Surface Water Drainage Report

for the
Proposed Greenhouse
Development
at
Sunnyfield, Marsh Road,
Weston
Spalding PE12 6HH

on behalf of

Ball Colegrave Ltd

Issue 01

April 2021

George Shuttleworth Ltd

Consulting Engineers

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Issue : 01
Written by : G Shuttleworth Bsc CEng MICE.
Date : 8th April 2021

1.0 INTRODUCTION

1.1. Planning Approval for the development has been obtained from South Holland District Council under the reference H22-0755-20.

1.2. Condition 5 of the Planning Approval states

> *Prior to practical completion of the glasshouses, full details of the means of surface water disposal shall be submitted to and approved in writing by the Local Planning Authority. The details so approved shall be implemented in full before the development hereby permitted is first brought into use.*
> *Note: The applicant's attention is drawn to advice from the South Holland Internal Drainage Board dated 16 October 2020 accompanying the application concerning this matter.*

1.3. A copy of the SHIDB letter is presented in Appendix 1.

1.4. George Shuttleworth Ltd (GSL) has been was appointed by the Developer to provide additional information on surface water drainage which should be sufficient to satisfy the requirements of South Holland IDB and the Local Planning Authority in order that the above planning condition may be discharged.

1.5. The additional information on surface water drainage is presented in this report.

2.0 EXISTING BUILDINGS & SW DRAINAGE

2.1. It is understood that the existing buildings on site drain via soakaways.

2.2. it is proposed that the drainage of the existing buildings will remain independent of the proposed new development and is not considered further in this report.

2.3. Drawing 720-001, contained in Appendix 1, shows the layout of the existing site, a select of LIDAR spot levels and the key drainage features.

3.0 RAINWATER RECYCLING

3.1. The Developer has an aim to recycle as much roof rainwater as practical. Demand following completion of the works is expected to be 6000m3 per year. This will vary from 800m3/ month in the summer months to 200m3/month in the winter months.

3.2. The area of the proposed new greenhouse roofs is 14300m2. Average annual rainfall in the Spalding area is 560mm. Collection of all the rainwater falling equates to a volume of 8580m3. This is slightly in excess of demand.

3.3. However, demand and rainfall vary from month to month. A rainfall balance calculation for a full year has been undertaken and is presented in Appendix 1.

3.4. A storage volume of around 1050m3 would be required to match monthly demand.

3.5. From previous work, monthly rainfall records for RAF Waddington near Lincoln were obtained for the years 1947-2018. In that period the average annual rainfall was 613mm but the wettest year was 827mm, 35% more than average and the driest was 383mm, which is 63% of the average. Within that period monthly rainfall varied between 350% of average to 20% of average,

3.6. A fairly regular event of 25mm of rainfall in 24 hours would generate 360m3 of rain fall

3.7. The peak monthly consumption of 200m3 equates to 6.66m3 per day. At this rate, it would take 54 days to use the water from 25mm of rainfall. This is the concern of SHIDB of what happens to the rainfall when the recycling storage is full.

3.8. The guidance in BS 8515 states that when demand is less than supply then no allowance for spare storage in the rainwater recycling system should be used in the calculation of stormwater attenuation.

3.9. Therefore, for this site full stormwater attenuation should be provided in addition to any storage provided for rainwater recycling.

3.10. The volume provided for rainwater recycling should be as large as practical and economically viable.

4.0 SURFACE WATER MANAGEMENT STRATEGY

4.1. Sustainable Drainage Systems (SuDS) have been considered for this development.

4.2. Following the preferred hierarchy of drainage stated in Part H of the Building Regulations and The Suds Manual the following disposal routes have been considered

a) Disposal via Infiltration
b) Disposal to a Watercourse
c) Disposal to Surface Water Sewer

4.3. A Desktop Geotechnical Study has been undertaken to assess if the site will be suitable for surface water disposal using infiltration systems.

Desktop Geotechnical Study

4.1. From the HR Wallingford Greenfield run-off Calculation Tool available on their web-site the tool identifies the site as having Soil Type 2 on the Winter Rainfall Acceptance Potential (WRAP) Map. Soil Type 2 has relatively good drainage and is generally suitable for infiltration drainage systems. A copy of the Greenfield Run-off Calculation Sheet is provided in Appendix 1.

4.2. The British Geological Society web-site was also checked for records of boreholes within the vicinity of the site. There are no boreholes in the immediate vicinity of the site.

4.3. The closest two are some 2.2km away. They both show silty sandy material at depths of around 1.2m but also that the standing groundwater level was between 1.5 and 2.7m below ground level

4.4. Copies of the borehole records are presented in Appendix 1.

4.5. It is understood that the existing buildings discharge rainwater via infiltration and have operated without problems for a number of years.

4.6. The presence of the drainage ditches along the frontage of the property may indicate that vertical drainage is restricted but the ditch may have been constructed to drain the road.

4.7. In the absence of site specific geotechnical investigation reports this Desktop Geotechnical Study concludes that some discharge via infiltration should be possible it would be wise to incorporate a discharge/overflow to a watercourse.

Disposal to a Watercourse

4.8. Following the hierarchy of Suds, a surface water drainage discharge to an open watercourse is the next preferred option.

4.9. As stated there is an open ditch along the frontage of the property. The ditch flows north for approximately 500m where it enters a South Holland IDB maintained drain discharging to the Lords System

4.10. The ditch is only shallow, around 1.0m depth, at the entrance and given the distance from the proposed attenuation basin a pumped discharge will be required. This is acceptable at the downstream end of a surface water drainage system, as the consequence of pump failure would not result in flooding. Water would just remain in the attenuation basin until the pump system was repaired.

5.0 OUTLINE OF SURFACE WATER DRAINAGE SYSTEM

5.1. The proposed development will create the following artificial surfaces potentially generating surface water run

a) 2500m2 of car parks and access roads.
b) 14300m2 of roofs

5.2. Access tracks around the buildings used only for maintenance will be constructed in stone with a permeable surface and be self draining

Car Parks and Access Roads

5.3. The car parks and access roads will be constructed in permeable material and not positively drained. Rainfall falling on such areas will percolate into the ground as at present.

5.4. The permeable areas only have to deal with the rainfall falling on it. For the 1 in 100 year plus climate change 1 hour storm the rainfall rate is 53mm/hr. With a typical 150mm minimum depth of Type 3 sub-base with a 30% void ration storage is available for 45mm of rainfall. A percolation rate of only 8mm/hr is required to prevent water levels rising into the surface course.

5.5. With 25mm/hr discharging, this leaves 28mm to be stored. With a void ratio of 0.3, this would require a sub-base depth of 94mm, which is less than the 150mm provided.

5.6. It should be noted that a greater depth of permeable sub-base may be required to fulfil the structural requirements.

5.7. The granular sub-base should provide sufficient treatment of the run-off as required in the SUDS Manual.

Roof Water Drainage

5.8. As stated in the previous section rainwater run-off from the roofs will be collected for re-use on site.

5.9. Following the guidance in BS 8515 Code of Practice for Rainwater Harvesting Systems as the site will be in surplus, no deduction for spare capacity in the rainwater recycling system should be made in the calculation of surface water storage volumes.

5.10. It is proposed to construct separate rainwater recycling and stormwater attenuation basins with all the roof water discharging through the rainwater recycling storage, overflowing to the stormwater attenuation facility when full.

5.11. The rainwater recycling storage will be lined but the stormwater attenuation basin will not allowing for discharge via infiltration out of the base.

5.12. The location of the proposed rainwater collection and storage basin is shown on Drawing 720-002.

5.13. With a large flat site, the use of conventional piped drainage, with long pipe lengths and minimum pipe gradients, will set the storage facilities too deep.

5.14. The furthest point from the recycling pond to be drained is the southern end of Block 2. It is proposed that rainwater discharging off the southern end of the roof is either conveyed to the south west corner in elevated deep gutters or at ground level is specifically designed channel drains.

5.15. From the south west corner the flow can be conveyed north to the recycling storage in an open swale laid a t a relatively flat gradient.

5.16. Using such a system it should be possible to discharge to the recycling storage at around 3.2m AOD that is around 800mm below the ground level in that corner.

5.17. It should be possible to let the recycling storage fill to around 3.2m AOD which is 350mm below ground level in the south west corner.

5.18. An overflow to the stormwater attenuation storage should be provided at this level. The overflow should be designed with an appropriate weir length to minimise the water level rise when the overflow is discharging.

5.19. The area allocated for rainwater recycling storage should be sufficient to include a 3.0m wide crest all round for maintenance purposes and 1075m3 storage based on 1.4m max water depth and 1 in 2 side slopes. The storage should be lined to prevent water loss though infiltration.

5.20. As stated above no deduction in storage requirement has been made for the rainwater recycling facility.

5.21. In assessing the stormwater storage volume required it is proposed to allow the maximum amount of water to discharge via infiltration out of the bottom of the basin and provide a pumped overflow to the ditch at the frontage of the property.

5.22. The base area of the proposed attenuation basin is 1050m2. A low discharge rate of 12mm/hr will discharge 3.33l/s.

5.23. A rainfall run-off analysis has been undertaken for a connected area of 14,342m2 and a discharge of 3.33 l/s which calculates that for storms up to the 1 in 100 year plus climate change event, an attenuation volume of 1238m3 will be required. A copy of the calculation sheet is presented in Appendix 1.

5.24. In the area allocated for stormwater attenuation the lowest ground level is around 3.4m AOD. Allowing 300mm freeboard the maximum water level is 3.1m AOD.

5.25. Allowing a 3.0m wide crest for maintenance access, and max 1 in 3 sides slopes an attenuation volume of 1275m3 can be provided.

5.26. The base of the stormwater attenuation basin will be too low to allow a gravity overflow or discharge to the ditch at the front of the property.

5.27. A pump station will be required to lift flows to discharge to the ditch. The start level of the pump should be set a distance above the base of the basin to maximise the infiltration discharge. The level could be set once the infiltration rate is established.

5.28. It is proposed that the maximum pimped rate discharging to the ditch is restricted to a maximum of 5.0 l/s

5.29. There is also an opportunity to maximise the amount of water recycled by prioritising the pumps to discharge to the rainwater storage facility when there is spare capacity. This will require water level monitors, automated valves and pump controls.

5.30. An illustration of the outline design a surface water drainage system for the proposed layout is shown on Drawing 720/002 provided in Appendix 1.

5.31. The detailed design of the surface water drainage system should follow the principles outlined in this report.

6.0 APPENDIX 1 – SUPPORTING INFORMATION

a) South Holland IDB Letter

b) HR Wallingford Greenfield Run-off Assessment

c) BGS Closest Boreholes

d) Surface Water Calculations and Rainfall Run Off Analysis

e) Drawing 720 -001 Existing Site, Levels and Key Drainage Features

f) Drawing 720-002 Proposed Development & Outline of Proposed SW & Rainwater Recycling System.

South Holland
Drainage Board

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Our Ref: 20_03160_P
Your Ref: H22-0755-20

16th October 2020

Dear Sir/Madam

RE: Erection of multispan plastic greenhouses, additional car parking area and lagoon at SUNNYFIELD MARSH ROAD WESTON SPALDING PE12 6HH

The site is within the Internal Drainage District (IDD) of the South Holland Internal Drainage Board (IDB) and therefore the Board's Byelaws apply. A copy of the Board's Byelaws can be accessed on our website (https://www.wlma.org.uk/uploads/SHIDB_Byelaws.pdf), along with maps of the IDD (https://www.wlma.org.uk/uploads/210-SHIDB_Index.pdf). These maps also show which watercourses have been designated as 'Adopted Watercourses' by the Board. The adoption of a watercourse is an acknowledgement by the Board that the watercourse is of arterial importance to the IDD and as such will normally receive maintenance from the IDB.

- Following a telephone conversation with the applicant, it has been brought to our attention that the drainage strategy of the site is no longer to infiltrate via soakaways but instead to create a lagoon which will hold water and be used for irrigation. In light of these changes and in order to avoid conflict between the planning process and the Board's regulatory regime and consenting process, we are submitting the below comments, in replacement of those submitted to the Local Planning Authority on 01/10/2020 (Our Ref: 20_03160_P).

- I note that the applicant has indicated that they plan to dispose of surface water via a lagoon (size 40 m x 32 m x 2 m = 2560 m^3) on the north west side of the site boundary. This lagoon will be self-contained and the water will be used for plant irrigation. We would ask that further information is to be provided by the applicant to identify how the lagoon will be sized to cater for the surface water that is created on site as well as additional rainfall events that will fall when the lagoon is already at capacity from onsite water. Would the lagoon be sized appropriately or would other means of discharged be proposed in these circumstances? We would ask that the drainage strategy considers this is more detail.

- If for any reason this strategy does not prove viable to hold all of the surface water in the onsite lagoon and a surface water discharge is proposed to a watercourse, then the proposed development will require land drainage consent in line with the Board's byelaws (specifically byelaw 3). Any consent granted will likely be conditional, pending the payment of a Surface

Water Development Contribution fee, calculated in line with the Board's charging policy (https://www.wlma.org.uk/uploads/WMA_Table_of_Charges_and_Fees.pdf).

Whilst the consenting process as set out under the Land Drainage Act 1991 and the aforementioned Byelaws are separate from planning, the ability to implement a planning permission may be dependent on the granting of these consents. As such I strongly recommend that the required consent is sought prior to determination of the planning application.

Kind Regards,

Emma

Emma Robertson
Sustainable Development Officer
Water Management Alliance

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	George Shuttleworth
Site name:	Kinder Garden
Site location:	Weston

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	52.83201° N
Longitude:	0.1025° W
Reference:	3128200570
Date:	Apr 07 2021 11:13

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 1

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	560	560
Hydrological region:	5	5
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	2.45	2.45
Growth curve factor 100 years:	3.56	3.56
Growth curve factor 200 years:	4.21	4.21

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	1.4	1.4
1 in 1 year (l/s):	1.22	1.22
1 in 30 years (l/s):	3.44	3.44
1 in 100 year (l/s):	5	5
1 in 200 years (l/s):	5.91	5.91

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

CATION ENGINEERING Ltd.

BOREHOLE LOG

TF 22 NE/13
2905 · 2966

LOCATION : WESTBURTON – WALTHAM CROSS – NORTHERN SEC.
BOREHOLE No. : 405.+6
BOREHOLE DIA. : 6".
GROUND LEVEL : —[illegible]=411 1"144
DATE (Start) : 28|4|68
WATER LEVEL : 9'0" below g.l.

Description	Thickness	Depth	Sample	Remarks
TOPSOIL.	1' 0" (0·30)	0'·0" 1' 0" (0·30)	• 1	
Soft brown sandy CLAY.	3' 0" (0·91)	4' 0" (1·22)	• 2 • 3 +	13 Blows | ft.
Medium density fine & medium brown silty SAND	10' 6" (3·20)			
		14' 6" (4·42)	• 4 • 5 +	38 Blows | ft.
Compact fine & medium greyish-brown silty SAND	19' 6" (5·94)		• 6 +	43 Blows | ft.
		34' 0" (10·36)	• 7 • 8 +	28 Blows | ft.
Fine, medium & coarse brown SAND & shells (compact)	6' 0" (1·83)		• 9 +	32 Blows | ft.
		40' 0" (12·19)		
				Borehole Completed.

BOREHOLE SCALE : 1"=5' • : DISTURBED SAMPLE ▮ : UNDISTURBED SAMPLE + STANDARD PENETRATION TEST

NDATION ENGINEERING Ltd.

BOREHOLE LOG

TF 32 NW/ 12
3035. 2797

LOCATION : WESTBURTON – WALTHAM CROSS – NORTHERN SEC.
BOREHOLE No. : ~~388~~ 46 ~~3171~~ ~~2619~~
BOREHOLE DIA. : 6".
GROUND LEVEL : =405 1" 144
DATE (Start) : 29/4/63.
WATER LEVEL : 5'0" below g.l.

Description	Thickness	Depth	Sample	Remarks
Soft silty sandy CLAY.	1' 6"	0'-0"		
		1'6		
		0·46 m	• 1	
Medium density sandy SILT.	5' 6"		• 2 +	15 Blows / ft.
		7'0		
		2·13m	• 3	
Medium density fine grey silty SAND.	13'0"			
			• 4 +	12 Blows / ft.
		20'0	• 5	
		6·10m		
			• 6 +	82 Blows / ft.
Compact fine grey silty SAND.	20'8"		• 7	
			• 8 +	46 Blows / ft.
		12·27m 40'8	• 9 +	51 Blows / ft.
				Borehole Completed.

BOREHOLE SCALE : 1"=5' • : DISTURBED SAMPLE ▮ : UNDISTURBED SAMPLE + STANDARD PENETRATION TEST

Existing Areas to Remain

	Area (m2)
Entrance Road	2620
Yard Area 1	814
Greenhouse 1	2382
Greenhouse 2	3006
Greenhouse 3	1814
	10636

Proposed Structures

Block 1	6816
Block 2	7526
	14342
Car Park	1910
Roadway	70

RAINWATER RECYCLING

General Overall Figures

Roof Area	14342	0
Annual Rainfal	0.56	
Annual Volume	8032	

Water Use (Provided by Client)

	Current (m3)	Future (m3)
Jan	50	200
Feb	200	800
Mar	200	800
Apr	200	800
May	200	800
Jun	200	800
Jul	200	800
Aug	50	200
Sep	50	200
Oct	50	200
Nov	50	200
Dec	50	200
	1500	6000

Spalding Rainfall

	Annual Profile	Adjusted	Phase 1 Rainfall Volume	Phase 1 Demand	Phase 1 Surplus	Phase 2 Rainfall Volume	Phase 2 Demand	Phase 2 Surplus
Jan	45	48.8	700	50.0	650	700	200.0	500
Feb	38	41.2	591	200.0	391	591	800.0	-209
Mar	33	35.8	514	200.0	314	514	800.0	-286
Apr	40	43.4	623	200.0	423	623	800.0	-177
May	33	35.8	514	200.0	314	514	800.0	-286
Jun	33	35.8	514	200.0	314	514	800.0	-286
Jul	48	52.1	747	200.0	547	747	800.0	-53
Aug	52	56.4	809	50.0	759	809	200.0	609
Sep	52	56.4	809	50.0	759	809	200.0	609
Oct	56	60.8	872	50.0	822	872	200.0	672
Nov	50	54.3	778	50.0	728	778	200.0	578
Dec	36	39.1	560	50.0	510	560	200.0	360
	516	560	8032	1500	6532	8032	6000	2032

BS8515	Int Approach		
5% Rainfall	28 mm	402	m3
5% Demand	75 mm	300	m3

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Consulting Engineers
www.george shuttleworthltd.co.uk

Job No: 720
Project: Kinder Garden Plants
Date: 08/04/2021
Engineer: GS

RAINFALL RUN-OFF ANALYSIS
ATTENUATION & INFILTRATION DISCHARGE THRO' BASE

Calculation of Rain Profiles

M5-60	20							
r	0.4							
D (mins)	15	30	60	120	240	360	720	1440
Z1	0.64	0.81	1	1.21	1.4	1.62	1.8	2.2
M5-D	12.8	16.2	20.0	24.2	28.0	32.4	36.0	44.0
Z2(100)	1.94	1.99	2.03	2.02	2.01	1.95	1.92	1.86
Z2(30)	1.50	1.52	1.53	1.54	1.53	1.51	1.49	1.45
Z2(2)	0.80	0.80	0.81	0.82	0.83	0.83	0.84	0.85
Z2(1)	0.62	0.62	0.64	0.65	0.67	0.68	0.69	0.71
MT-D(100)	24.83	32.24	40.60	48.88	56.28	63.18	69.12	81.84
MT-D(30)	19.20	24.62	30.60	37.15	42.84	48.92	53.64	63.80
MT-D(2)	10.24	12.96	16.20	19.84	23.24	26.89	30.24	37.40
MT-D(1)	7.87	10.04	12.70	15.73	18.76	22.03	24.84	31.24
I(100)	99.33	64.48	40.60	24.44	14.07	10.53	5.76	3.41
I(30)	76.80	49.25	30.60	18.57	10.71	8.15	4.47	2.66
I(2)	40.96	25.92	16.20	9.92	5.81	4.48	2.52	1.56
I(1)	31.49	20.09	12.70	7.87	4.69	3.67	2.07	1.30

Note: Intensity I() limited to 100mm/hr

Calculation of Flows and Volumes

Contributing Impermeable Area = 14342 m2
Climate Change of 30%
Flows (l/s) = 2.78 x I x A(ha) x Global warming

Storm	15	30	60	120	240	360	720	1440
1 in 100 yr	514.85	334.20	210.44	126.69	72.93	54.58	29.86	17.68
1 in 30 yr	398.08	255.27	158.61	96.27	55.51	42.26	23.17	13.78
2 in 30 yr	212.31	134.35	83.97	51.43	30.12	23.23	13.06	8.08
1 in 1 yr	163.21	104.12	65.83	40.77	24.31	19.03	10.73	6.75

Volume (m3) = Cv x A(ha) x I x D/60 Cv= 1.00

Storm	15	30	60	120	240	360	720	1440
1 in 100 yr	463.00	601.08	756.99	911.45	1049.35	1178.00	1288.75	1525.92
1 in 30 yr	357.99	459.12	570.54	692.61	798.76	912.19	1000.12	1189.56
1 in 2 yr	190.93	241.64	302.05	369.99	433.31	501.40	563.83	697.33
1 in 1 yr	146.77	187.27	236.79	293.29	349.78	410.79	463.14	582.47

Initial Estimate of Balancing Volume Required

For Peak Discharge of 3.33 l/s Av Discharge Factor= 1 Av Qout = **3.33** l/s

Storm	15	30	60	120	240	360	720	1440
1 in 100 yr	460.00	595.09	745.00	887.47	1001.40	1106.07	1144.89	1238.20
1 in 30 yr	354.99	453.12	558.55	668.63	750.80	840.27	856.27	901.85
1 in 2 yr	187.93	235.65	290.06	346.02	385.36	429.48	419.97	409.62
1 in 1 yr	143.78	181.28	224.81	269.31	301.83	338.86	319.29	294.76

Storage required for 1 in 30 yr storm **902** m3
Storage required for 1 in 100 yr storm **1238** m3

Rainwater Recycling

Plan Area Available	2118	m2
Area Inside 3.0m wide Crest	1493	m2
Average Ground Level	3.8	m
IL incoming swale	2.87	m
Depth	0.93	m
GL SW Corner Greenhouse	3.8	m
Assume max WL is 600mm down	3.2	m
Assume 1 in 2 side slopes		
Area at Max Water Level	1068	m2
Assume Water Depth	1.4	m
Base Level	1.8	m
Area of Base	460	
Storage Available	1069.6	m3

Stormwater Attenuation

Plan Area Available	2564	m2
Area Inside 3.0m wide Crest	1625	m2
Lowest Ground Level	3.4	m
Freeboard	0.3	m
Max Water Level	3.1	m
Area at Max Water Level	1487	m2
Overflow from Recycling at	3.2	m
Storage Depth	1	m
Side slopes 1 in	3	m
Sloping sides	3	m
Base Leel	2.1	m
Area of Base	1063	m2
Storage Available	1275	m3

Working from Dyke Upstream

Invert of Ditch	2.8
Ground Level at Ditch	3.8
Distance to Pond	150
Gradient 1 in	150
Il at Pond	3.8
GL at Pond	3.6

Working from Block 2 Downstream

Ground Level SE corner	3.54
Cover to Pipe	0.15
Distance to SW Corner	100
Pipe Dia	0.225
Start IL	3.165
Gradient 1 in	225
IL SW Corner	2.72
GL SW Corner	3.8
Depth	1.08
Swale length	200
Gradient 1 in	500
Swale IL NW Corner	2.32
GL NW Corner	4.00
Depth	1.68

Alternative have above Ground End Gutter or channel drain at ground Level

Ground Level SW corner	3.54
Cover to Pipe	0.15
Pipe Dia	0.225
Start IL	3.165
Distance to Swale	10
Gradient 1 in	225
IL SW Corner	3.12
GL SW Corner	3.8
Depth	0.68
Swale length	200
Gradient 1 in	800
Swale IL NW Corner	2.87
GL NW Corner	4.00
Depth	1.13

NOTES

1. DO NOT SCALE FROM THIS DRAWING
2. SPOT LEVELS PLOTTED FROM A GRID OF LIDAR LEVELS.

PROPERTY OWNESHIP EDGED BLUE

ROADSIDE DITCH DRAINAING TO SHIDB LORDS DRAIN SYSTEM

+4.0
+4.0
+3.80
+3.82
+3.66
+3.6
+3.75
+3.6
+3.80
+3.60
+3.6
+3.6
+3.44
+3.41
+3.45
+3.69
+3.500
EXISTING GLASS HOUSE
EXISTING HARDSTANDING
EXISTING ACCESS ROAD
EXISTING BUILDING
EXISTING GLASS HOUSE
EXISTING ACCESS ROAD
Nursery
EXISTING GLASS HOUSE
Sunnyfield House
+3.70
+2.92
+2.85
Tank
EXISTING GLASS HOUSE
Herons Way
+3.80
+3.60
+2.90
SITE ENTRANCE
+3.8
+3.50
+3.54
Cobblestones
OPEN DITCH
+3.17
+2.9

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REV	DESCRIPTION	AP	DATE

George Shuttleworth Ltd
Consulting Engineers
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CLIENT: BALL COLEGRAVE LTD

PROJECT: SUNNYFIELD, MARSH RD, WESTON, SPALDING GREENHOUSE EXTENSION

DRAWING TITLE: EXISTING SITE, LEVELS & KEY DRAINAGE FEATURES

SCALE	APPROVED BY	DATE
1:500	GS	APR 21

DRG SIZE	DRAWING NO.	REV.
A1	720-001	

NOTES

1. DO NOT SCALE FROM THIS DRAWING
2. SPOT LEVELS PLOTTED FROM A GRID OF LIDAR LEVELS.
3. THIS DRAWING IS AN OUTLINE DESIGN ONLY. DETAILED DESIGN TO FOLLOW THE PRINCIPLES SHOWN ON THIS DRAWING.

SWALE INLET LEVEL
2.87m

+4.0

FULLY LINED RAINWATER RECYCLING POND
MIN CREST LEVEL = 3.6m
BASE LEVEL = 1.8m
OVERFLOW LEVEL = 3.20m

RECYCLING SYSTEM TAKING WATER FOR RECYCLING POND DESIGNED BY OTHERS

BASE LEVEL 1.8m

+3.80

MIN 3.0m WIDE FLAT CREST FOR ACCESS

+3.82

DESIGN WATER LEVEL

MIN 3.0m WIDE FLAT CREST FOR ACCESS

+3.66

OVERFLOW TO STORMWATER ATTENUATION BASIN AT 3.20m

EITHER INSTALL COLLECTOR PIPE OR INDIVIDUAL; PIPES DISCHARGING DIRECTLY TO SWAL

+3.6

+3.75

MIN 3.0m WIDE FLAT CREST FOR ACCESS

ROADSIDE DITCH DRAINAING TO SHIDB LORDS DRAIN SYSTEM

DRAINAGE SWALE AT MIN GRADIENT

+3.80

BLOCK 1 NEW GLASS HOUSE

+3.60

EXISTING

+3.6

STORMWATER ATTENUATION /INFILTRATION BASIN
BASE LEVEL = 2.1m
DESIGN WATER LEVEL = 3.1m
MIN CREST LEVEL 3.4m
MIN VOLUME = 1275m3 WITH 1 IN 3 SIDE SLOPES

+3.44

EXISTING

+3.6

+3.6

DESIGN WATER LEVEL

MIN 3.0m WIDE FLAT CREST FOR ACCESS

+3.41

RECIRCULATION PIPE

BURIED SW PIPES TO PICK UP ROOF DRAINAGE

EXISTING

NEW SELF DRAINING CAR PARK IN PERMEABLE CONSTRUCTION

+3.500

+3.42

OVERFLOW PUMP STATION RATED AT 5.0 L/S MAX. TO HAVE CONTROL SYSTEM TO PUMP TO RECYCLING POND WHEN CAPACITY AVAILABLE.

+3.69

EXISTING

Nursery

EXISTING

Sunnyfield House

+2.92

+3.70

EXISTING

Tank

RISING MAIN DISCHARGING TO DITCH

+2.85

ASSUMED SWALE IL= 3.12m

Herons Way

+3.80

+3.60

BLOCK 2 NEW GLASS HOUSE

EXISTING

+2.90

PUMOPED OVERFLOW TO DITCH

SITE ENTRANCE

GLASSHOUSE ROOF DRAINAGE TO BE CARRIED TO WESTERN SIDE IN EITHER ELEVATED END GUTTERS OR SURFACE CHANNEL DRAINAS TO MIMIMISE DEPTH AT HEAD OF SWALE

+3.54

Cobblestones

+3.8

+3.50

OPEN DITCH

+3.17

+2.9

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REV	DESCRIPTION	AP	DATE

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CLIENT: BALL COLEGRAVE LTD

PROJECT: SUNNYFIELD, MARSH RD, WESTON, SPALDING GREENHOUSE EXTENSION

DRAWING TITLE: PROPOSED SITE & OUTLINE OF PROPOSED SW & WATER RECYCLING SYSTEM

SCALE	APPROVED BY	DATE
1:500	GS	APR 21

DRG SIZE	DRAWING NO.	REV.
A1	720-002	