03360 + 0.0040 W	6.46 W	0.9430
30	28.80	7.776	0.06720 + 0.0079 W	6.46 W	1.1919
60	36.40	9.828	0.13440 + 0.0158 W	6.46 W	1.4969
120	46.20	12.474	0.26879 + 0.0316 W	6.46 W	1.8801
240	58.50	15.795	0.53758 + 0.0632 W	6.46 W	2.3389
360	67.20	18.144	0.80637 + 0.0949 W	6.46 W	2.6450
720	85.10	22.977	1.61274 0.1897 W	6.46 W	3.2128
1440	107.80	29.106	3.22548 + 0.3795 W	6.46 W	3.7840
2880	120.90	32.643	6.45097 + 0.7589 W	6.46 W	3.6282

Therefore construct a Soakaway:
8.5 m long x **0.8** m deep x **4.0** m wide

Prepared by: A. Manthe

Storm Water Attenuation Calculations

Total Site Area = 20388 m^2

Areas contributing to SW Run-off:

Description	Finish	Area (m^2)	Percentage run-off (%)	Equivalent run-off area (m^2)
Roof Areas	conc tile	1900	90	1710
Courtyard	paved	310	70	217
Road/parking/footpath	macadam/conc	904	80	723.2
Equivalent impermeable area:				2650.2

Approved hydrobrake outflow = 6.00 l/s

30 year storm

Permissible Volume (l)= Actual Achievable Outflow (l/s) x time (s)

Actual Volume (l)= (Equivalent Impermeable Area x depth of rainfall)

Storage capacity (l)= Actual - Permissible Volumes

Duration	Rainfall	Permissible	Actual	Store
min	mm	l	l	l
15	22.7	5400.00	60159.54	54759.54
30	28.8	10800.00	76325.76	65525.76
60	36.4	21600.00	96467.28	74867.28
120	46.2	43200.00	122439.24	79239.24
240	58.5	86400.00	155036.70	68636.70
360	67.2	129600.00	178093.44	48493.44
720	85.1	259200.00	225532.02	-33667.98
1440	107.8	518400.00	285691.56	-232708.44

Rainfall figures are site specific, see Met Eireann rainfall table attached.

From table above, required storage volume is 79.24 m^3

100 year storm

Duration	Rainfall	Permissible	Actual	Store
min	mm	l	l	l
15	33.3	5400.00	88251.66	82851.66
30	41.8	10800.00	110778.36	99978.36
60	52.6	21600.00	139400.52	117800.52
120	66	43200.00	174913.20	131713.20
240	82.9	86400.00	219701.58	133301.58
360	94.8	129600.00	251238.96	121638.96
720	119.1	259200.00	315638.82	56438.82
1440	149.6	518400.00	396469.92	-121930.08

Rainfall figures are site specific, see Met Eireann rainfall table attached.

From table above, required storage volume is 133.30 m^3
Allow 20% for climate change,
therefore storage required is 159.96 m^3

Attenuation provided in oversized pipes
length = 230.3 m
diameter = 0.675 m

therefore, Attenuation provided = $L\pi r^2$ 82.4 m^3

Type of surface	Runoff coefficient (φ)
Roof without storage	0.9
Concrete or asphalt, rock with large slopes	0.8
Cobbled stone with gravel joints	0.7
Gravel road	0.4
Rock with small slopes	0.3
Gravel paths	0.2
Park	0.1
Lawn, pasture, etc.	0-0.1
Forest, no slopes	0-0.1

Storm Water Attenuation Calculations

Total Site Area = 20388 m^2

Areas contributing to SW Run-off:

Description	Finish	Area (m^2)	Percentage run-off (%)	Equivalent run-off area (m^2)
Existing Roof Areas	conc tile	1900	90	1710
Courtyard	paved	310	70	217
Road/parking/footpath	macadam/conc	904	80	723.2
Equivalent impermeable area:				2818.1

Permissible outflow = 6.00 l/s previously approved

30 year storm

Permissible Volume (l)= Actual Achievable Outflow (l/s) x time (s)

Actual Volume (l)= (Equivalent Impermeable Area x depth of rainfall)

Storage capacity (l)= Actual - Permissible Volumes

Duration	Rainfall	Permissible	Actual	Store
min	mm	l	l	l
15	22.7	5400.00	63970.87	58570.87
30	28.8	10800.00	81161.28	70361.28
60	36.4	21600.00	102578.84	80978.84
120	46.2	43200.00	130196.22	86996.22
240	58.5	86400.00	164858.85	78458.85
360	67.2	129600.00	189376.32	59776.32
720	85.1	259200.00	239820.31	-19379.69
1440	107.8	518400.00	303791.18	-214608.82

Rainfall figures are site specific, see Met Eireann rainfall table attached.

From table above, required storage volume is 87.00 m^3

100 year storm

Duration	Rainfall	Permissible	Actual	Store
min	mm	l	l	l
15	33.3	5400.00	93842.73	88442.73
30	41.8	10800.00	117796.58	106996.58
60	52.6	21600.00	148232.06	126632.06
120	66	43200.00	185994.60	142794.60
240	82.9	86400.00	233620.49	147220.49
360	94.8	129600.00	267155.88	137555.88
720	119.1	259200.00	335635.71	76435.71
1440	149.6	518400.00	421587.76	-96812.24

Rainfall figures are site specific, see Met Eireann rainfall table attached.

From table above, required storage volume is 147.22 m^3
Allow 20% for climate change,
therefore storage required is 176.66 m^3

Existing length of 675mm diameter oversized pipe provided = 230 m
Proposed length of 675mm diameter oversized pipe provided = 50 m
Hydrobrake discharge = 6.00 l/s
Attenuation provided = 100.24 m^3

Type of surface	Runoff coefficient (φ)
Roof without storage	0.9
Concrete or asphalt, rock with large slopes	0.8
Cobbled stone with gravel joints	0.7
Gravel road	0.4
Rock with small slopes	0.3
Gravel paths	0.2
Park	0.1
Lawn, pasture, etc.	0-0.1
Forest, no slopes	0-0.1