

**Flood risk assessment for proposed greenhouse structures at
Fleurie, Lakes Lane, Barnham,**

Summary

The site is classified as EA Zone 1.

The total site area is 8.9ha, of which 7.8ha is pertinent to the application (the remaining area with eucalyptus trees is on the east side and has no material change to it).

All of the site is unclassified in terms of risk of flooding from sea or river.

Virtually all of the site is unclassified for surface water, with just a few small depressions at risk. None of the proposed development is impacted by the small pockets that are classified as likely to have shallow ponding in surface topographical features.

All of the site is unclassified in terms of risk of flooding from reservoirs.

There are existing greenhouses on the site.

The redevelopment adds a further 2.9ha of greenhouses (plastic clad and glass).

A roof water drainage and attenuation system is proposed, designed according to EA guidelines – see separate document “Drainage and attenuation system”.

The site was not in the 2012 flood event zone.

1. Background

The proposal is for a redevelopment of an existing site currently in horticultural production with various greenhouse structures already on it.

The site is broadly level, with a very slight fall (~0.6m) north to south on the west boundary, and larger fall (~1.8m) on the eastern one. There is also a slight dip in the centre at the north end. This will be levelled as part of the development, and therefore will alter the flood risk assessments from the EA system as below.

Due to the nature of the structure and use there is no concern of flood risk consequences to the structure or cropping, thus the only issue is avoiding increased discharge to the drainage system.

There is no risk to human life as there is no permanent occupancy and none of the risk scenarios in the EA data show more than a small fraction of the site covered, and to shallow depths only.

2. Site data (EA)

2.1 Classification

The site is EA zone 1. A Flood Risk Assessment is being provided as required since it is over 1ha.

2.2 Flood risk from sea or rivers

The risk of flooding from sea or river is un-categorised, see map below.



2.3 Risk of flooding from surface water.

The majority of the site is un-classified, with only the immediate surrounding areas to the stream having any risk, see map below. All of the high risk area is within the confines of the stream and immediate environs, and is not included in any of the proposals.



Risk of flooding from reservoirs is also un-classified.

2.4 Conclusion

This is a low risk development, as it retains the site in agricultural production and is not for habitation, with only short term and intermittent occupancy by workers.

There is a low risk of flooding from surface water,

The design as laid out in the associated document "Drainage" can contain all the predicted rainfall including the Climate Change Allowance (Upper end allowance to 2069 = 20%).

According to the EA assessments there is low risk of flooding within the proposed area, which is only shallow surface water ponding. This is not a significant issue for the development proposed.

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13.8.20

Lakes Lane Nursery, drainage and attenuation system

Summary

The attenuation system proposed is based on the well-established flooded drain principle. This involves having a gravity fed system, with the level of the outlet into the tanks lower than the inlet from the greenhouse, with gasketed pipe joints, so that there is a static head difference to generate flow.

The outlet from the tanks is gravity fed via twin orifice plates to permit differential discharge according to intensity and in accordance with permitted discharge rates. A sump is connected to each pipe system to pump down the pipes when the rain event stops; this is purely to allow the system to sit dry for most of the time and then to start without a static filling of water. It is not to fill or drain the system, which is by gravity.

Background

Total site area = 8.93ha (of which 7.8ha is pertinent to the drainage design, the remainder being a block of eucalyptus trees on the east side of the watercourse, which is not connected or materially changed).

Total new greenhouse area = 3.7 ha.

Greenhouse area to be removed = 0.8 ha

Proposed *additional* area of new greenhouses = 2.9 ha

Rainfall data summary

The site specific Standard Average Annual Rainfall (SAAR) is 756mm.

1 in 100 6 hour event = 63mm

1 in 100 12 hour event = 90.86mm

Climate change allowance factor for greenhouses = +20% (upper end) as specified in Environment Agency guidance (July 2020 latest revision).

(20 year design life =>2040; 2040 is pre-2069, the cut-off date for +20%).

Design basis

Impermeable areas – new greenhouses (3.7 ha).

All run-off from new greenhouses to be captured and attenuated.

Trafficked areas to be either stoned or permeable tarmac.

Discharge basis

Assume an arable greenfield site run-off equivalent for 3.7 ha.

Using IH24 formula as per UKSuds:

Area 3.7 ha

$$Q_{\text{barrural}} = 0.00108 \times (0.01 \times \text{AREA})^{0.89} \times \text{SAAR}^{1.17} \times \text{SPR}^{2.17}$$

$$= 23.5 \text{ l/s (1:100 years)}$$

and

$$1:1 \text{ year} = 6.3 \text{ l/s}$$

where:

Q_{barrural} is the mean annual flood flow from a rural catchment (approximately 2.3 year return period).

AREA is the area of the catchment in ha.

SAAR is for the period 1961 - 1990.

SPR is Standard Percentage Runoff coefficient for the SOIL category.

Balance

Full data is appended at the end.

Summary

Worst case occurs with Summer rain, t = 720 minutes.

Required attenuation = 3,790m³.

Holding capacity of gutters and pipework in this event = 349m³.

Balance = 3,440m³ storage required.

Design solution

5 off above ground storage tanks with flooded drainage system ('up and over') to feed them as per normal greenhouse practice, with sump connection and drain down pump to ensure that system starts dry during a rain event (see attached drawing for drain pump down sump details).

Tanks marked B,C,E,H,I on attached plan.

Capacities

2 x 1,069 m³ (B, C)

2 x 377 m³ (H, I)

1 x 696 m³ (E)



Total attenuation capacity = 3588 m³ (allows for the additional 71 m³ for rainfall on tank).

Multiple stage fixed discharge

The outlets from the tanks will have a conventional valved discharge to double orifice plates, comprising the following:

- Isolating valve
- Strainer
- orifice plates (diameters as below)

Total maximum discharge will be set at 23.5 l/s as per SUDS calculations. Individual maximum discharges as below.

Tanks B & C	15.0 l/s
Tanks H & I	45 l/s
Tank E	3.9 l/s

Discharges will be according to Method 1, with low level outlet discharging according to a 1:1 event and second stage according to a 1:100 event at +750mm, with orifice diameters as below.

Orifice calculations are based on the following formula:

$$Q = C \times A \times \sqrt{(2 \times g \times H)}$$

with $C = 0.62$

	<i>Base outlet</i>	<i>Upper outlet</i>
Tanks B & C	47mm	57mm
Tanks H & I	26mm	30mm
Tank E	24mm	28mm

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Annexe 1. Rainfall and system balance details

Maximum balance shown in red.

Winter

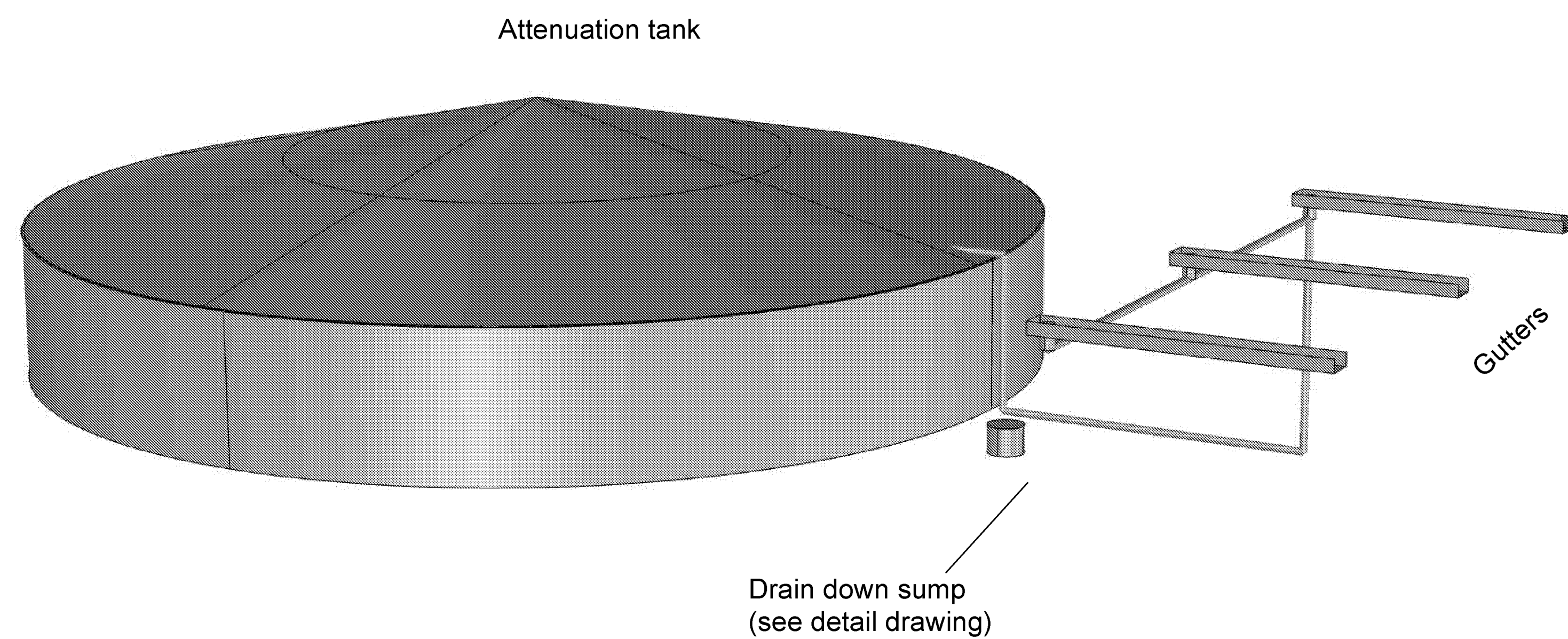
t min	Winter mm/hr	Ranfall + CCA	Vol	Discharge	Balance
15	147	176.4	1635.863	21.186	1614.677
30	98	117.6	2181.151	42.372	2138.779
60	63	75.6	2804.337	84.744	2719.593
120	37	44.4	3293.983	169.488	3124.495
180	27	32.4	3605.576	254.232	3351.344
240	21	25.2	3739.116	338.976	3400.14
360	15	18	4006.195	508.464	3497.731
480	12	14.4	4273.275	677.952	3595.323
600	10	12	4451.328	847.44	3603.888
720	9	10.8	4807.434	1016.928	3790.506
960	7	8.4	4985.487	1355.904	3629.583
1440	5	6	5341.594	2033.856	3307.738
2160	3	3.6	4807.434	3050.784	1756.65
2880	3	3.6	6409.912	4067.712	2342.2
4320	2	2.4	6409.912	6101.568	308.3443
5760	1.7	2.04	7264.567	8135.424	0
7200	1.4	1.68	7478.231	10169.28	0
8640	1.3	1.56	8332.886	12203.14	0
10080	1.2	1.44	8973.877	14236.99	0

Summer

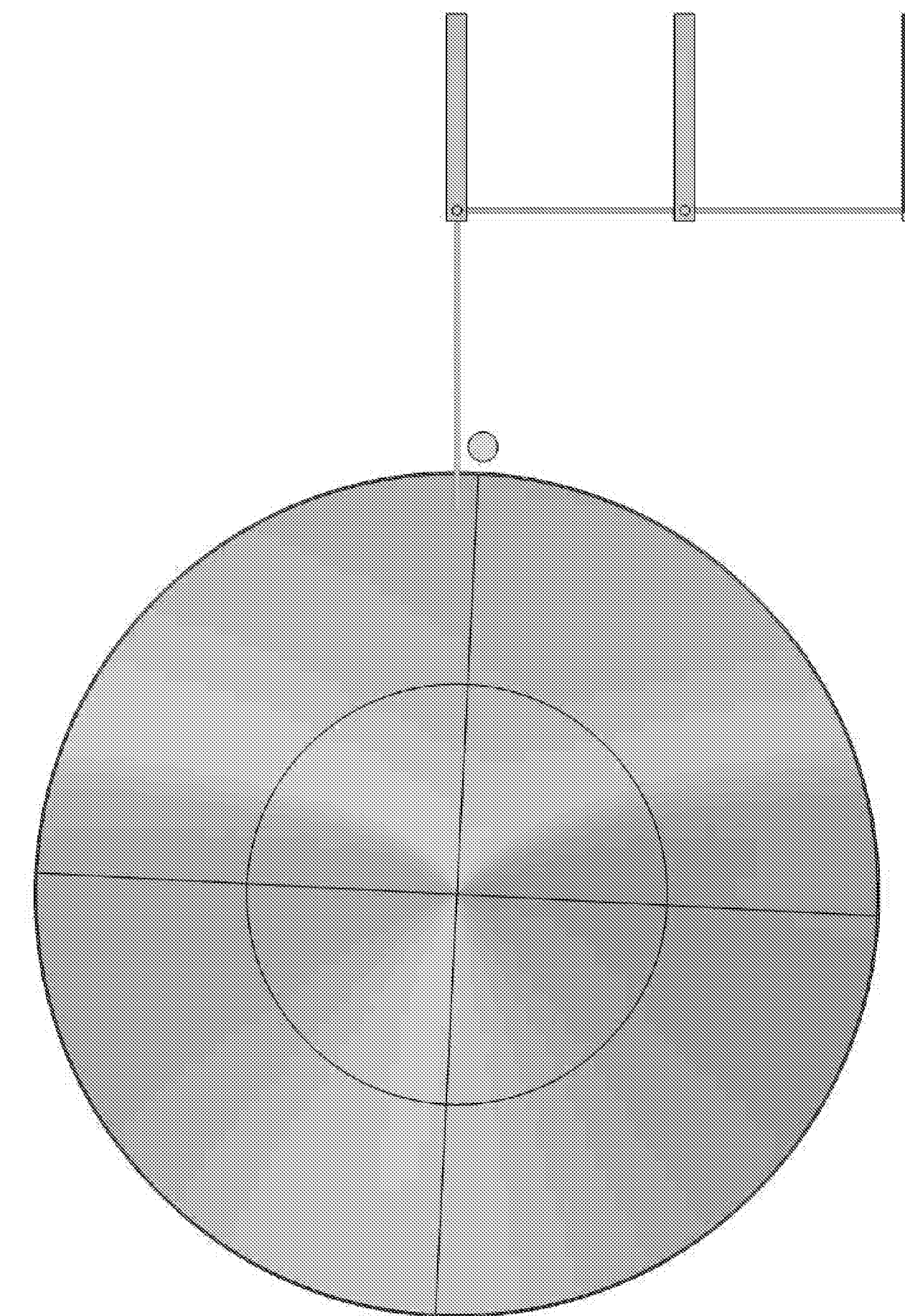
Summer mm/h			Vol	Discharge	Balance
148	177.6	213.12	1646.991	21.186	1625.805
99	118.8	142.56	2203.407	42.372	2161.035
63	75.6	90.72	2804.337	84.744	2719.593
36	43.2	51.84	3204.956	169.488	3035.468
27	32.4	38.88	3605.576	254.232	3351.344
21	25.2	30.24	3739.116	338.976	3400.14
15	18	21.6	4006.195	508.464	3497.731
12	14.4	17.28	4273.275	677.952	3595.323
10	12	14.4	4451.328	847.44	3603.888
9	10.8	12.96	4807.434	1016.928	3790.506
7	8.4	10.08	4985.487	1355.904	3629.583
5	6	7.2	5341.594	2033.856	3307.738
3.5	4.2	5.04	5608.673	3050.784	2557.889

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3	3.6	4.32	6409.912	4067.712	2342.2
2	2.4	2.88	6409.912	6101.568	308.3443
1.6	1.92	2.304	6837.24	8135.424	0
1.4	1.68	2.016	7478.231	10169.28	0
1.3	1.56	1.872	8332.886	12203.14	0
1.2	1.44	1.728	8973.877	14236.99	0



Perspective view (general across all)



Plan view

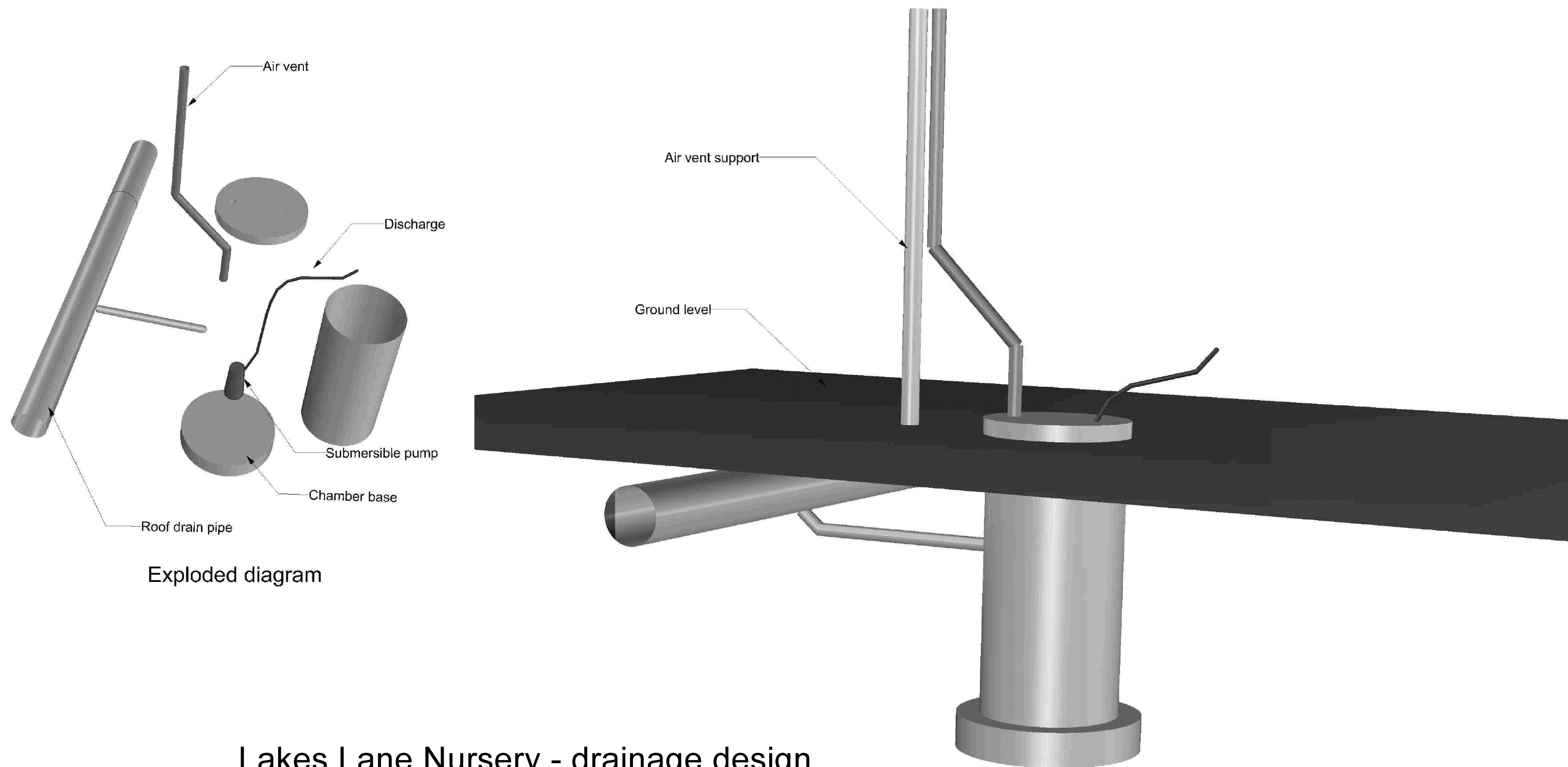
Lakes Lane Nursery
Fleurie

Attenuation tank
system

Drawn by: AM
Date:
Scale:
Revisions:

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Exploded diagram

Lakes Lane Nursery - drainage design. Flooded drain pump down chamber

Min 600 dia chamber / rings on concrete base. Sealed type manhole cover with 2 cut outs for vent pipe and discharge pipe, to be sealed with non-setting compound.

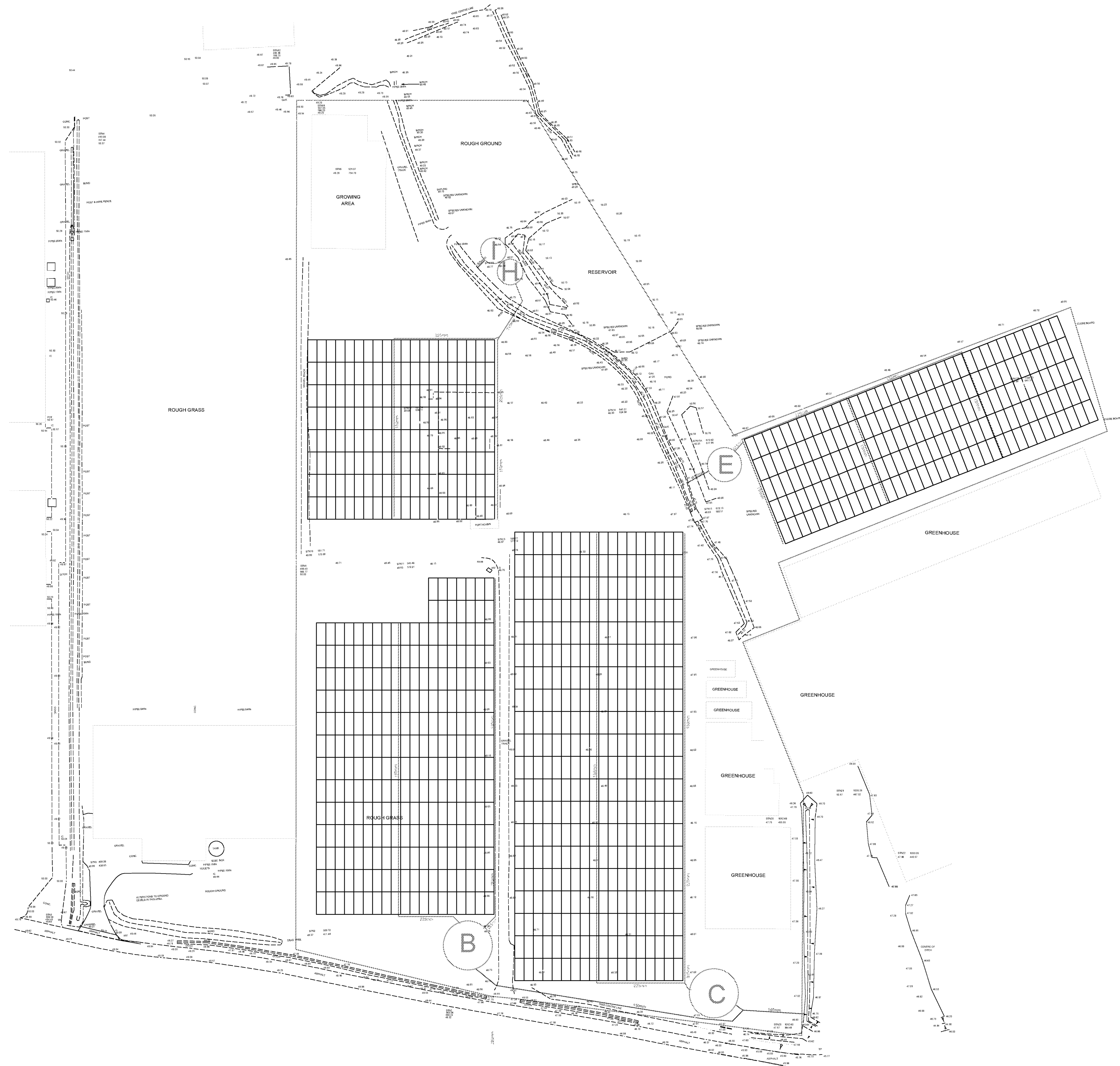
Air vent to tank top + 1m.

Sump pump on auto float switch.

Side entries from main roof water drainage (1 shown).

700 N

500 N



- Tanks
- Greenhouse header pipes and to tanks.
- Tank drain to discharge

Lakes Lane Nursery Fleurie

Attenuation tank system - pipe routes & sizes.

Drawn by: AM
Date: 29.8.20
Scale: 1:1000 (A1)

Revisions:

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