Flood Risk Assessment and Drainage Report for a

Proposed Additional 2No Poultry Units at Boiling Wells Farm South Rauceby Sleaford. NG34 8QX

Prepared for

Greylees Ltd

Issue 01

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Issue : 01
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1.0 DEVELOPMENT SITE AND LOCATION

1.1 The development site is located to the east of South Rauceby village, Sleaford. The OS Grid Reference of the application site is TF 043 458. Drawing 788-001 contained in Appendix 1 indicates the site location.

1.2 The site covers some 0.8 hectares and is currently a greenfield site bounded on two sides by open land. On the eastern boundary, there are four existing poultry units and an attenuation pond with a further two poultry units on the southern boundary.

1.3 Two of the existing poultry units were granted planning permission in October 2014 under Planning Reference 14/0985/FUL. A further two were granted planning permission in January 2016 under planning reference 15/1242/FUL. With a further two granted under planning reference 21/0871/FUL

1.4 The field in which the new poultry sheds will be located falls from around 30.00m in the North West Corner to 20,0m in the south east corner.

1.5 The site is shown to be in Flood Zone 1 on the Environment Agency Flood Maps. (See Appendix 1)

1.6 Although the proposed development is less than 1.0 hectare the site as a whole will have an impermeable area of over 2.15 hectares a Flood Risk Assessment Report has been produced to demonstrate how the increase in surface water run–off from the development would be dealt with.

1.7 This report provides the information required to demonstrate a strategy for dealing with surface water run–off in a sustainable way such that the on and off site impacts are minimal.

1.8 A consultation response from the Environment Agency for one of the earlier developments on site objected to the development, as the application did not include information to demonstrate that the risks posed to groundwater can be satisfactorily managed. Therefore, this report has been expanded to include a section on groundwater protection.

2.0 DEVELOPMENT PROPOSALS

2.1 The development comprises of two 2320m2 poultry units along with some 725m2 of concrete hardstandings.

2.2 On completion the two new poultry units along with six existing poultry units will form one site served by the same drainage facilities.

2.3 Details of the proposed development are shown on Drawing 788-002 contained in Appendix 1.

2.4 In accordance with Table 2 of the National Planning Policy Framework (NPPF) the development would be classed as less vulnerable.

2.5 In accordance with Table 3 of the NPPF less vulnerable developments in Flood Zone 1 are acceptable.

2.6 The estimated lifetime for the proposed development is 50 years.

3.0 SEQUENTIAL TEST

3.1 Less vulnerable developments in Flood Zone 1 are deemed to have passed the Sequential Test.

4.0 CLIMATE CHANGE

4.1 The NPPF web based guidance provides guidance on potential effects of climate change on flooding which is based on information published by the Environment Agency.

4.2 The Environment Agency published updated information on Climate Change in February 2016, which has been updated several times with the latest update published May 2022.

4.3 The Climate Change Allowances cover

a) Peak River flow

b) Peak Rainfall Intensity

c) Sea Level Rise

d) Offshore wind speed and extreme wave height.

4.4 For Peak River Flows for less vulnerable developments the central allowance should be used. For Anglian Region the central allowance is an increase of 21%.

4.5 For Peak Rainfall Intensity, the development should be checked that including the 2010 epoch upper end allowance the development should be safe from flooding and should not increase flooding elsewhere in the catchment for up to a 1 in 100 year event. In Anglian Region the 1 in 100 year upper end allowance is 40%.

4.6 Sea Level Rises. In Anglian Regions sea levels may rise by up to 1.20m to the 2155 horizon. It is understood that the Flood Hazard Mapping Produced by the Environment Agency includes the appropriate sea level rises.

4.7 Offshore Peak Wind Speed and Extreme Wave Height Allowance. Normally, the Environment Agency models include the appropriate allowance.

4.8 The development site is elevated over 5.0m above the nearest fluvial and flood levels and is sufficiently distant from the coast not to be adversely affected by climate change.

4.9 The surface water drainage system serving the site will need to be designed such that potential additional flows due to climate change do not cause flooding on this development and do not to contribute to an increased risk of flooding elsewhere in the catchment.

5.0 SITE SPECIFIC FLOOD RISK

5.1 The site is in Flood Zone 1 and hence is not at risk of flooding from the sea or river.

5.2 The only potential sources of risk of flooding are therefore:

a) Flooding From Surface Water

b) Flooding from groundwater sources.

c) Flooding from he surface water sewerage system serving the development.

d) Flooding from water mains or sewerage infrastructure.

5.3 The above risks are considered in more detail as follows:

Flooding From Surface Water

5.4 The site is not shown to be in an area at risk of surface water flooding. A copy of the Surface Water Flood Map is presented in Appendix 1.

Flooding from groundwater sources.

5.5 The site is within a ground water protection zone for a water abstraction point within the Lincolnshire Limestone aquifer. Although we are unaware of the range of the variation in the water table at this location, given the elevation and topography of the site, the risk of flooding from high groundwater levels is minimal.

Flooding from site the surface water sewerage system .

5.6 The surface water system will be designed to attenuate flows for a range of storms up to the 1 in 100 year plus climate change event. The attenuation pond will be located adjacent to the existing watercourse and provided with overflows such that the risk of flooding due to a surcharged attenuation pond is minimal.

5.7 It is proposed that the surface water sewerage system is designed to meet the requirements of the Building Regulations. For flows in excess of the design criteria, given the topography of the site flow paths will be created for overland flows that will discharge to the attenuation pond.

5.8 Therefore, the risk of flooding from excess surface water flows will be minimal.

Flooding from water or sewerage infrastructure.

5.9 There are no large water mains or sewers in the area and hence there is no flooding risk from this source.

6.0 OCCUPIERS & USERS OF THE DEVELOPMENT

6.1 The current proposals will see an increase in people using the land by up to 1-2 persons on an employment basis only. There will be no residential occupiers of the site.

6.2 As stated earlier in this report the site is in Flood Zone 1 and at minimal risk of flooding

6.3 The proposed development therefore can be considered safe for the lifetime of the development.

7.0 EXCEPTION TEST

7.1 For Less Vulnerable developments in Flood Zone 1 an Exception Test is not required.

8.0 SURFACE WATER MANAGEMENT

8.1 Sustainable Drainage Systems (SuDS) were been considered for the previous poultry shed developments on this site.

8.2 Following the preferred hierarchy of drainage stated in Part H of the Building Regulations and The Suds Manual the following disposal routes were considered

a) Disposal via Infiltration

b) Disposal to a Watercourse

c) Disposal to Surface Water Sewer

8.3 In the absence of site specific data and the presence of the watercourse on the southern boundary led to the conclusion that it was probable that drainage on the site was restricted and may be unsuitable for disposal via infiltration.

8.4 As the watercourse was available, it was concluded that the more conservative approach would be to attenuate flows on site and discharged at a controlled rate to the watercourse. An open unlined attenuation basin was proposed and if any infiltration were possible then it would still occur and reduce the discharge to the watercourse.

8.5 Six poultry sheds have now been constructed along with an oversized attenuation basin that is understood to be 3.0m below the ground level at the southern end and at least 1.0m below the base of the ditch. There is an overflow pipe to the ditch around 2.75m above the base of the attenuation basin. The attenuation basin is founded on weathered Lincolnshire Limestone.

8.6 It is understood that flows from the four poultry sheds have been attenuated in the basin over the past six year, increasing to six units for the last two years and the overflow to the ditch has not operated in that time.

8.7 Therefore, it is proposed to use the existing attenuation basin to attenuate the flow from the additional two poultry units.

8.8 This will provide a sustainable drainage system for the proposed development.

9.0 OUTLINE DESIGN OF THE PROPOSED SURFACE WATER DRAINAGE SYSTEM

9.1 The intention of this report is to demonstrate that it is practical to provide a surface water drainage system that meets the requirements of the NPPF. The detailed design of the system will need to be undertaken at the detailed design stage and follow the principles contained in this report.

9.2 The majority of the surface water generated will be from the poultry shed roofs, which should have a higher quality than the hardstanding areas. The quality of the run-off should be sufficient that collection via pipes and discharge via the attenuation pond should provide an adequate level of treatment.

9.3 The hardstanding areas outside the entrances to poultry units will be drained via gullies or channel drains and pipes. The pipes will have diverter valves to direct the flows to sealed tanks when the units are periodically being cleaned out.

9.4 The existing poultry unit roofs and hardstanding areas have impermeable areas of 13920m2 and 2950m2 respectively equating to a total impermeable area of 16970m2. The new development will add a further 4640m2 of roof area and 750m2 of concrete hardstanding.

9.5 Although, it may be possible to extend the existing pipes and conveyance systems will be extended to serve the two new poultry units and hardstanding areas, some of them pass under buildings and may require pipes under finished areas. If this is the case , then it may be more practical to install new pipes immediately to the north of the new and exisitng units, as shown on Drawing 788-002, contained in Appendix1.

9.6 The base area of the attenuation basin to the 20.0m contour has been estimated at 2300m2

9.7 The volume in the attenuation basin below the overflow pipe has been estimated at 7100m3

9.8 A conservative assessment of the percolation rate through the base of the of 50mm/hr has been assumed and assuming only 50% of the base area, up to the 20.0m contour is available to discharge flow a discharge of 15.9 l/s can be achieved.

9.9 Calculations of the storage volume required to attenuate flows for up to a 1 in 100 year plus 40% climate change event have been undertaken using the Wallingford Procedure – Modified Rational Method, considering run-off from the impermeable areas only and limiting the discharge to 15.9l/s

9.10 The required attenuation volumes are as listed in the following table. Calculation sheets are presented in Appendix 1.

Storm Event	Attenuation Volume (m3)	% of Volume to Overflow
1 in 1 year	359	5
1 in 30 year	1129	16
1 in 100 year	1558	22

9.11 The total volume of run off from the 1 in 100 year plus 40% climate change six hour storm is 1903m3.

9.12 From the above figures, it can be seen that the less than 22% of the storage volume provided will be utilised for the eight poultry sheds and associated hardstanding areas now proposed.

9.13 The above methodology was checked using the SWMM Software which allows the infiltration discharge through the base to be modelled more accurately. Conservatively, a percolation rate of 25mm/hr to represent only 50% of the actual wetted base areas to be available for percolation at 50mm/hr.

9.14 The software calculated that for the 1 in 100 year 40% Climate Change 6 hour winter storm an attenuation volume of 1649m3 (23.2%) would be required with the attenuation basin filling to a maximum depth of 1.13m

9.15 An illustration of the outline design of the proposed surface water drainage system is shown on Drawing 788/002 provided in Appendix 1.

10.0 OFF SITE IMPACTS

10.1 As the surface water discharge from the site will be collected, attenuated and discharged at a controlled rate there will be no adverse impact on flooding elsewhere in the catchment.

11.0 RESIDUAL RISKS

11.1 There are residual risks that more extreme events are experienced that those evaluated in this report. However, the consequences of more extreme events will not be significantly greater than those assessed in this report.

12.0 GROUNDWATER CONTAMINATION

12.1 In assessing any potential contamination from the development the basic source-pathway-receptor modelling approach should be used.

12.2 The source of the potential contamination is the waste product from the poultry together with any washing down effluent. This waste could have high concentrations of ammonia and nitrates.

12.3 The pathway is through the underlying soil strata and groundwater paths.

12.4 The receptor is the underlying limestone aquifer, which supports Public Water Supply (PWS) abstraction.

12.5 Drawing 788-004, contained Appendix 1 provides a diagram of the conceptual model.

12.6 High nitrate concentrations have historically impacted the PWS and there is therefore a risk that the source of contamination, travelling into and via the groundwater, could affect the PWS.

12.7 The proposed solution to mitigate this risk is to create barriers to prevent the source of contamination entering the groundwater. The proposed barriers are as follows

a) The poultry unit, and feed silos will all be constructed on concrete slabs. Joints in the concrete slabs will be designed to incorporate a flexible sealant groove to prevent liquids passing through any cracks, which would open up as the slabs expend and contract.

b) The external concrete slabs will be designed such that they will fall towards collection drains to prevent any spillages passing onto to the adjacent ground. The drains will have diverter valves that, during the periodic cleaning operations, will divert flows to suitably sized watertight collection chambers, from where the contents will be removed off site by tanker.

c) Following the periodic cleaning exercise, the diverter valves will be set to allow rainwater to discharge to the attenuation pond.

13.0 CONCLUSIONS

13.1 The proposed development is in Flood Zone 1 and the type of development is appropriate for this Zone.

13.2 The existing surface water attenuation system has sufficient capacity to attenuate the surface water discharges and discharge via infiltration so that the proposed development will not cause flooding elsewhere in the catchment.

13.3 The detailed design of the surface water system will need to undertaken following the principles of drainage contained in this report.

13.4 The proposals outlined above will minimise the risk of contamination of ground water supplies.

13.5 Taking into account the above points it is concluded that the proposed development can be considered appropriate in this location.

14.0 APPENDIX 1 SUPPORTING INFORMATION

a) Environment Agency Flood Map for Planning with Site Location added

b) Surface Water Flood Map

c) Surface Water Drainage Calculations

d) Hydraulic Model Schematic

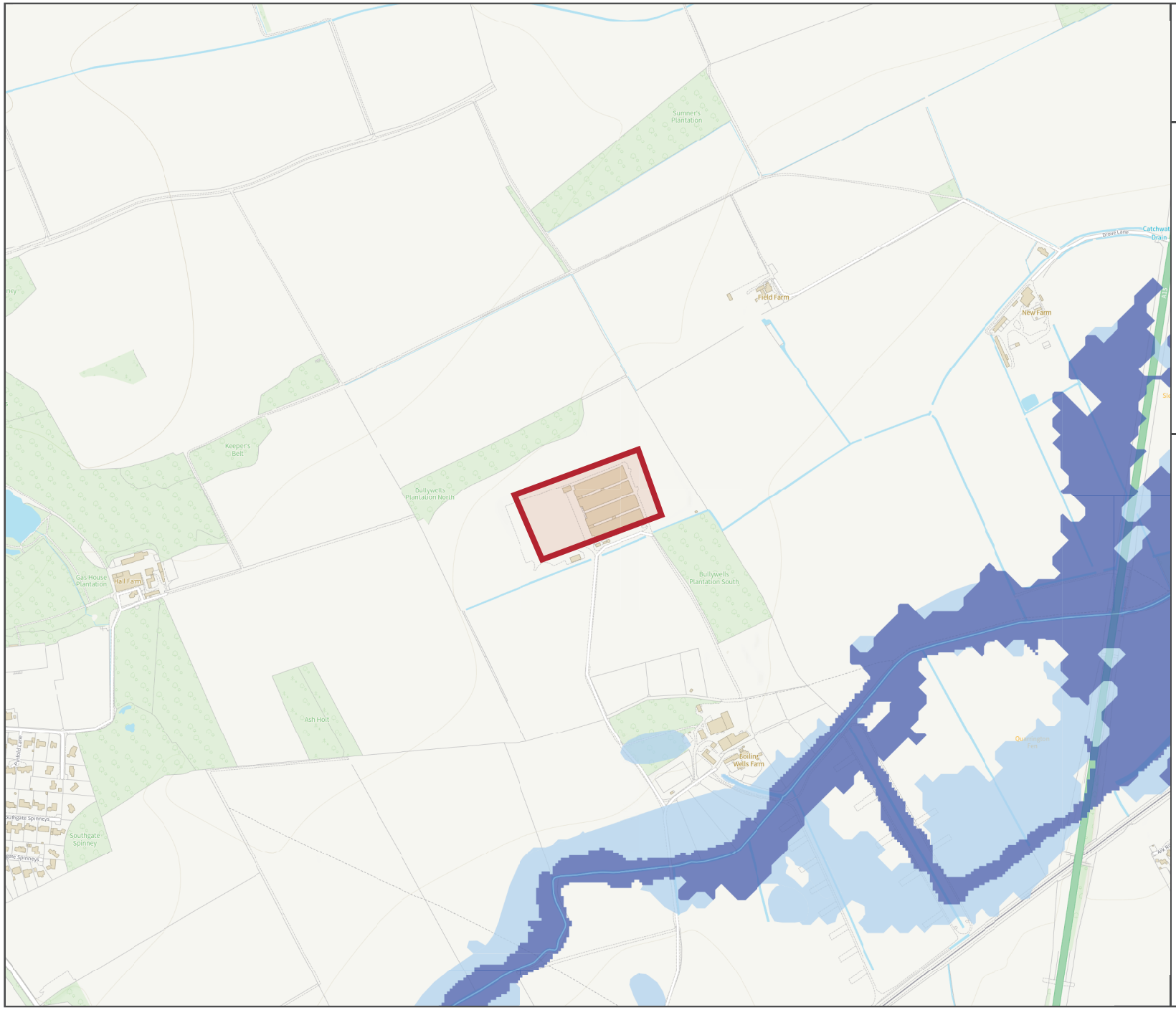
e) Rainfall Curves and Attenuation Volume

f) Model Output for 100year 40% Climate Change 6.0 hour Winter Storm

g) Drawing 788/001 – Location Plan

h) Drawing 788/002 –Outline Surface Water Design

i) Drawing 788/004 – Contamination Model



Environment Agency

Flood map for planning

Your reference
B Wells 10k

Location (easting/northing)
504124/345827

Scale
1:10000

Created
29 Aug 2023 16:24

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 100 200 300m

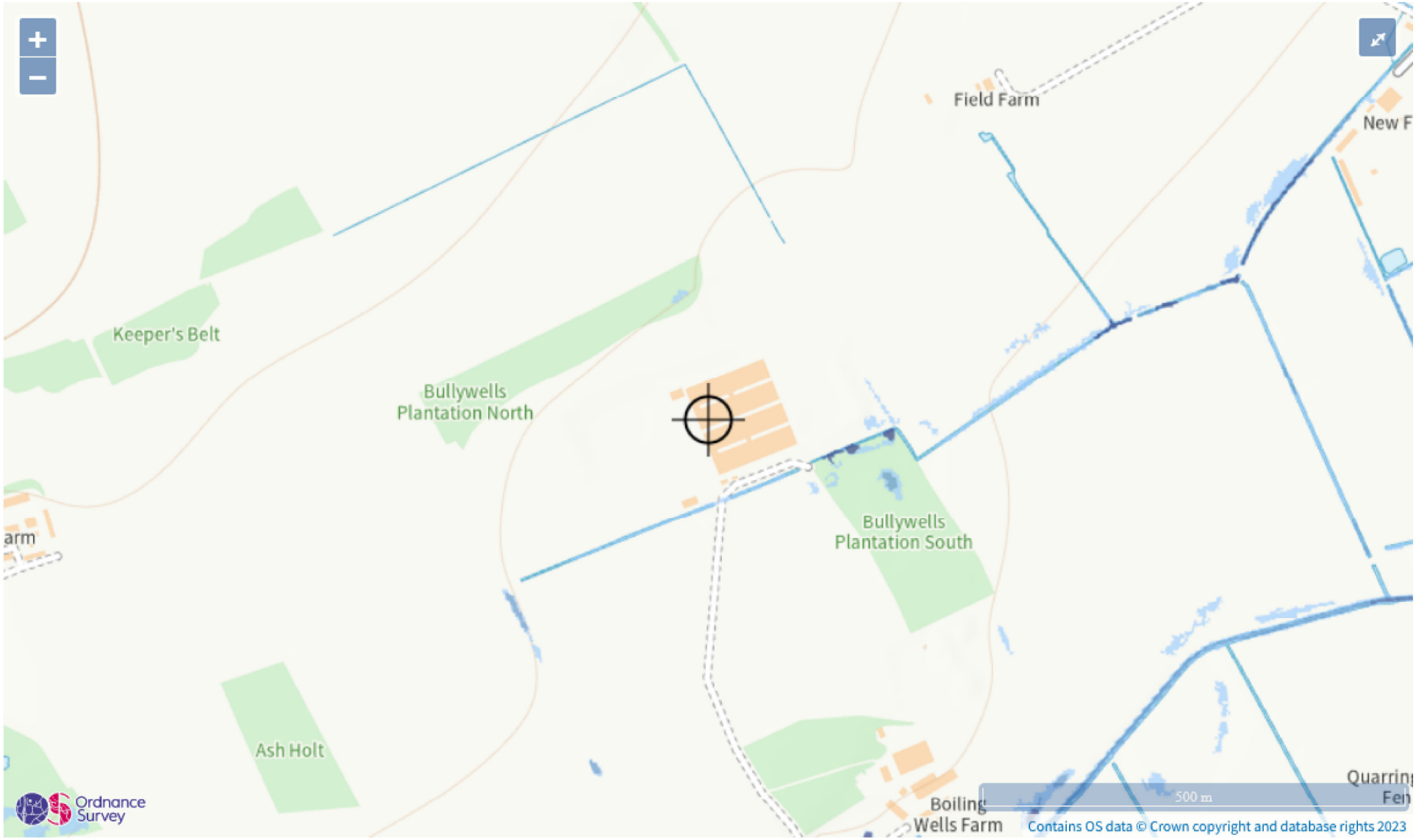
Select the type of flood risk information you're interested in. The map will then update.

Flood risk

Extent of flooding

Location

Enter a place or postcode



Extent of flooding from surface water

High Medium Low Very low Location you selected

EXISTING AREAS

Poultry Units	13920	m2
Concrete Hardstandings	2950	m2
Total	16870	m2

ADDITIONAL PROPOSED AREAS

Poultry Units	4640	m2
Concrete Hardstandings	725	m2
Total	5365	m2

TOTAL EXISTING & PROPOSED AREAS

Poultry Units	18560	m2
Concrete Hardstandings	2950	m2
Total	21510	m2

ESTIMATE ATTENUATION VOLUME AVAILABLE

Contour	Depth of Slice	Area (m2)	Vol Between Contours (m3)	Cumulative Volume (m3)
19.0		232		
19.5	0.5	1387	405	405
20.0	0.5	2296	921	1326
20.5	0.5	3264	1390	2716
21.0	0.5	4383	1912	4627
21.5	0.5	5420	2451	7078
22.0	0.5	6487	2977	10055

ESTIMATE PERCOLATION RATE

Base of Attenuation Basin is Weathered Lincolnshire Limestone.

On other sites on Lincolnshire Limestone percolation rates of 250mm/hr have been achieved

Conservatively here assumed percolation rate is	50	mm/hr
Also, conservatively assumed % of base available for percolation is	50.00%	
Base Area for percolation at say 20.0m contour	2296	m2
Discharge Rate	15.9	l/s

ATTENUATION & DISCHARGE TO DITCH

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 = 21510 m2
Climate Change of 40%
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	831.54	539.77	339.89	204.62	117.79	88.15	48.22	28.55
1 in 30 yr	642.95	412.29	256.17	155.49	89.66	68.26	37.42	22.25
2 in 30 yr	342.90	216.99	135.62	83.06	48.64	37.52	21.10	13.05
1 in 1 yr	263.61	168.17	106.32	65.84	39.26	30.74	17.33	10.90

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	747.79	970.82	1222.63	1472.09	1694.82	1902.60	2081.48	2464.53
1 in 30 yr	578.19	741.53	921.49	1118.64	1290.08	1473.30	1615.31	1921.27
1 in 2 yr	308.37	390.28	487.85	597.58	699.85	809.83	910.65	1126.26
1 in 1 yr	237.06	302.47	382.45	473.69	564.94	663.47	748.03	940.76

Initial Estimate of Balancing Volume Required

For Peak Discharge of 15.94 l/s Av Discharge Factor= 1 Av Qout = **15.94** l/s

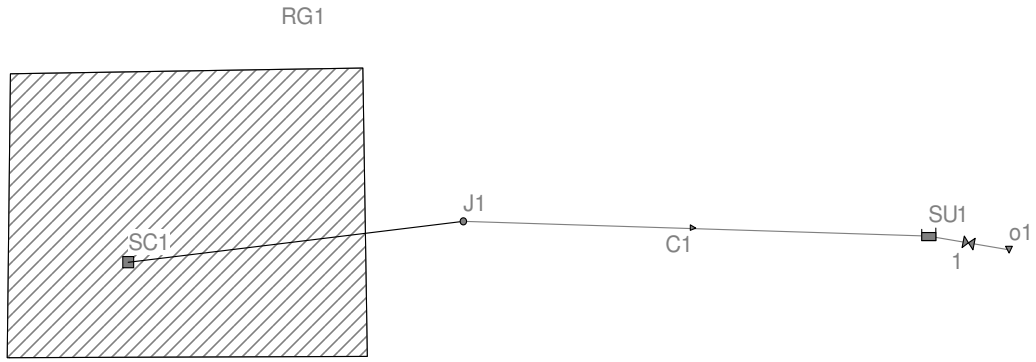
Storm	15	30	60	120	240	360	720	1440
1 in 100 yr	733.44	942.12	1165.23	1357.29	1465.22	1558.20	1392.68	1086.93
1 in 30 yr	563.84	712.83	864.09	1003.84	1060.48	1128.90	926.51	543.67
1 in 2 yr	294.02	361.58	430.45	482.78	470.25	465.43	221.85	0.00
1 in 1 yr	222.71	273.77	325.05	358.89	335.34	319.07	59.23	0.00

Storage required for 1 in 30 yr storm **1129** m3
Storage required for 1 in 100 yr storm **1558** m3

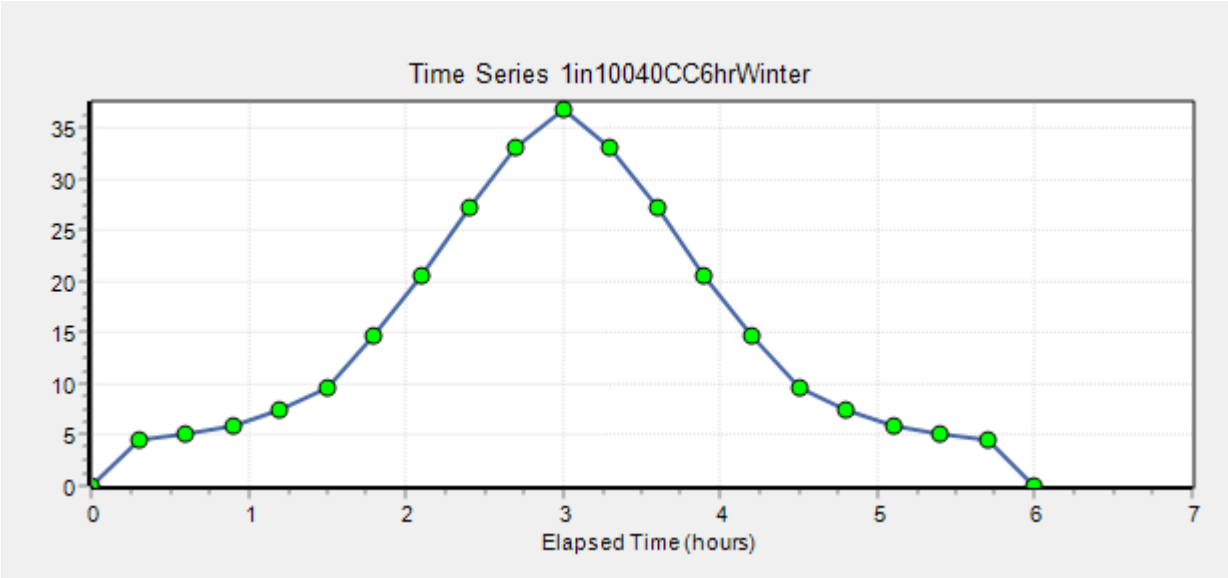
BOILING WELLS FARM

SELECTED OUTPUT FROM SWMM HYDRAULIC MODEL

1. Schematic Diagram
2. Rainfall Profile and Storage Depth Area Figures
3. Condensed Summary Report

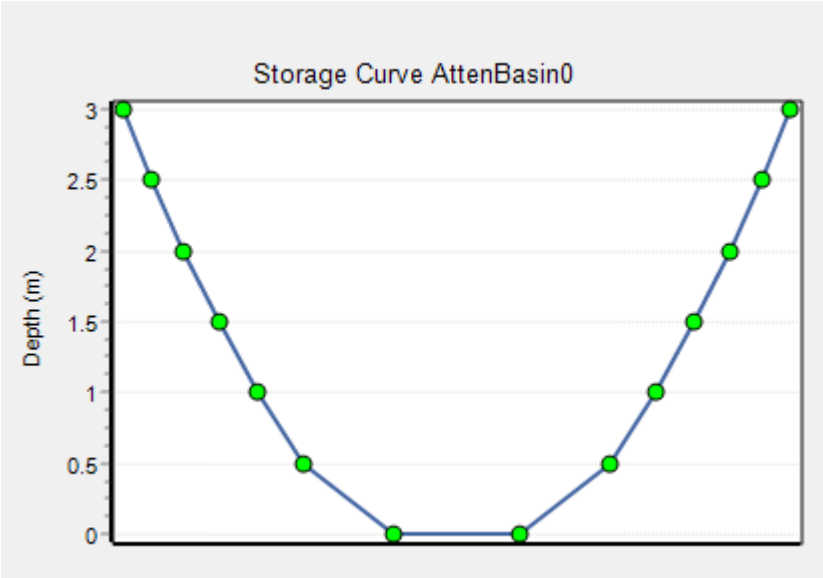

RG1
J1
SC1
C1
SU1
o1
1

RAINFALL PROFILES



Rainfall is in mm/hr

STORAGE VOLUME



Depth (m)	Area (m2)
0	232
0.5	1387
1.0	2296
1.5	3264
2.0	4383
2.5	5420
3.0	6487

SUMMARY REPORT FOR 1in100YR PLUS 40% CLIMATE CHANGE 6 HOUR WINTER STORM

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.0)

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.08	0.14	20.14	0 05:59	0.13
o1	OUTFALL	0.00	0.00	21.00	0 00:00	0.00
SU1	STORAGE	0.58	1.13	20.13	0 06:00	1.13

Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	202.81	202.81	0 03:36	1.85	1.85	0.038
o1	OUTFALL	0.00	0.00	0 00:00	0	0	0.000
SU1	STORAGE	0.00	202.83	0 03:36	0	1.85	0.634

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

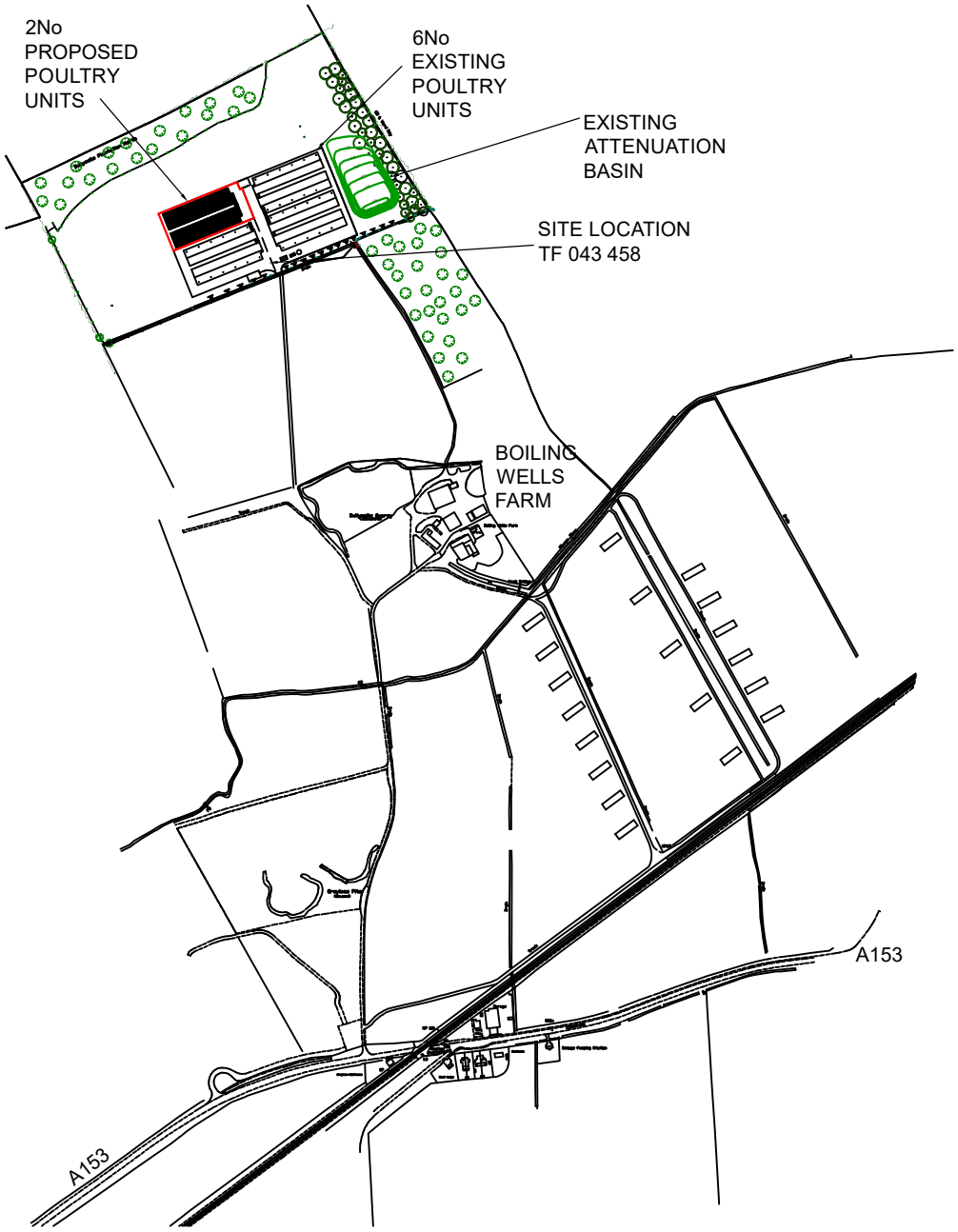
Storage Volume Summary

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SU1	0.707	7	0	10	1.649	16	0 06:00	17.74

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
o1	0.00	0.00	0.00	0.000
System	0.00	0.00	0.00	0.000

Analysis begun on: Fri Aug 25 16:07:24 2023
Analysis ended on: Fri Aug 25 16:07:24 2023
Total elapsed time: < 1 sec



NOTES
1. DO NOT SCALE FROM THIS DRAWING.
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REV	DESCRIPTION	AP	DATE

CLIENT: GREYLEES LTD

PROJECT: BOILING WELLS FARM, SOUTH RAUCEBY

DRAWING TITLE: LOCATON PLAN

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1 Fulmar Court, Lincoln LN6 3NE
07940 927285

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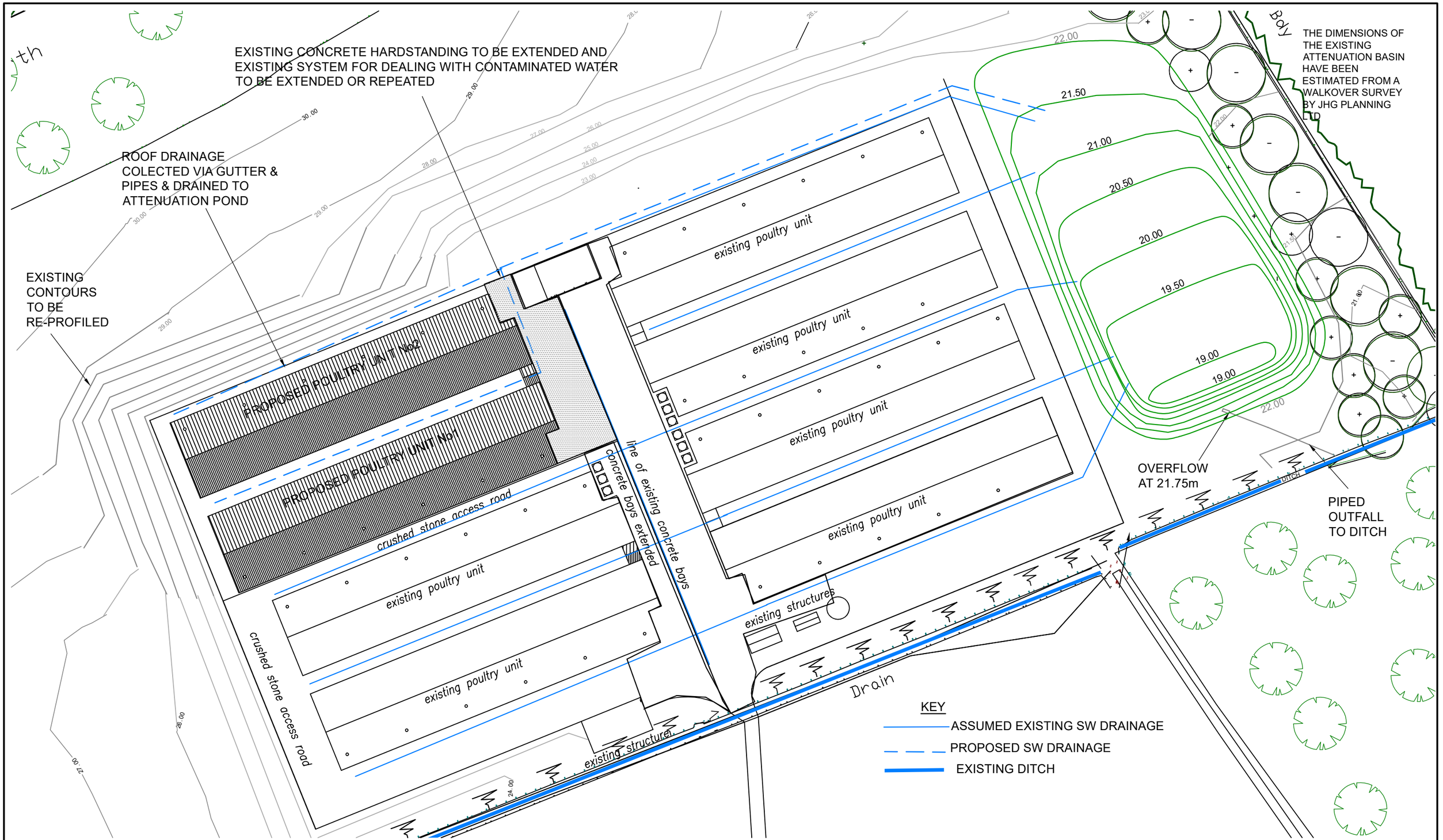

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REV	DESCRIPTION	AP	DATE

CLIENT: GREYLEES LTD

PROJECT: BOILING WELLS FARM, SOUTH RAUCEBY

DRAWING TITLE: OUTLINE SW DRAINAGE DESIGN FOR ADDITIONAL TWO POULTRY UNITS

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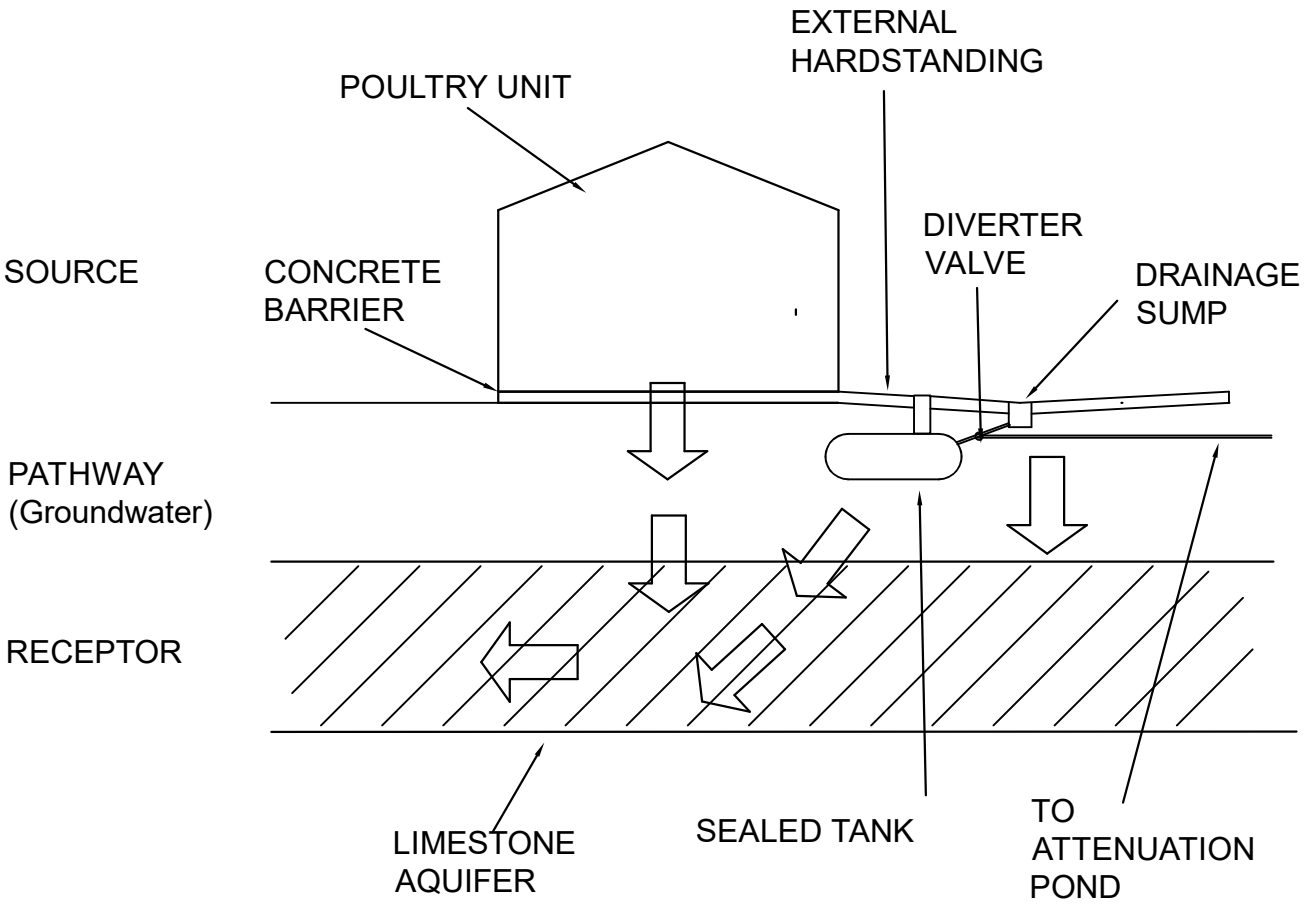

SITE GRID REFERENCE: TF 0425 4579

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REV	DESCRIPTION	AP	DATE

CLIENT GREYLEES LTD

PROJECT BOILING WELLS FARM, SOUTH RAUCEBY

DRAWING TITLE CONCEPTUAL POLLUTION MODEL

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SCALE AT A4	DATE	APPROVED	DRG SIZE	DRAWING NO.	REV.
NTS	AUG 23	GS	A4	788-004	-