



SUSTAINABLE DRAINAGE STATEMENT

SHARCOTT PENNINGS FARM, WILCOT ROAD, PEWSEY, WILTSHIRE SN9 5NL

GRID REFERENCE SU150605

REVISION P01

OCTOBER 2024

REFERENCE: 47342-AAH-RP-C-001

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1.0 Introduction and Site Context

- 1.1 AAH Consultants have prepared this sustainable drainage statement to support the application for the formation of a slurry reservoir, infilling of an existing slurry reservoir and erection of a new barn (the “Development”) at Sharcott Pennings Farm, Wilcot Road, Pewsey, Wiltshire SN9 5NL (the “Site”).
- 1.2 As required by Core Policy 67 (Flood Risk) of the Wiltshire Core Strategy 2015-2026, the design has been developed in accordance with the Non-Statutory Technical Standards for SuDS (March 2015), the SuDS Manual C753 (2015), Wiltshire Council Drainage and Betterment Strategy (June 2024) and Wiltshire Council Surface Water Soakaways Developer’s Guidance Note (December 2018).
- 1.3 The information presented is as follows:
- A background to the Site and Development proposals
 - Surface water drainage strategy
- 1.4 The proposed Development (Appendix B) is for a new barn to be constructed at an existing farm. The new barn will be constructed in the position of the pre-existing slurry reservoir, with the new slurry reservoir being relocated to the south of the Site. The roof area of the new barn measures approximately 2750m², and the surface water runoff will need to be sustainably managed on the Site.
- 1.5 All new external areas are proposed to be surfaced in impermeable finishes to enable the capture of dirty water for conveyance to the new slurry reservoir.
- 1.6 The Site is located entirely in Flood Zone 1 and is therefore at very low risk of fluvial flooding. Furthermore, the Site is at very low risk of flooding from overland surface water flows, groundwater and artificial sources, such as sewers and reservoirs.
- 1.7 The Site topography is gently sloping from a higher elevation in the north (approximately 128mAOD) to a lower elevation in the south (approximately 124mAOD). There are localised slopes to the boundaries of the Site, in the area of the new slurry reservoir and at the existing infiltration basin.
- 1.8 Disposal options for surface water are limited to shallow soakaway systems (infiltration).
- 1.9 The Site soils are of a sandy nature and are generally supportive of the sustainable disposal of surface water by means of shallow and widespread infiltration.

2.0 Surface Water Drainage

Existing Drainage

- 2.1 The topographic survey (Appendix A) illustrates evidence of a formal drainage system for the management and disposal of surface water runoff. Gullies, rainwater pipes and chambers are evident.
- 2.2 Although the survey does not indicate the interconnectivity of drainage features, the owner and operator of the Site has confirmed that surface water runoff from the roofs of buildings and the northern entrance and yard area is conveyed through a below ground drainage system to an infiltration pond in the south-eastern corner of the Site.
- 2.3 It has also been confirmed that all surface water runoff from the yard areas surrounding the barns (south of the northern entrance yard area) is classed as dirty water due to the movements of cattle through the farm. Surface water runoff from these external areas, as well as slurry generated from within the barns, is conveyed to the slurry reservoir at the south of the Site.
- 2.4 It is strongly recommended that the size, depth and interconnectivity between drainage features is verified prior to detailed design.
- 2.5 There are no watercourses (culverted or otherwise) within or directly adjacent to the Site.

Infiltration

- 2.6 In accordance with the Non-Statutory Technical Standards for SuDS (March 2015) and the SuDS Manual C753 (2015), infiltration is considered the most sustainable means of surface water management and is promoted as part of a SuDS approach to controlling runoff close to source (i.e. rather than discharging downstream).
- 2.7 As above and in accordance with the hierarchy of surface water disposal options as set out in Building Regulations Approved Document H, infiltration has been explored as the preferred method of disposal.
- 2.8 Infiltration testing in accordance with BRE Digest 365 was undertaken in 2010 as part of the original planning application for the Site in its current format (E/10/0071/FUL) to confirm the permeability of the underlying soils. The calculated infiltration rate is referenced within the Cole Easdon Consultants Drainage Strategy Report (Appendix C) as 0.025m/hour and has been used as the basis of the surface water drainage strategy. Additional infiltration testing is

recommended to be undertaken to confirm the design infiltration rate from the original planning application.

SuDS Management Train

- 2.9 Core Policy 67 (Flood Risk) of the Wiltshire Core Strategy 2015-2026 and Wiltshire Council Drainage and Betterment Strategy emphasise the multiple benefits that SuDS can provide, including amenity and biodiversity.
- 2.10 Surface water runoff from the roof of the new barn is proposed to be collected through traditional rainwater downpipes and conveyed through below ground pipes to the existing infiltration pond. The infiltration pond capacity has been assessed and is discussed in the following section.
- 2.11 Surface water runoff from new hardstanding around the new barn is classed as dirty water and is proposed to be conveyed towards the central access to the west through the slope of the finished ground surface. Runoff is then proposed to be collected by existing drainage infrastructure and conveyed to new slurry reservoir. The existing dirty water drainage infrastructure is presumed to have sufficient available capacity to accept the minimal additional flows generated by the new hardstanding.
- 2.12 Details of the dirty water drainage system and new slurry reservoir are outside of the scope of this report.
- 2.13 The proposed drainage strategy presented in Appendix D meets the above requirements by proposing a SuDS system incorporating near ground level features that closely mimic the existing drainage/hydrology.

Hydraulic Design

- 2.14 Hydraulic calculations have been undertaken using Causeway Flow software and are presented in Appendix E. The hydraulic calculations have been based on the existing catchment being served by the infiltration basin, with the additional runoff proposed to contribute to the infiltration basin from the new barn roof.
- 2.15 The hydraulic calculations have been undertaken using both FSR and FEH-22 rainfall data and assessed for the most conservative results. For this Site, the FEH-22 rainfall data provides the most conservative results and has been used to inform the design. The results of the FSR data have also been presented for clarity.

- 2.16 The hydraulic calculations have been based on the following storm events, presented as AEP (Annual Exceedance Probability), plus an increase in rainfall as a result of climate change (CC):
- 50% AEP
 - 3.3% AEP + 40% CC
 - 1% AEP + 45% CC
- 2.17 The catchment served by the infiltration pond from the original planning application (E/10/0071/FUL) equates to 1.256ha. This was increased by a further 0.275ha following the application for a new barn in 2019 (19/04896/FUL). Therefore, the infiltration pond is currently serving a catchment of 1.531ha, which has been modelled as a single inflow into the infiltration basin.
- 2.18 The new barn as part of this application will result in an additional catchment of 0.275ha. This contributing area has been split between the nodes and links within the hydraulic model to provide an accurate representation of the proposals.
- 2.19 The infiltration pond has been modelled based on the depth and area parameters and the infiltration rate of 0.025m/hour within the hydraulic model as part of the 2010 application, as well as factor of safety of 2.0 in accordance with the guidance set out within Table 25.2 of the CIRIA SuDS Manual 2015¹.
- 2.20 Additional topographic survey will be required to be undertaken in the area of the existing infiltration pond to confirm the existing dimensions and capacity. Additional infiltration testing is recommended to be undertaken to confirm the design infiltration rate from the original planning application.
- 2.21 Subject to the above being validated, the infiltration pond currently has sufficient capacity to accept the flows from the current catchment. It does not, however have sufficient capacity to accept flows from the proposed new barn.
- 2.22 The total required storage volume within the infiltration pond is approximately 1850m³. As such, it is proposed to increase the capacity of the infiltration basin by extending it by 1.5m width on all sides (at a gradient of 1 in 3) and tying in to the existing bank top profile at the

¹ Table 25.2 requires a minimum factor of safety of 1.5 for catchments over 1,000m² where there would be no damage or inconvenience should the infiltration capacity reduce over time. It is generally recommended however, that a minimum factor of safety of 2.0 is applied. For this Site, the exceedance route in the event of the infiltration pond being overwhelmed is demonstrated to be conveyed towards the west and then south into the adjacent field within the applicant's land ownership. Exceedance flows would spread and infiltrate to ground. There is also additional capacity provided with the freeboard allowance, therefore the risk of exceedance is very low. Therefore, there is a very low risk of damage or inconvenience to buildings or infrastructure in this scenario.

northern corner. The bank top level of the infiltration pond is proposed to be raised to a minimum of 124.6mAOD (0.52m above lowest existing bank top level) to provide the required additional storage capacity and allow for at least 300mm of freeboard. The freeboard allowance has been provided to provide a factor of safety against flooding.

- 2.23 The proposed surface water drainage system has been simulated against the above storm events, and the results demonstrate no flooding within any design storm event.
- 2.24 The infiltration basin has been assessed for capacity under consecutive rainfall events. The Wiltshire Council Drainage and Betterment Strategy requires attenuation systems to have the capacity to accept a 10% AEP storm following a 30% AEP + 40% CC storm. The 30% AEP + 40% CC storm requires a volume capacity of 1394m³ and the 10% AEP storm requires a volume capacity of 750m³, totalling 2144m³. The total available volume within the infiltration pond, including the freeboard allowance, is 2376m³. Therefore, there is sufficient capacity within the infiltration pond to accept runoff from the above consecutive storm events.
- 2.25 It is strongly recommended that the existing infiltration pond is cleared of silt and settled deposits to ensure the efficacy of the infiltration system.
- 2.26 Overflow and exceedance routes are indicated in Appendix D and show that, in the event of a blockage on the drainage system or a storm in excess of the design parameters, water will migrate towards the west and then south into the adjacent field within the applicant's land ownership. Exceedance flows would spread and infiltrate to ground and would not affect buildings or other infrastructure.

Water Quality

- 2.27 The water quality treatment train has been determined based on the CIRIA SuDS Manual. The appraisal of the Site's characteristics and relevant SuDS components is presented below, demonstrating that the relevant indices can be met through the implementation of a loamy soil of at least 300mm in depth to the base of the infiltration pond and a dense grass surface finish, which will provide good contaminant attenuation potential.

<i>Minimum water quality management requirements for discharges to receiving surface waters and groundwater (SuDS Manual, 2015, Table 4.3)</i>		
Land use	Pollution hazard level	Requirement for discharge to surface waters and groundwater
Industrial roofs	Low	Simple Index Approach

<i>Steps in the simple index approach (SuDS Manual, 2015, Box 26.2):</i> <i>1. Allocate suitable pollution hazard indices for the proposed land use</i> <i>2. Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index</i> <i>3. Where the discharge is to protected surface waters or groundwater, consider the need for a more precautionary approach</i>
Where the mitigation index of an individual component is insufficient, two components (or more) in series will be required, where (SuDS Manual, 2015):- [not required since hazard indices are sufficiently met by the proposed SuDS below] ———— Total SuDS mitigation index = mitigation index 1 + 0.5 * mitigation index 2 A factor of 0.5 is used to account for the reduced performance of secondary or tertiary components where the discharge is of already reduced inflow concentrations to protected waters.

<i>Pollution hazard indices for different land use classifications (SuDS Manual, 2015, Table 4.3)</i>				
Land use	Pollution hazard level	Total suspended solids TSS	Metals	Hydrocarbons
Industrial roofs	Low	0.3	0.2-0.8	0.05
<i>Indicative SuDS mitigation indices for discharges to groundwater (SuDS Manual, 2015, Table 26.4)</i>				
Type of SuDS component		TSS	Metals	Hydrocarbons
A soil with a good contaminant attenuation potential (loamy soil) of at least 300mm in depth and dense grass surface finish.		0.6	0.5	0.6

Maintenance

- 2.28 To ensure that SuDS components operate efficiently over the lifetime of the Development it is fundamental that routine maintenance duties are undertaken. The areas of the Site drainage system which require regular maintenance are those where silt and debris accumulate, limiting the storage or conveyance function of individual components, which in turn exacerbates the probability of drainage system failure.
- 2.29 Maintenance activities for the infiltration pond and upstream chambers and pipes are outlined below. Ultimately, the applicant is responsible for ensuring that full instructions for maintenance, along with the details of any parts that may need to be replaced, are provided to the appropriate person(s).
- 2.30 Should the Site come under new ownership, the applicant will be responsible for providing the maintenance schedule to the new owners. It is recommended that a written schedule of maintenance is kept by the client for future use.

Table 1: Infiltration Pond Maintenance Requirements

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – public area	Monthly (during growing season)
	Cut the meadow grass	Half yearly (spring, before nesting season, and autumn)
	Inspect marginal and bankside vegetation and remove nuisance plants (for first three years)	Monthly (at start, then as required)
	Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage and/or physical damage	Monthly
	Inspect water body for signs of poor water quality	Monthly (May – October)
	Inspect silt accumulation rates in upstream chambers and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to a minim of 1m above water level	Annually
	Tidy all dead growth (scrub clearance) before start of growing season (Note: tree maintenance is usually part of overall landscape management contract)	Annually
	Remove all sediment from any forebay	Every 1 – 5 years, or as required
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays	Every 5 years or as required
Occasional maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment, this will only be required rarely, eg every 25 – 50 years
Remedial actions	Repair erosion or other damage	As required
	Replant, where necessary	As required
	Aerate pond when signs of eutrophication are detected	As required
	Realign rip-rap or repair other damage	As required
	Repair/rehabilitate inlets, outlets and overflows	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check infiltration pond to ensure emptying is occurring	Annually

3.0 Conclusion

- 3.1 AAH Consultants have prepared this sustainable drainage statement to support the application for the formation of a slurry reservoir, infilling of an existing slurry reservoir and erection of a new barn at Sharcott Pennings Farm, Wilcot Road, Pewsey, Wiltshire SN9 5NL
- 3.2 As required by Core Policy 67 (Flood Risk) of the Wiltshire Core Strategy 2015-2026, the design has been developed in accordance with the Non-Statutory Technical Standards for SuDS (March 2015), the SuDS Manual C753 (2015), Wiltshire Council Drainage and Betterment Strategy (June 2024) and Wiltshire Council Surface Water Soakaways Developer's Guidance Note (December 2018).
- 3.3 The Site is located entirely in Flood Zone 1 and is therefore at very low risk of fluvial flooding. Furthermore, the Site is at very low risk of flooding from overland surface water flows, groundwater and artificial sources, such as sewers and reservoirs.
- 3.4 The Site soils are of a sandy nature and are generally supportive of the sustainable disposal of surface water by means of shallow and widespread infiltration. An existing infiltration pond is present on the Site and serves to manage the disposal of runoff generated from roofs and the northern entrance and yard area. This infiltration pond is proposed to be increased in capacity to accept additional flows generated from the new barn roof by widening and raising the banks.
- 3.5 Additional topographic survey will be required to be undertaken in the area of the existing infiltration pond to confirm the existing dimensions and capacity. Additional infiltration testing is recommended to be undertaken to confirm the design infiltration rate from the original planning application.
- 3.6 It is strongly recommended that the size, depth and interconnectivity between existing drainage features is verified prior to detailed design.
- 3.7 The proposed surface water drainage system has been simulated against individual and consecutive design storm events and the results demonstrate no flooding within any storm scenario.
- 3.8 It is strongly recommended that the existing infiltration pond is cleared of silt and settled deposits to ensure the efficacy of the infiltration system.
- 3.9 Overflow and exceedance routes illustrate that, in the event of a blockage on the drainage system or a storm in excess of the design parameters, water will migrate away from the Site

into the adjacent field within the applicant's land ownership. Exceedance flows would spread and infiltrate to ground and would not affect buildings or other infrastructure.

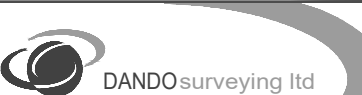
- 3.10 The water quality treatment train has been assessed and demonstrated that the relevant indices can be met through the implementation of a loamy soil of at least 300mm in depth to the base of the infiltration pond and a dense grass surface finish.
- 3.11 Management and maintenance plans, along with overall maintenance responsibility for key surface water drainage features, have been provided.
- 3.12 This report demonstrates that surface water from the Site and the Development can be sustainably managed without increasing flood risk.

APPENDIX A:
TOPOGRAPHIC SURVEY



Revision

Rev. 1: 20/03/2023. Survey completed to include new client data. Rev. 2: 20/03/2023. Survey completed to include new client data.



Land & Measured Building Surveyors

27-29 New Street, Charfield, South Glos, GL12 8ES

Project Name: Sharcott Farm, Pinner, Cheltenham

Drawing Title: Topographical Survey 1 of 4

Client: Sharcott Farm

Agents: Pinner Architecture & Planning Ltd

Date: 18/03/2023 Scale: 1:1000

Grid Orientation: Sheet ID: 1000000000

Site Level Datum: 41004.1917 m OD

Scale: 1:1000

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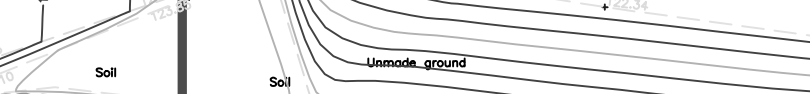
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Revision

Rev. 1: 20/03/2023. Survey completed to include new client data. Rev. 2: 20/03/2023. Survey completed to include new client data.



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Project Name: Sharcott Farm, Pinner, Cheltenham

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Tree Abbreviations

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Land & Measured Building Surveyors

27-29 New Street, Charfield, South Glos, GL12 8ES

Project Name: Sharcott Farm, Pinner, Cheltenham

Drawing Title: Topographical Survey 3 of 4

Client: Sharcott Farm

Agents: Pinner Architecture & Planning Ltd

Date: 18/03/2023 Scale: 1:1000

Grid Orientation: Sheet ID: 1000000000

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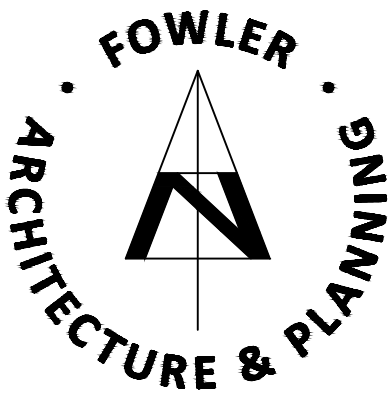
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APPENDIX B:
DEVELOPMENT PROPOSALS



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revisions

project
SHARCOTT PENNINGS FARM
Pewsey

drawing

Location Plan

scale
1:1250 @ A3

drawn by
DB

date
May '21

230327-01
drawing no

rev



SITE PLAN
1:500

revisions	initial	date
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SHARCOTT PENNING'S FARM
Pewsey

drawing
Prop Barn - site plan

scale
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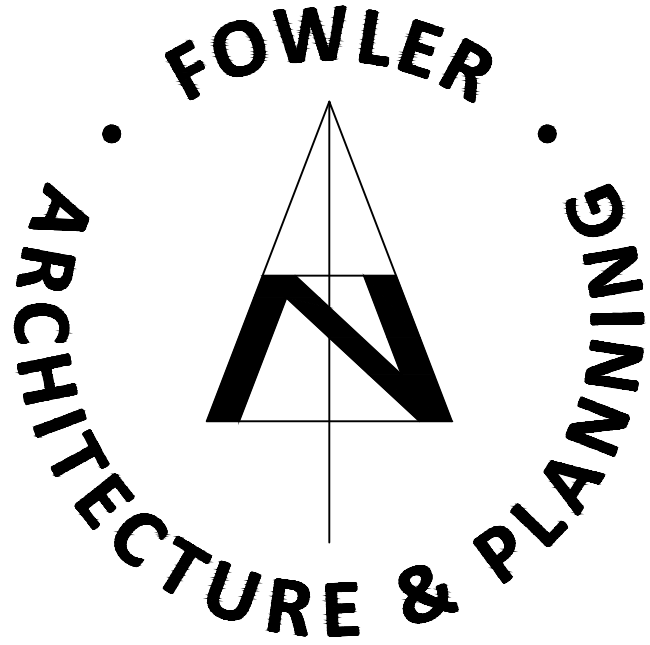
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date
April 23

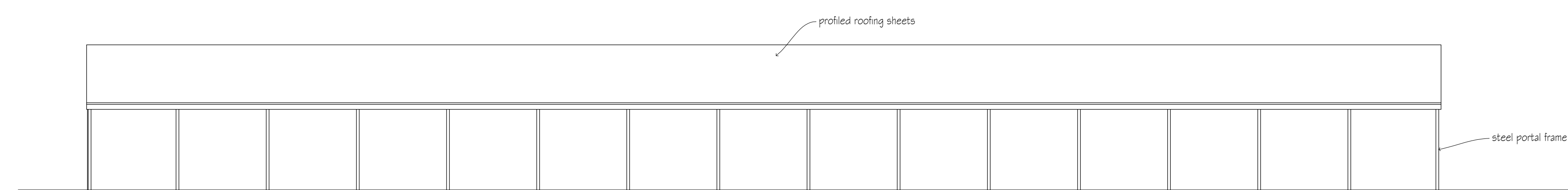
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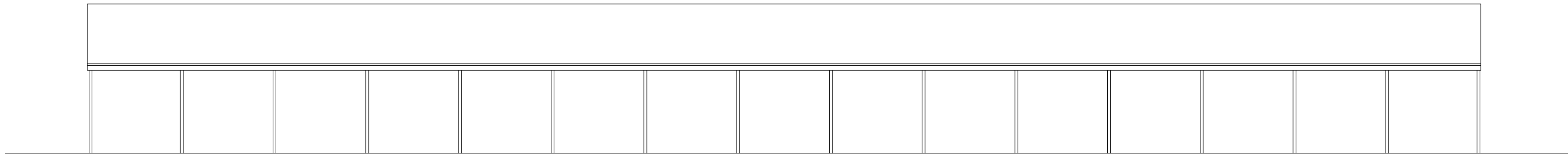
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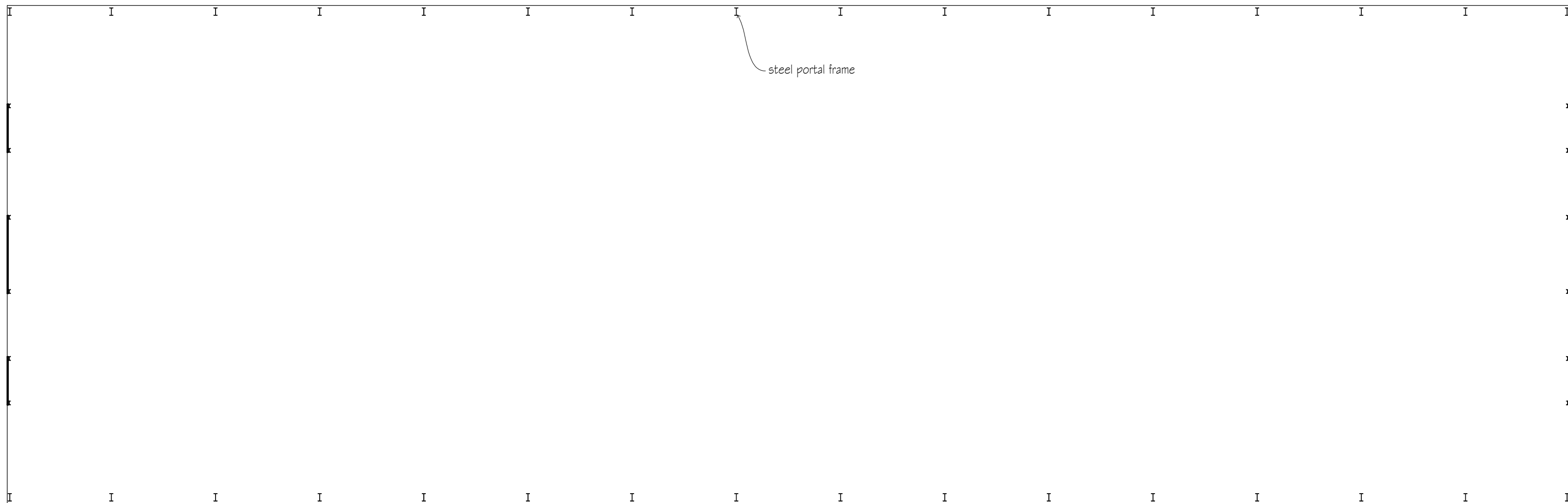
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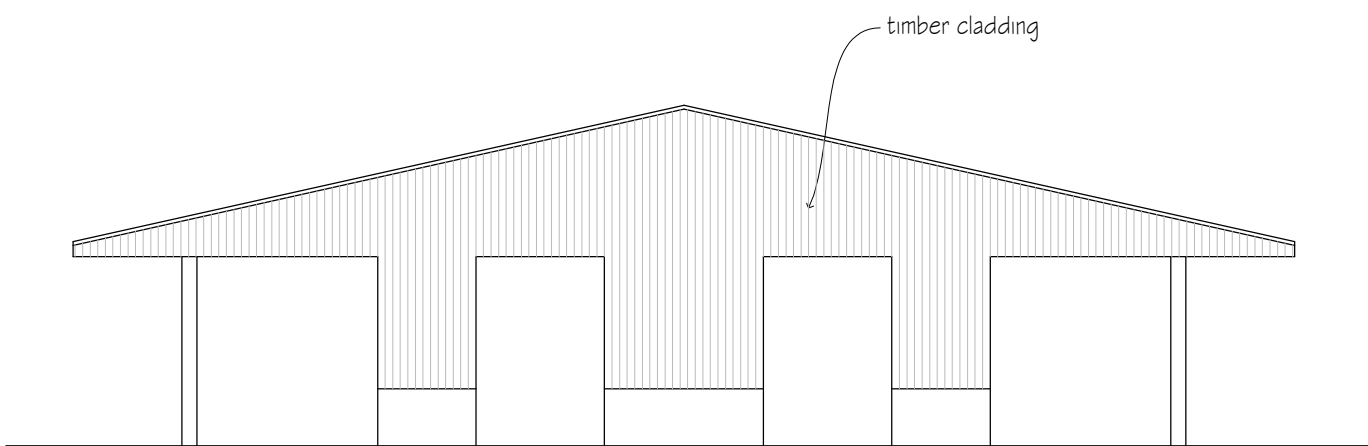
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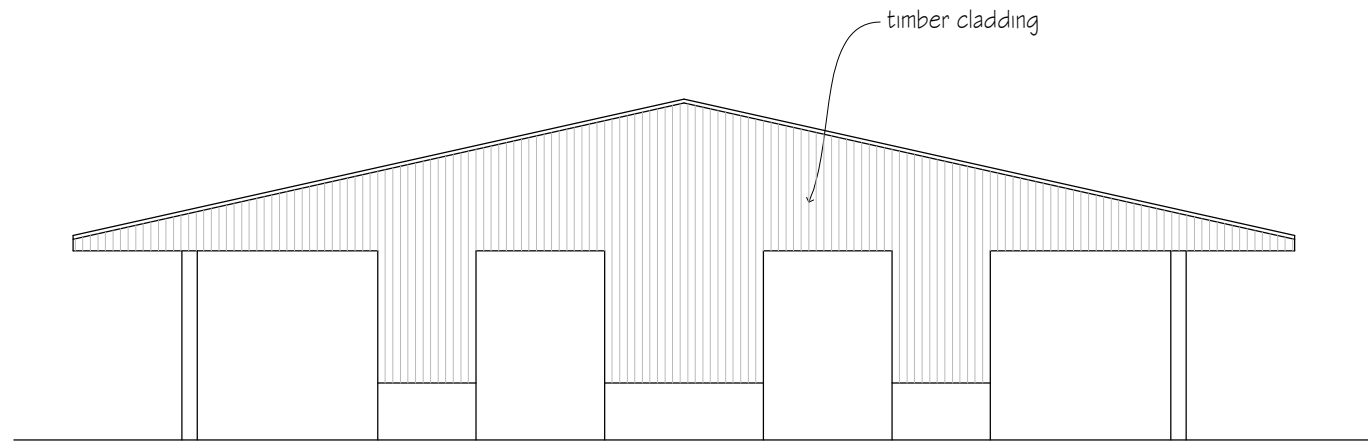
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PLAN
1:200



EAST ELEVATION
1:200



WEST ELEVATION
1:200

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project
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Pewsey

drawing
Prop Barn

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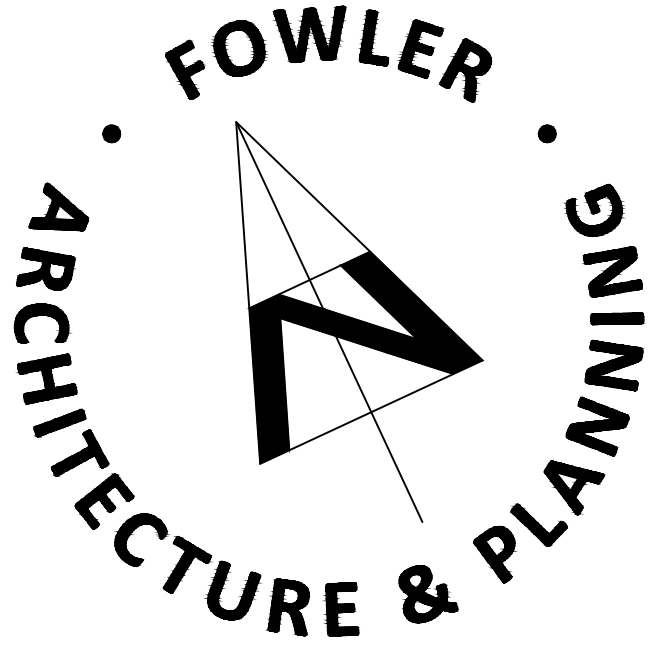
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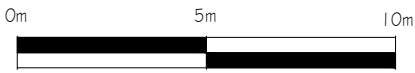
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APPENDIX C:

PREVIOUS APPLICATION DRAINAGE STRATEGY



**SHARCOTT PENNING FARM
WILCOT ROAD, PEWSEY,
WILTSHIRE**

**DRAINAGE STRATEGY REPORT
FOR
PROPOSED DAIRY COMPLEX**

NOVEMBER 2010

[ISSUE NO.1]

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SHARCOTT PENNING FARM, WILCOT ROAD, PEWSEY
DRAINAGE STRATEGY REPORT

COLE EASDON CONSULTANTS (CEC)
DOCUMENT ISSUE RECORD

Client: Stowell Farms
Project: Sharcott Penning Farm, Wilcot Road, Pewsey, Wiltshire
Job Number: 3063
Document Title: Drainage Strategy

<i>Issue / Revision:</i>	Issue 1			
<i>Description / Status:</i>	Formal Issue			
<i>Date:</i>	November 2010			
<i>Prepared:</i>	S Starr BSc (Hons)			
<i>Signature:</i>				
<i>Document Check:</i>	K. Legg			
<i>Signature:</i>				
<i>Technical Check:</i>	J Candy			
<i>Signature:</i>				
<i>Authorised:</i>	R Bowley BSc CEng MCIWEM			
<i>Signature:</i>				
<i>File Reference:</i>	3063 Drainage Strategy (Issue 1)			

COLE EASDON CONSULTANTS (CEC)

NOVEMBER 2010



SHARCOTT PENNING FARM, WILCOT ROAD, PEWSEY
DRAINAGE STRATEGY REPORT

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APPENDICES

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Appendix 2: Surface Water Infiltration Pond - Micro Drainage Calculations

Appendix 3: Met Office Average Rainfall Figures for Lyneham 1971 - 2000

Appendix 4: Dirty Water Lagoon - Micro Drainage Calculations

Appendix 5: Drawing No. 3063/501 Rev D - Proposed Drainage Strategy

1.0 INTRODUCTION

- 1.1 This Drainage Strategy has been prepared by Cole Easdon Consultants on behalf of Stowell Farm for a proposed dairy complex on land at Sharcott Penning Farm, Wilcot Road, Pewsey, Wiltshire.
- 1.2 The development proposal includes the demolition of the existing beef cattle buildings and replacement with a new dairy complex and tied dwelling.
- 1.3 The report has been prepared in response to a letter from the Environment Agency dated 1st April 2010, which gave comments on a Flood Risk Assessment prepared by an independent Consultant Hydrologist in support of the planning application for the development. A copy of the letter is included in Appendix 1.
- 1.4 The drainage strategy for the proposed dairy complex has been prepared to minimise any flood risk associated with the proposals and to clarify the means of surface water and contaminated water disposal.
- 1.5 The strategy includes provision for the management of clean runoff (from roof areas and uncontaminated hard standings) and a separate system for runoff from external yards and the proposed silage clamps.
- 1.6 The bulk of the cattle waste generated by the proposals will be located within the cattle sheds and will be managed separately from both the clean and dirty water runoff systems.

2.0 EXISTING SITE

Site Topography and Geology

- 2.1 The existing site lies to the northwest of the village of Pewsey and is located off Wilcot Road.
- 2.2 The existing site lies on sloping ground which falls away from Wilcot Road to the north of the site towards Woodborough Road approximately 700 metres to the southwest.
- 2.3 The existing hard paved yard and buildings to the north of the site will be demolished and replaced with a larger dairy complex that includes cattle sheds, associated hard paved yards and silage clamps.
- 2.4 A large grassed field is situated between the new dairy complex and Woodborough Road to the southwest, which will be used for cattle grazing. The land to the east and west of the site is predominantly agricultural land.
- 2.5 Trial pits on-site have shown that the geology consists of approximately 350mm of topsoil on greensand sub-strata.

3.0 DRAINAGE STRATEGY

Clean Surface Water

- 3.1 Clean surface water runoff will be generated from the roofs of the proposed buildings and the site access roads and delivery area in the north of the site (catchment area 12,500m²).
- 3.2 This runoff will be discharged via a piped system to an infiltration pond to be located to the south of the proposed dairy complex. In accordance with the requirements of PPS25, a 1 in 100 year + 30% storm has been used to size the pond. Such an event will generate 900m³ runoff from the clean catchment. The pond has therefore been sized to accommodate this volume with a further 0.5m freeboard.
- 3.3 Soakage testing has been carried out in accordance with BRE Digest 365 in this area and the sand/greensand strata beneath the site is sufficiently permeable for drainage by infiltration (Infiltration rate = 0.025m/hr).
- 3.4 The banks of the proposed pond will be graded at 1:3 and stabilised using appropriate planting/geotextiles to prevent erosion.
- 3.5 A large volume of the roof water will be directed to a rainwater harvesting tank before entering the pond. This will then be reused daily as drinking water for the cattle. However, as the tank may be full during a storm event, the storage volume provided within the proposed pond has not been reduced.

Contaminated Water

- 3.6 Runoff from proposed silage clamps and from hardstanding areas adjacent to the proposed cattle sheds (catchment area approx 8,400m²) will contain relatively low concentrations of silage leachate and cattle effluent. This water will be drained to a dirty water lagoon, also located in the south of the site.
- 3.7 The lagoon has been sized based on the total of the average monthly rainfall for the three wettest months of the year (from Met Office records 1971-2000 for Lyneham, Wiltshire) multiplied by the area of the site likely to come into contact with effluent. This calculation gives a runoff volume of 1,790m³ over a 3 month period.
- 3.8 The proposed lagoon will accommodate this volume and include minimum 750mm freeboard above the top water level, providing an additional 1,200m² storage volume. Please note that the calculations for the dirty water lagoon in Appendix 4 are based on a 1000 year storm and an artificially large catchment area, which causes flooding. The pond was modelled in this way purely to demonstrate that the proposed design could accommodate the necessary volume (1,790m³) and to generate water levels within the pond. The input parameters and the resultant flooding do not relate to the conditions under which the pond will operate.
- 3.9 The lagoon will be drained a minimum of once every three months but in practice, it is likely to be emptied more frequently. It will be drained using a tanker or umbilical pipeline and irrigated on the land in accordance with good farm practice.
- 3.10 The banks of the lagoon will be graded at 1:3 and stabilised using appropriate geotextiles. It will be lined with an impermeable butyl liner to prevent infiltration into the strata below.

Slurry

- 3.11 Cattle waste will be concentrated within the covered cattle sheds, and will be isolated from both the systems outlined above. Slurry will be directed to slurry channels running through the sheds and discharged to an anaerobic digester plant, which will be used to generate heat and power for use on the farm.
- 3.12 The capacity of the anaerobic digester plant will provide in excess of the 22 week NVZ storage requirement and the digestate and separated fibre produced by the process will be disposed of in accordance with the relevant regulations as detailed in the site Farm Waste Management Plan and in accordance with good farm practice.

4.0 CONCLUSIONS

- 4.1 This drainage assessment evaluates various sources of surface water and contaminated water generation arising from the proposed dairy complex at Sharcott Penning Farm, Pewsey. It calculates the required size of the surface water infiltration basin and the size of the dirty water lagoon necessary to receive contaminated flow arising from the dairy complex.
- 4.2 We can conclude that the surface water runoff from the site can be managed in a sustainable manner, thereby reducing the risk of flooding within the site and the local area.
- 4.3 Contaminated water containing relatively low concentrations of silage leachate and cattle effluent will be stored in an appropriately sized lagoon and will be drained a minimum of once every three months using a tanker or umbilical pipeline and irrigated on the land in accordance with good farm practice.

Cole Easdon Consultants
November 2010

Cole Easdon Consultants		Page 1
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Date 03 November 2010 12:41	Designed By sstar	
File Infiltration basin 1.5m.src	Checked By	
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Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 1910 minutes

Storm Duration (mins)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m ³)	Status
15 Summer	3.3	3.3	8.8232	0.3232	272.8	O K
30 Summer	3.4	3.4	8.9227	0.4227	364.8	O K
60 Summer	3.6	3.6	9.0252	0.5252	463.3	O K
120 Summer	3.8	3.8	9.1253	0.6253	563.1	O K
180 Summer	3.9	3.9	9.1783	0.6783	617.6	O K
240 Summer	3.9	3.9	9.2118	0.7118	652.7	O K
360 Summer	4.0	4.0	9.2578	0.7578	701.7	O K
480 Summer	4.1	4.1	9.2863	0.7863	732.4	O K
600 Summer	4.1	4.1	9.3048	0.8048	752.7	O K
720 Summer	4.1	4.1	9.3173	0.8173	766.1	O K
960 Summer	4.1	4.1	9.3293	0.8293	779.5	O K
1440 Summer	4.1	4.1	9.3268	0.8268	776.5	O K
2160 Summer	4.1	4.1	9.3068	0.8068	754.7	O K
2880 Summer	4.1	4.1	9.2838	0.7838	729.6	O K
4320 Summer	4.0	4.0	9.2378	0.7378	680.2	O K
5760 Summer	3.9	3.9	9.1943	0.6943	634.5	O K
7200 Summer	3.8	3.8	9.1543	0.6543	592.7	O K
8640 Summer	3.8	3.8	9.1158	0.6158	553.5	O K
10080 Summer	3.7	3.7	9.0793	0.5793	516.4	O K
15 Winter	3.3	3.3	8.8592	0.3592	305.8	O K
30 Winter	3.5	3.5	8.9697	0.4697	409.1	O K
60 Winter	3.7	3.7	9.0827	0.5827	519.9	O K
120 Winter	3.9	3.9	9.1928	0.6928	633.1	O K
180 Winter	4.0	4.0	9.2518	0.7518	695.5	O K
240 Winter	4.1	4.1	9.2898	0.7898	736.1	O K
360 Winter	4.2	4.2	9.3418	0.8418	793.5	O K
480 Winter	4.2	4.2	9.3753	0.8753	830.6	O K
600 Winter	4.3	4.3	9.3978	0.8978	856.0	O K
720 Winter	4.3	4.3	9.4133	0.9133	873.7	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	122.43	19
30 Summer	82.24	34
60 Summer	52.66	64
120 Summer	32.50	124
180 Summer	24.12	184
240 Summer	19.39	242
360 Summer	14.27	362
480 Summer	11.46	482
600 Summer	9.66	602
720 Summer	8.40	722
960 Summer	6.72	960
1440 Summer	4.91	1398
2160 Summer	3.57	1728
2880 Summer	2.85	2104
4320 Summer	2.07	2936
5760 Summer	1.64	3752
7200 Summer	1.38	4544
8640 Summer	1.19	5368
10080 Summer	1.06	6160
15 Winter	122.43	19
30 Winter	82.24	34
60 Winter	52.66	64
120 Winter	32.50	122
180 Winter	24.12	180
240 Winter	19.39	240
360 Winter	14.27	358
480 Winter	11.46	474
600 Winter	9.66	590
720 Winter	8.40	706



Summary of Results for 100 year Return Period (+30%)

Storm Duration (mins)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
960 Winter	4.3	4.3	9.4318	0.9318	894.3	O K
1440 Winter	4.3	4.3	9.4388	0.9388	902.4	O K
2160 Winter	4.3	4.3	9.4163	0.9163	877.0	O K
2880 Winter	4.3	4.3	9.3898	0.8898	846.9	O K
4320 Winter	4.1	4.1	9.3303	0.8303	780.4	O K
5760 Winter	4.0	4.0	9.2693	0.7693	714.0	O K
7200 Winter	3.9	3.9	9.2103	0.7103	651.5	O K
8640 Winter	3.8	3.8	9.1543	0.6543	592.9	O K
10080 Winter	3.7	3.7	9.1003	0.6003	537.7	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
960 Winter	6.72	934
1440 Winter	4.91	1382
2160 Winter	3.57	1972
2880 Winter	2.85	2244
4320 Winter	2.07	3156
5760 Winter	1.64	4088
7200 Winter	1.38	4968
8640 Winter	1.19	5792
10080 Winter	1.06	6656

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York House, Edison Park Dorcan Way Swindon, SN3 3RB		
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Rainfall Details

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	20.000	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.350	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 1.200

Time from:	(mins) to:	Area (ha)
0	4	1.200

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York House, Edison Park Dorcan Way Swindon, SN3 3RB		
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Infiltration Basin Details

Infil Coef - Base (m/hr)	0.025000	Porosity	1.00
Infil Coef - Sides (m/hr)	0.025000	Invert Level (m)	8.500
Safety Factor	2.0	Ground Level (m)	10.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.00	786.0	0.40	931.0	0.80	1089.0	1.20	1259.0	1.60	1440.0



Lyneham 1971–2000 averages

Lyneham (145 m AMSL)

Month	Max Temp [°C]	Min Temp [°C]	Days of Air Frost [days]	Sunshine [hours]	Rainfall [mm]	Days of Rainfall ≥ 1mm [days]	Wind at 10 m [knots]
Jan	6.6	1.2	11.0	55.2	70.1	12.8	9.9
Feb	6.9	1.0	10.6	72.3	50.6	9.9	9.8
Mar	9.4	2.6	5.8	108.5	58.3	11.3	9.7
Apr	12.0	3.7	3.4	158.9	47.7	9.6	9.3
May	15.7	6.7	0.3	196.2	51.8	9.5	8.9
Jun	18.5	9.7	0.0	194.1	58.5	9.2	8.0
Jul	21.2	11.9	0.0	212.4	47.2	7.4	7.7
Aug	20.7	11.8	0.0	197.5	56.1	8.7	7.4
Sep	17.7	9.8	0.0	144.6	63.9	9.9	7.8
Oct	13.6	6.8	0.6	107.3	70.4	11.2	8.4
Nov	9.6	3.7	4.9	71.7	66.9	11.2	8.9
Dec	7.4	2.1	8.5	48.4	77.4	12.5	9.6
Year	13.3	6.0	45.2	1665.0	719.0	123.2	8.7

TOTAL 214mm

Summary of Results for 1000 year Return Period (+30%)

Outflow is too low. Design is unsatisfactory.

Half Drain Time exceeds 7 days

Storm Duration (mins)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	0.0	0.0	8.0963	0.7463	565.2	O K
30 Summer	0.0	0.0	8.3189	0.9609	773.1	O K
60 Summer	0.0	0.0	8.5413	1.1913	999.9	O K
120 Summer	0.0	0.0	8.7512	1.4012	1231.9	O K
180 Summer	0.0	0.0	8.8592	1.5092	1358.9	O K
240 Summer	0.0	0.0	8.9277	1.5777	1441.7	O K
360 Summer	0.0	0.0	9.0322	1.6822	1572.5	O K
480 Summer	0.0	0.0	9.1067	1.7567	1668.6	O K
600 Summer	0.0	0.0	9.1647	1.8147	1744.8	O K
720 Summer	0.0	0.0	9.2122	1.8622	1808.2	O K
960 Summer	0.0	0.0	9.2867	1.9367	1910.2	O K
1440 Summer	0.0	0.0	9.3912	2.0412	2057.5	O K
2160 Summer	0.0	0.0	9.4946	2.1446	2208.2	O K
2880 Summer	0.0	0.0	9.5666	2.2166	2316.7	O K
4320 Summer	0.0	0.0	9.6671	2.3171	2471.1	O K
5760 Summer	0.0	0.0	9.7366	2.3866	2581.3	O K
7200 Summer	0.0	0.0	9.7936	2.4436	2673.3	O K
8640 Summer	0.0	0.0	9.8421	2.4921	2753.0	O K
10080 Summer	0.0	0.0	9.8840	2.5340	2822.3	O K
15 Winter	0.0	0.0	8.1713	0.8213	633.0	O K
30 Winter	0.0	0.0	8.4123	1.0623	865.9	O K
60 Winter	0.0	0.0	8.6517	1.3017	1119.9	O K
120 Winter	0.0	0.0	8.8767	1.5267	1379.7	O K
180 Winter	0.0	0.0	8.9922	1.6422	1521.9	O K
240 Winter	0.0	0.0	9.0652	1.7152	1614.7	O K
360 Winter	0.0	0.0	9.1772	1.8272	1761.2	O K
480 Winter	0.0	0.0	9.2567	1.9067	1868.8	O K
600 Winter	0.0	0.0	9.3182	1.9682	1954.2	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	200.96	19
30 Summer	137.44	34
60 Summer	88.88	64
120 Summer	54.75	124
180 Summer	40.26	184
240 Summer	32.04	244
360 Summer	23.30	364
480 Summer	18.54	484
600 Summer	15.51	604
720 Summer	13.39	724
960 Summer	10.61	964
1440 Summer	7.62	1444
2160 Summer	5.45	2164
2880 Summer	4.29	2884
4320 Summer	3.05	4324
5760 Summer	2.39	5768
7200 Summer	1.98	7208
8640 Summer	1.70	8648
10080 Summer	1.49	10088
15 Winter	200.96	19
30 Winter	137.44	34
60 Winter	88.88	64
120 Winter	54.75	124
180 Winter	40.26	184
240 Winter	32.04	244
360 Winter	23.30	364
480 Winter	18.54	484
600 Winter	15.51	604

York House, Edison Park
Dorcan Way
Swindon, SN3 3RB

Date 03 November 2010 12:56
File Dirty Water Lagoon.src

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Elstree Computing Ltd

Source Control W.11.4



Summary of Results for 1000 year Return Period (+30%)

Storm Duration (mins)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
720 Winter	0.0	0.0	9.3687	2.0187	2025.2	O K
960 Winter	0.0	0.0	9.4479	2.0979	2139.4	O K
1440 Winter	0.0	0.0	9.5586	2.2086	2304.4	O K
2160 Winter	0.0	0.0	9.6691	2.3181	2473.2	O K
2880 Winter	0.0	0.0	9.7451	2.3951	2594.7	O K
4320 Winter	0.0	0.0	9.8511	2.5011	2767.7	O K
5760 Winter	0.0	0.0	9.9246	2.5746	2891.1	O K
7200 Winter	0.0	0.0	9.9851	2.6351	2994.1	O K
8640 Winter	0.0	0.0	10.0635	2.7135	3083.3	FLOOD
10080 Winter	0.0	0.0	10.1415	2.7915	3161.0	FLOOD

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
720 Winter	13.39	724
960 Winter	10.61	964
1440 Winter	7.62	1444
2160 Winter	5.45	2164
2880 Winter	4.29	2884
4320 Winter	3.05	4324
5760 Winter	2.39	5768
7200 Winter	1.98	7208
8640 Winter	1.70	8648
10080 Winter	1.49	10088

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Dorcan Way
Swindon, SN3 3RB

Date 03 November 2010 12:56
File Dirty Water Lagoon.src

Designed By sstarr
Checked By

Elstree Computing Ltd

Source Control W.11.4

Rainfall Details

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	1000	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	20.000	Shortest Storm (mins)	15	Climate Change t	+30
Ratio-R	0.350	Longest Storm (mins)	10080		

Time / Area Diagram

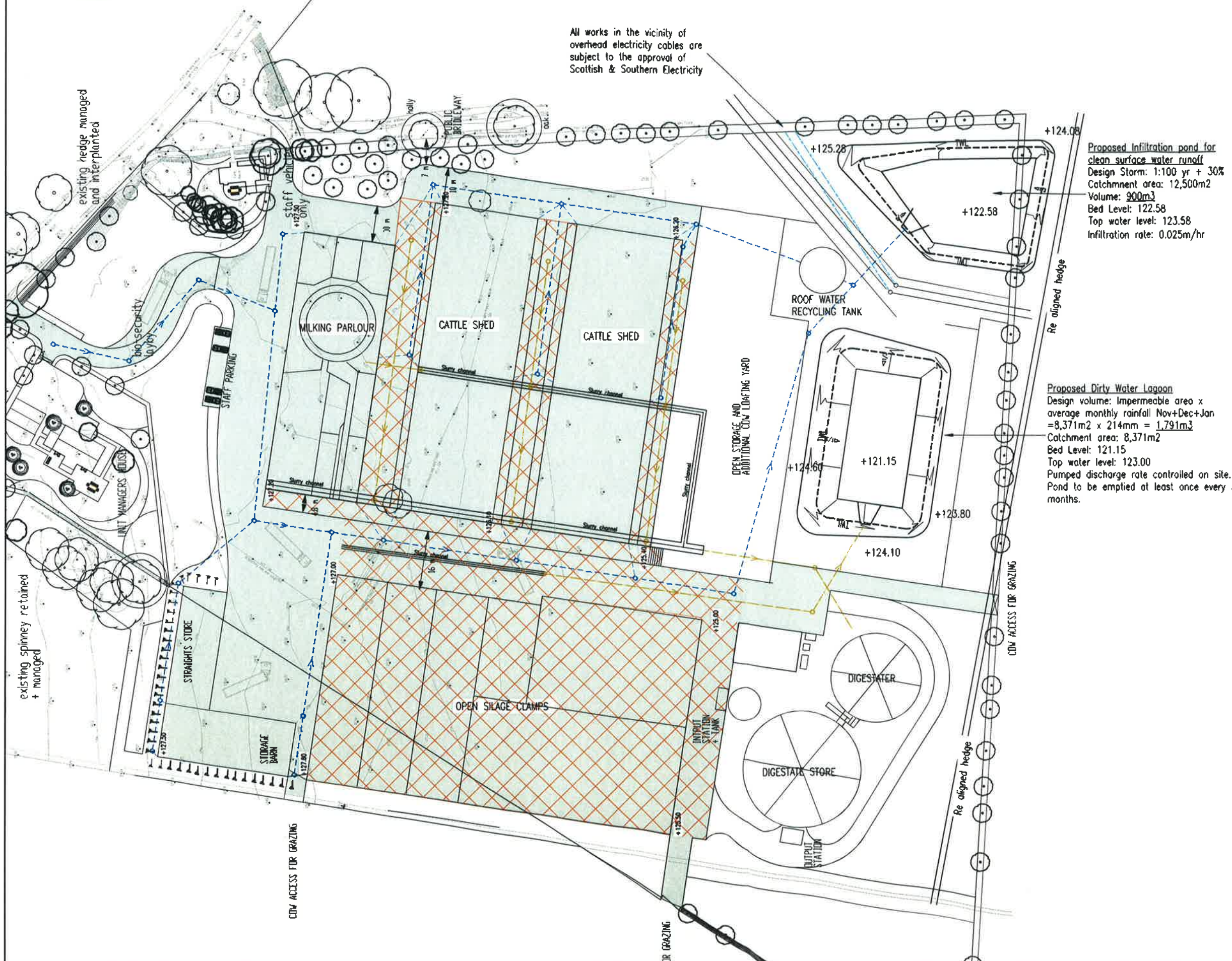
Total Area (ha) = 1.500

Time	(mins)	Area
from:	to:	(ha)

0	4	1.500
---	---	-------

AZ

All works in the vicinity of overhead electricity cables are subject to the approval of Scottish & Southern Electricity



Proposed Infiltration pond for clean surface water runoff
 Design Storm: 1:100 yr + 30%
 Catchment area: 12,500m²
 Volume: 900m³
 Bed Level: 122.58
 Top water level: 123.58
 Infiltration rate: 0.025m/hr

Proposed Dirty Water Lagoon
 Design volume: Impermeable area x average monthly rainfall Nov+Dec+Jan
 = 8,371m² x 214mm = 1,791m³
 Catchment area: 8,371m²
 Bed Level: 121.15
 Top water level: 123.00
 Pumped discharge rate controlled on site.
 Pond to be emptied at least once every 3 months.

- KEY**
- Clean water catchment (12,560m²)
 - Dirty water catchment (10,697m²: 8,371m² to drain to lagoon, 2326m² digester)
 - Proposed clean water drain
 - Proposed dirty water drain
 - Proposed slurry channel
 - Finished Level (by others)
 - Overhead HV cables

- NOTES**
1. PROPOSED DRAINAGE ARRANGEMENT IS INDICATIVE ONLY AND WILL BE CONFIRMED AT THE DETAIL DESIGN STAGE
 2. THIS DRAWING IS NOT FOR CONSTRUCTION
 3. ALL WORKS IN THE VICINITY OF OVERHEAD CABLES ARE SUBJECT TO THE APPROVAL OF SCOTTISH & SOUTHERN ELECTRICITY.
 4. ALL LEVELS REFERENCED TO ORDNANCE DATUM

D	SMS	01.11.10	Dirty water lagoon amended to provided 750mm freeboard
C	SMS	27.10.10	Infiltration pond amended. Drainage layout adjusted.
B	SMS	19.10.10	Infiltration pond repositioned
A	SMS	13.10.10	Infiltration pond deepened to 2m

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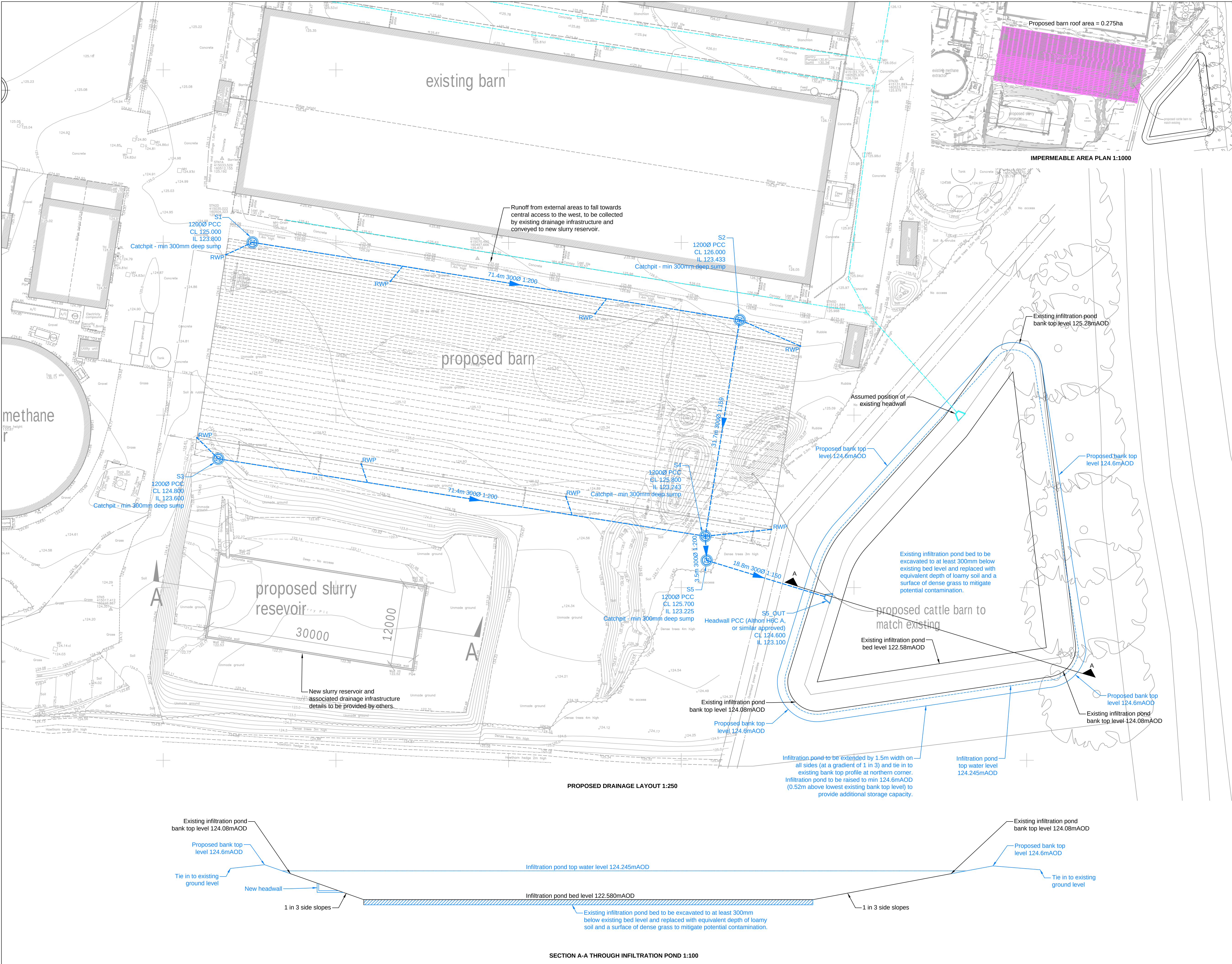
Web Site: www.ColeEasdon.com
 E-mail: cec@ColeEasdon.com

Client: **Sharcott Pennings Farm**

Job Title: **Proposed Drainage Strategy**

Designed by: SMS	Drawn by: SMS	Checked by: RB
Date: September 2010	Scale: 1:500 @A1	
Doc. no.: 3063/501	Rev: D	

APPENDIX D:
DRAINAGE STRATEGY



- General Notes**
- This drawing to be read in conjunction with all relevant architect's and engineer's reports, drawings and specifications.
 - This drawing has been produced for the preliminary project stage to support the planning application. The design shall be developed following planning approval and further survey information.
 - Existing drainage provision has been assumed from the topographic survey and may not accurately represent the situation at the Site. Size, depth and interconnectivity between drainage features to be confirmed prior to detailed design.
 - Additional topographic survey required to be undertaken in the area of the existing infiltration pond to confirm the existing dimensions and capacity.
 - Infiltration rate of 0.025m/hour used for preliminary design purposes (as taken from the original planning application. Additional infiltration testing is recommended to be undertaken to confirm the design infiltration rate from the original planning application.
 - It is strongly recommended that the existing infiltration pond is cleared of silt and settled deposits to ensure the efficacy of the infiltration system.
 - Below ground services and CCTV drainage surveys are strongly recommended to be undertaken prior to detailed design.
 - All existing drainage infrastructure affected by the Development proposals to be diverted or protected.

- Legend**
- Existing SW Drainage (assumed route)
 - Proposed SW Drainage
 - Assumed Rainwater Pipe Position
 - Existing Infiltration Basin Extent
 - Proposed Infiltration Basin Extent
 - Top Water Level

Drawing No.	47342-DR-D-101	P01
Date	01/10/24	Drawn MF
Scale @ A1	VARIES	Checked EL

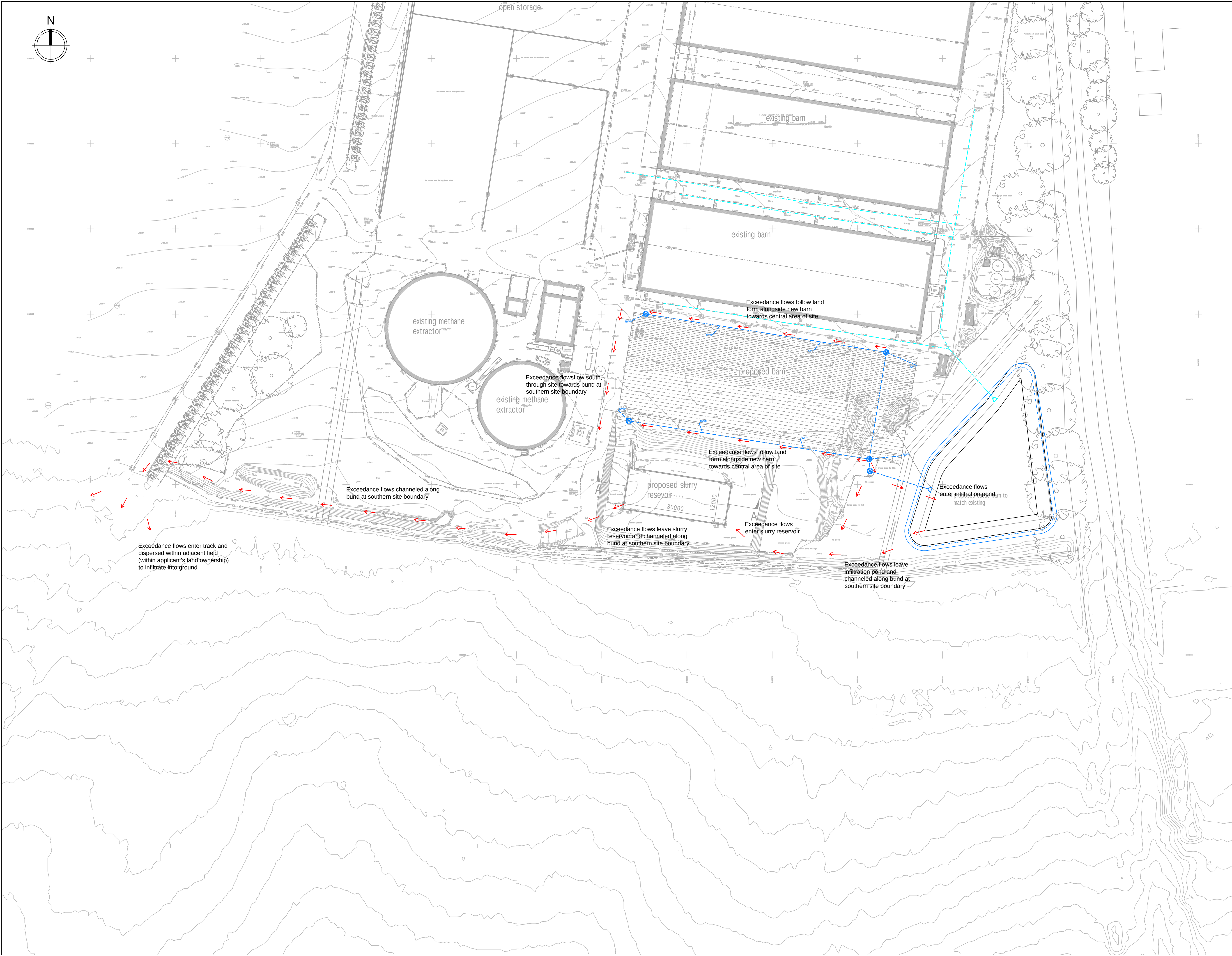
Client
STOWELL FARMS

Site
SHARCOTT PENNINGS FARM

Dwg. Title
PROPOSED DRAINAGE STRATEGY

AAH consultants

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YORK
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- General Notes**
1. This drawing to be read in conjunction with all relevant architect's and engineer's reports, drawings and specifications.
 2. This drawing has been produced for the preliminary project stage to support the planning application. The design shall be developed following planning approval and further survey information.
 3. Existing drainage provision has been assumed from the topographic survey and may not accurately represent the situation at the Site. Size, depth and interconnectivity between drainage features to be confirmed prior to detailed design.
 4. Additional topographic survey required to be undertaken in the area of the existing infiltration pond to confirm the existing dimensions and capacity.
 5. Infiltration rate of 0.025m/hour used for preliminary design purposes (as taken from the original planning application). Additional infiltration testing is recommended to be undertaken to confirm the design infiltration rate from the original planning application.
 6. It is strongly recommended that the existing infiltration basin is cleared of silt and settled deposits to ensure the efficacy of the infiltration system.
 7. Below ground services and CCTV drainage surveys are strongly recommended to be undertaken prior to detailed design.
 8. All existing drainage infrastructure affected by the Development proposals to be diverted or protected.

- Legend**
- Existing SW Drainage (assumed route)
 - Proposed SW Drainage
 - Assumed Rainwater Pipe Position
 - Existing Infiltration Basin Extent
 - Proposed Infiltration Basin Extent
 - Top Water Level
 - Exceedance Flow Direction

Drawing No. 47342-DR-D-102		P01	
Date	01/10/24	Drawn	MF
Scale @ A1	1:500	Checked	EL

Client
STOWELL FARMS

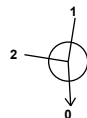
Site
SHARCOTT PENNINGS FARM

Dwg. Title
EXCEEDANCE FLOW ROUTES

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
1	415037.924	160500.015	125.000	1.200	1200		0	1.000	123.800	300
2	415108.455	160488.794	126.000	2.557	1200		1	1.000	123.443	300
							0	1.001	123.443	300
3	415032.972	160468.670	124.800	1.200	1200		0	2.000	123.600	300
4	415103.474	160457.455	125.800	2.557	1200		1	1.001	123.243	300
							2	2.000	123.243	300
							0	1.002	123.243	300
5	415103.675	160453.952	125.700	2.475	1200		1	1.002	123.225	300
							0	1.003	123.225	300
5_OUT	415121.665	160448.441	124.600	1.500			1	1.003	123.100	300

APPENDIX E:

SURFACE WATER DRAINAGE CALCULATIONS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	45	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	0.900
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.069	5.00	125.000	1200	415037.924	160500.015	1.200
2			126.000	1200	415108.455	160488.794	2.557
3			124.800	1200	415032.972	160468.670	1.200
4	0.069	5.00	125.800	1200	415103.474	160457.455	2.557
5			125.700	1200	415103.675	160453.952	2.475
5_OUT			124.600		415121.665	160448.441	1.500

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	71.418	0.600	123.800	123.443	0.357	200.0	300	6.07	50.0
1.001	2	4	31.732	0.600	123.443	123.243	0.200	158.7	300	6.50	50.0
2.000	3	4	71.388	0.600	123.600	123.243	0.357	200.0	300	6.07	50.0
1.002	4	5	3.509	0.600	123.243	123.225	0.018	200.0	300	6.55	50.0
1.003	5	5_OUT	18.815	0.600	123.225	123.100	0.125	150.5	300	6.80	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.108	78.3	36.2	0.900	2.257	0.138	0.0	143	1.087
1.001	1.245	88.0	36.2	2.257	2.257	0.138	0.0	134	1.186
2.000	1.108	78.3	36.2	0.900	2.257	0.138	0.0	143	1.087
1.002	1.108	78.3	72.3	2.257	2.175	0.276	0.0	229	1.251
1.003	1.279	90.4	72.3	2.175	1.200	0.276	0.0	204	1.415

Simulation Settings

Rainfall Methodology	FSR	Summer CV	1.000	Additional Storage (m ³ /ha)	0.0
Rainfall Events	Singular	Winter CV	1.000	Starting Level (m)	
FSR Region	England and Wales	Analysis Speed	Normal	Check Discharge Rate(s)	x
M5-60 (mm)	20.000	Skip Steady State	✓	Check Discharge Volume	x
Ratio-R	0.400	Drain Down Time (mins)	10080		

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440 | 2160 | 2880

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	30	40	0	0
10	0	0	0	100	45	0	0

Node 5 OUT Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.02500	Safety Factor	2.0	Invert Level (m)	122.580
Side Inf Coefficient (m/hr)	0.02500	Porosity	1.00	Time to half empty (mins)	4137

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	786.0	786.0	0.400	931.0	931.0	0.800	1089.0	1089.0	1.200	1259.0	1259.0	1.500	1389.0	1389.0	2.020	1548.0	1389.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	123.890	0.090	16.0	0.1021	0.0000	OK
15 minute summer	1.000:50%	11	123.754	0.133	31.7	0.2344	0.0000	OK
15 minute summer	2	11	123.565	0.122	31.3	0.1377	0.0000	OK
15 minute summer	3	10	123.690	0.090	16.0	0.1021	0.0000	OK
15 minute summer	2.000:50%	11	123.551	0.129	31.7	0.2228	0.0000	OK
15 minute summer	4	11	123.464	0.221	62.1	0.2499	0.0000	OK
15 minute summer	5	12	123.411	0.185	60.5	0.2098	0.0000	OK
960 minute winter	5_OUT	930	123.106	0.006	26.9	463.9897	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	1	1.000	1.000:50%	15.7	0.662	0.201	0.8532
15 minute summer	1	1.000	2	31.3	1.104	0.400	1.0156
15 minute summer	2	1.001	4	31.1	0.758	0.354	1.3080
15 minute summer	3	2.000	2.000:50%	15.7	0.681	0.201	0.8322
15 minute summer	3	2.000	4	31.0	0.787	0.396	1.5113
15 minute summer	4	1.002	5	60.5	1.193	0.772	0.1775
15 minute summer	5	1.003	5_OUT	60.8	1.364	0.672	0.8383
960 minute winter	5_OUT	Infiltration		3.4			

Results for 10 year Critical Storm Duration. Lowest mass balance: 99.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	123.912	0.112	23.9	0.1263	0.0000	OK
15 minute summer	1.000:50%	11	123.790	0.168	47.5	0.3761	0.0000	OK
15 minute summer	2	11	123.598	0.155	46.8	0.1754	0.0000	OK
15 minute summer	3	10	123.712	0.112	23.9	0.1262	0.0000	OK
15 minute summer	2.000:50%	11	123.588	0.166	47.5	0.3687	0.0000	OK
15 minute summer	4	11	123.558	0.315	89.5	0.3566	0.0000	SURCHARGED
15 minute summer	5	11	123.480	0.255	89.9	0.2889	0.0000	OK
1440 minute winter	5_OUT	1380	123.332	0.232	27.8	695.9449	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	1	1.000	1.000:50%	23.6	0.734	0.301	1.1489
15 minute summer	1	1.000	2	46.8	1.222	0.597	1.3808
15 minute summer	2	1.001	4	45.6	0.807	0.518	1.7000
15 minute summer	3	2.000	2.000:50%	23.6	0.759	0.301	1.1350
15 minute summer	3	2.000	4	45.5	0.854	0.581	1.9728
15 minute summer	4	1.002	5	89.9	1.299	1.148	0.2357
15 minute summer	5	1.003	5_OUT	90.1	1.465	0.997	1.1555
1440 minute winter	5_OUT	Infiltration		3.7			

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	12	124.053	0.253	42.4	0.2859	0.0000	OK
15 minute summer	1.000:50%	12	124.034	0.412	84.3	2.2616	0.0000	SURCHARGED
15 minute summer	2	12	123.907	0.464	68.8	0.5252	0.0000	SURCHARGED
15 minute summer	3	12	123.950	0.350	42.4	0.3956	0.0000	SURCHARGED
15 minute summer	2.000:50%	12	123.922	0.500	80.9	3.3313	0.0000	SURCHARGED
2160 minute winter	4	2100	123.875	0.632	5.2	0.7153	0.0000	SURCHARGED
1440 minute winter	5	1410	123.872	0.647	9.8	0.7318	0.0000	SURCHARGED
2160 minute winter	5_OUT	2100	123.873	0.773	34.3	1335.6440	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	1	1.000	1.000:50%	42.0	0.838	0.536	2.3882
15 minute summer	1	1.000	2	68.8	1.263	0.878	2.5146
15 minute summer	2	1.001	4	62.0	0.880	0.704	2.2345
15 minute summer	3	2.000	2.000:50%	40.5	0.840	0.517	2.5135
15 minute summer	3	2.000	4	65.4	0.929	0.836	2.5135
2160 minute winter	4	1.002	5	5.0	0.627	0.064	0.2471
1440 minute winter	5	1.003	5_OUT	7.2	0.729	0.079	1.3249
2160 minute winter	5_OUT	Infiltration		4.5			

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	12	124.413	0.613	57.0	0.6932	0.0000	SURCHARGED
15 minute summer	1.000:50%	12	124.356	0.735	117.1	7.1857	0.0000	SURCHARGED
2160 minute winter	2	2100	124.238	0.795	3.4	0.8996	0.0000	SURCHARGED
15 minute summer	3	12	124.250	0.650	57.0	0.7352	0.0000	SURCHARGED
2160 minute winter	2.000:50%	2100	124.237	0.816	3.4	8.8566	0.0000	SURCHARGED
2160 minute winter	4	2160	124.240	0.997	6.4	1.1280	0.0000	SURCHARGED
2160 minute winter	5	2100	124.242	1.017	6.0	1.1505	0.0000	SURCHARGED
2160 minute winter	5_OUT	2100	124.236	1.136	43.9	1834.4380	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	1	1.000	1.000:50%	60.1	0.873	0.768	2.5146
15 minute summer	1	1.000	2	75.4	1.324	0.962	2.5146
2160 minute winter	2	1.001	4	3.2	0.408	0.036	2.2345
15 minute summer	3	2.000	2.000:50%	52.4	0.883	0.669	2.5135
15 minute summer	3	2.000	4	78.5	1.115	1.002	2.5135
2160 minute winter	4	1.002	5	6.0	0.668	0.077	0.2471
2160 minute winter	5	1.003	5_OUT	6.0	0.666	0.066	1.3249
2160 minute winter	5_OUT	Infiltration		4.8			

Design Settings

Rainfall Methodology	FEH-22	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	0.900
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	45	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.069	5.00	125.000	1200	415037.924	160500.015	1.200
2			126.000	1200	415108.455	160488.794	2.557
3	0.069	5.00	124.800	1200	415032.972	160468.670	1.200
4			125.800	1200	415103.474	160457.455	2.557
5			125.700	1200	415103.675	160453.952	2.475
5_OUT	1.531		124.600		415121.665	160448.441	1.500

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	71.418	0.600	123.800	123.443	0.357	200.0	300	6.07	50.0
1.001	2	4	31.732	0.600	123.443	123.243	0.200	158.7	300	6.50	50.0
2.000	3	4	71.388	0.600	123.600	123.243	0.357	200.0	300	6.07	50.0
1.002	4	5	3.509	0.600	123.243	123.225	0.018	200.0	300	6.55	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.108	78.3	36.2	0.900	2.257	0.138	0.0	143	1.087
1.001	1.245	88.0	36.2	2.257	2.257	0.138	0.0	134	1.186
2.000	1.108	78.3	36.2	0.900	2.257	0.138	0.0	143	1.087
1.002	1.108	78.3	72.3	2.257	2.175	0.276	0.0	229	1.251

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	123.876	0.076	11.4	0.0858	0.0000	OK
15 minute summer	1.000:50%	11	123.732	0.110	22.6	0.1615	0.0000	OK
15 minute summer	2	11	123.544	0.101	22.3	0.1145	0.0000	OK
15 minute summer	3	10	123.676	0.076	11.4	0.0858	0.0000	OK
15 minute summer	2.000:50%	11	123.529	0.107	22.6	0.1537	0.0000	OK
15 minute summer	4	12	123.417	0.174	44.1	0.1973	0.0000	OK
15 minute summer	5	12	123.375	0.150	42.7	0.1693	0.0000	OK
960 minute winter	5_OUT	915	123.080	-0.020	25.8	438.3589	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	1	1.000	1.000:50%	11.2	0.604	0.143	0.6653
15 minute summer	1	1.000	2	22.3	1.009	0.284	0.7914
15 minute summer	2	1.001	4	22.1	0.700	0.251	1.0035
15 minute summer	3	2.000	2.000:50%	11.2	0.622	0.143	0.6503
15 minute summer	3	2.000	4	22.0	0.728	0.281	1.1603
15 minute summer	4	1.002	5	42.7	1.107	0.545	0.1362
15 minute summer	5	1.003	5_OUT	43.2	1.259	0.478	0.6453
960 minute winter	5_OUT	Infiltration		3.4			

Results for 10 year Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	123.912	0.112	23.9	0.1263	0.0000	OK
15 minute summer	1.000:50%	11	123.790	0.168	47.5	0.3761	0.0000	OK
15 minute summer	2	11	123.598	0.155	46.8	0.1754	0.0000	OK
15 minute summer	3	10	123.712	0.112	23.9	0.1262	0.0000	OK
15 minute summer	2.000:50%	11	123.588	0.166	47.5	0.3687	0.0000	OK
15 minute summer	4	11	123.558	0.315	89.5	0.3566	0.0000	SURCHARGED
15 minute summer	5	11	123.480	0.255	89.9	0.2889	0.0000	OK
960 minute winter	5_OUT	945	123.382	0.282	40.2	749.7836	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	1	1.000	1.000:50%	23.6	0.734	0.301	1.1489
15 minute summer	1	1.000	2	46.8	1.222	0.597	1.3808
15 minute summer	2	1.001	4	45.6	0.807	0.518	1.7000
15 minute summer	3	2.000	2.000:50%	23.6	0.759	0.301	1.1350
15 minute summer	3	2.000	4	45.5	0.854	0.581	1.9728
15 minute summer	4	1.002	5	89.9	1.299	1.148	0.2357
15 minute summer	5	1.003	5_OUT	90.1	1.465	0.997	1.1555
960 minute winter	5_OUT	Infiltration		3.8			

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	12	124.129	0.329	44.5	0.3717	0.0000	SURCHARGED
15 minute summer	1.000:50%	12	124.087	0.466	87.9	2.8889	0.0000	SURCHARGED
15 minute summer	2	12	123.951	0.508	72.0	0.5742	0.0000	SURCHARGED
15 minute summer	3	12	124.005	0.405	44.5	0.4580	0.0000	SURCHARGED
15 minute summer	2.000:50%	12	123.964	0.542	83.2	3.9145	0.0000	SURCHARGED
1440 minute winter	4	1380	123.923	0.680	7.6	0.7685	0.0000	SURCHARGED
1440 minute winter	5	1410	123.917	0.692	7.2	0.7830	0.0000	SURCHARGED
1440 minute winter	5_OUT	1410	123.917	0.817	49.3	1393.8470	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	1	1.000	1.000:50%	43.4	0.847	0.554	2.5146
15 minute summer	1	1.000	2	72.0	1.277	0.919	2.5146
15 minute summer	2	1.001	4	64.2	0.912	0.730	2.2345
15 minute summer	3	2.000	2.000:50%	40.7	0.849	0.520	2.5135
15 minute summer	3	2.000	4	67.2	0.954	0.858	2.5135
1440 minute winter	4	1.002	5	7.2	0.704	0.092	0.2471
1440 minute winter	5	1.003	5_OUT	7.2	0.742	0.079	1.3249
1440 minute winter	5_OUT	Infiltration		4.6			

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	12	124.458	0.658	59.1	0.7442	0.0000	SURCHARGED
15 minute summer	1.000:50%	12	124.396	0.774	115.9	7.9744	0.0000	SURCHARGED
1440 minute winter	2	1410	124.247	0.804	4.8	0.9094	0.0000	SURCHARGED
15 minute summer	3	12	124.289	0.689	59.1	0.7797	0.0000	SURCHARGED
1440 minute winter	2.000:50%	1410	124.246	0.825	4.8	9.0547	0.0000	SURCHARGED
1440 minute winter	4	1410	124.252	1.009	9.6	1.1406	0.0000	SURCHARGED
1440 minute winter	5	1440	124.245	1.020	9.0	1.1532	0.0000	SURCHARGED
1440 minute winter	5_OUT	1410	124.245	1.145	62.4	1847.4110	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute summer	1	1.000	1.000:50%	56.8	0.879	0.725	2.5146
15 minute summer	1	1.000	2	76.8	1.313	0.981	2.5146
1440 minute winter	2	1.001	4	4.8	0.442	0.054	2.2345
15 minute summer	3	2.000	2.000:50%	54.8	0.881	0.700	2.5135
15 minute summer	3	2.000	4	80.3	1.140	1.025	2.5135
1440 minute winter	4	1.002	5	9.0	0.724	0.115	0.2471
1440 minute winter	5	1.003	5_OUT	8.8	0.742	0.097	1.3249
1440 minute winter	5_OUT	Infiltration		4.8			