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Engineering & Project Management

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Drainage Strategy Document

Jepco

Gedney Marsh H3 Access Road Project

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1. INTRODUCTION

JEPCO, always at the forefront of innovation and sustainability have embarked upon an ambitious venture to develop and operate a highly efficient, ultimately Carbon Neutral, Agricultural infrastructure at their existing Lincolnshire base.

JEPCO's ultimate development of the site shall consist of sustainable year round growing supported by renewable energy sources which will serve to contribute towards ongoing decarbonisation of the UK grid and the national target of achieving zero carbon emission by 2050.

The overall project is subdivided into three main elements which shall be delivered in the order listed to a line with Jepco's business model.

- Agritech development Norfolk House Farm as per planning registration no: PP-10163701
- Renewable energy generation.
- Energy storage and distribution.

The Agritech Project has already been submitted for planning and is being considered under planning reference no: PP-10163701. During the submission and consideration of this application, and the development of the pre-planning applications for the subsequent applications, it became apparent that a wider review of access to the site would be required.

Although the operational traffic volumes generated by the completed development are not considered to be onerous, the routing of same through small villages such as Gedney Dyke will serve only to compound an already difficult situation traffic movement.

Hence, in consultation with all stakeholders, Jepco and their partners have taken the decision to apply for permission to construct a new roadway which shall bypass all populated area and provide direct access from the site to the A17.

2. PROPOSED DEVELOPMENT

Key to the accommodation of the development of Jepcos plans is the ability to transport both construction and production materials into a relatively remote site from the main road network.

To maximise the efficiency of this operation, Jepco, with their local partners have devised a scheme to construct a new road North of Gedney Dyke and linking from the B1359 to the existing private Wurth road and re-joining Roman Bank at the Hovenden Golf Club and hence joining the A17 at the Lowgate junction where the volumes and types of vehicle can be better accommodated.

The location of this proposed road is as indicated on figure 1 & 2 below.

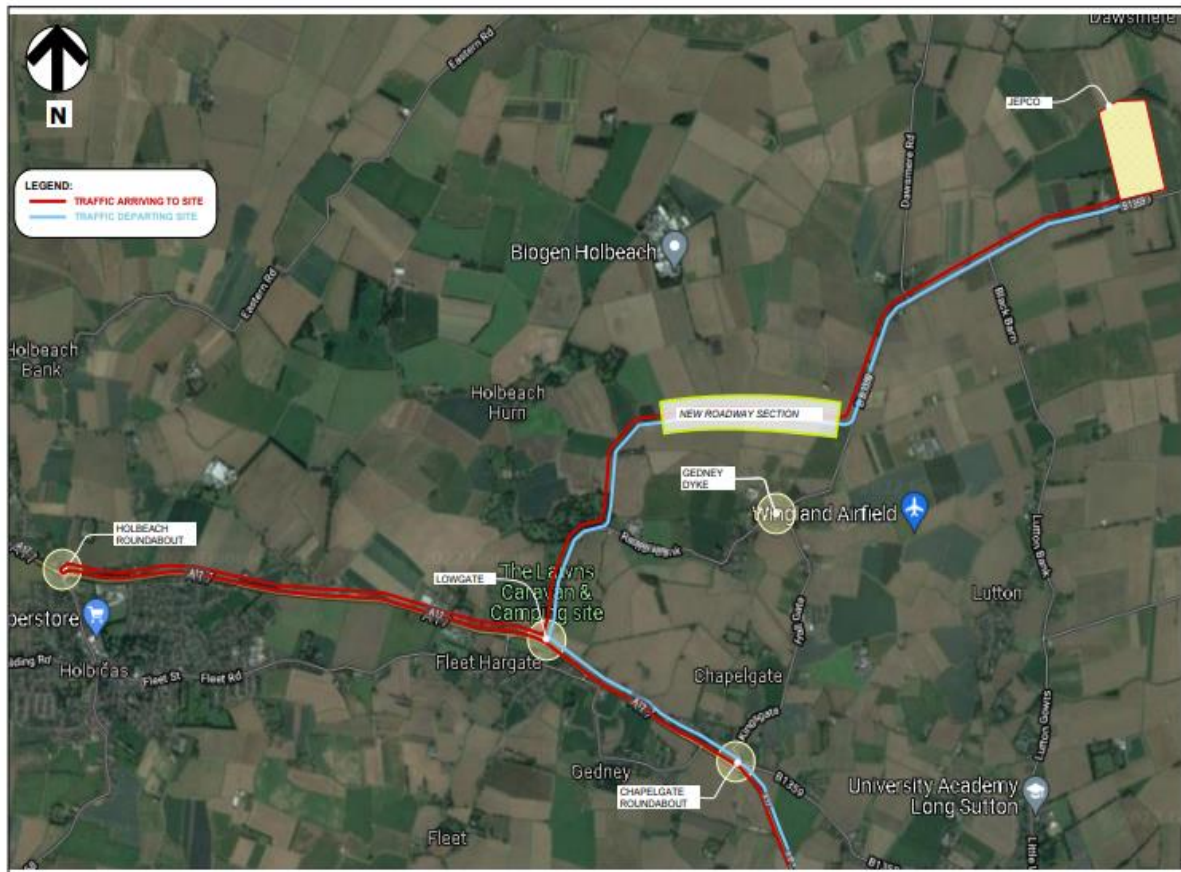


Figure 1

Once completed this road shall provide clear access to the initial and all further phases of the development as well as the permanent operations of the site and the sustainable future development of the area. It is intended that the road shall be available for all users which shall significantly improve the local network providing access to private vehicles and farm machinery without the need to travel through Gedney Dyke.

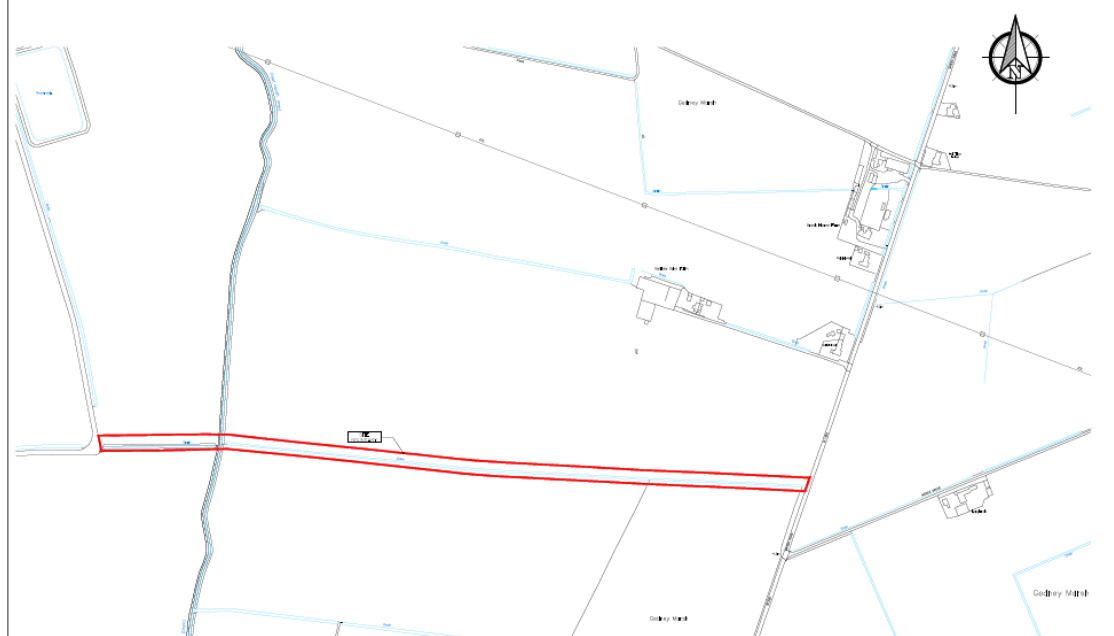


Figure 2

The road construction itself would be of reinforced concrete similar to the existing private road and would be open to all agricultural traffic from all operators in the area thus removing all of this traffic other than the operators directly located in Gedney Dyke.

3. DRAINAGE STRATEGY

The CIRIA SuDS design document provides guidance on the control and management of stormwater from new development sites in their publications.

The storm management system design has been prepared on the basis of minimising the effect of the development by comparison with the expected storm run off for an undeveloped site. The attached HR Wallingford preliminary SUDS estimation tool gives (SAAR) average annual rainfall of 801mm.

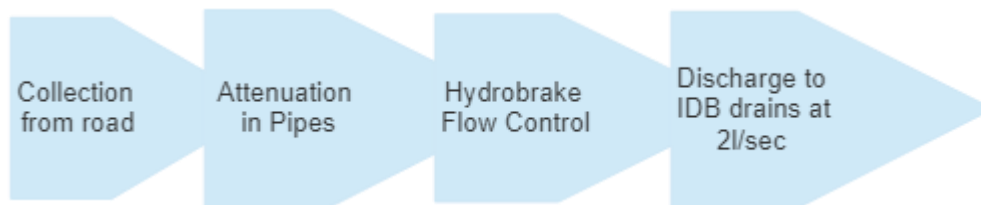
The attenuation requirements of this development shall include for the entire area of new road which is circa 0.7ha

3.1 Stormwater Mitigation Measures

To comply with the principles of SuDS, stormwater mitigation measures are outlined below to ensure the proposed development has a minimal impact on the local drainage Board Infrastructure.

The storm water systems will be constructed to allow for a 1:100-year storm event with a Climate change factor of 1.4.

All new hardstanding and roads shall be drained via underground pipework systems to four discharge points along the road length.



The attenuation system shall be achieved within oversized pipes combining all run off and be controlled by a hydro brake as per figure 3 limiting discharge to 2l/sec to the existing IDB drainage ditch, the location of which is indicated on the drainage layout.

The junction between the ditch and the new pipework shall be formed with a concrete headwall and stilling chamber complete with grilles across the entry to the pipe to prevent water surge into the ditch causing erosion of the banks and bed, this access point shall be maintained by the site team.



Figure 3 MD 5 Hydro brake

3.2 Flood Risk

The development is located within a Flood Risk 3a category but is categorised as a Less Vulnerable development. The risk posed emanates from Sea flooding due to the proximity to the Wash. An accompanying Flood Risk Assessment doc no 22006 30-Rp-002 outlines the risks and the mitigations associated with same.



APPENDIX 1

SUDS SITE ASSESSMENT

Site Drainage Evaluation

Site name: Jepco

Site location: Gedney Marsh Lincs

Report Reference: 1618412665430

Date: 03032022

1. INTRODUCTION

This is a bespoke report providing initial guidance on potential implementation of SuDS for the development site in line with current best practice.

The use of this tool should be supplemented by more detailed guidance on SuDS best practice provided in a number of sources, principally the CIRIA SUDS Manual (2007), other CIRIA documents; the Use of SUDS in High Density Developments, HR Wallingford, (2005) and other HR Wallingford documents.

The objective is to provide some early guidance on the numbers and types of components that might be suitable for consideration within the site design. This may facilitate pre-application discussions with planners and other relevant authorities.

This guidance has been provided prior to the completion of the SUDS standards and the supporting guidance. However, the principles of this tool are unlikely to be very different to the aims of the SUDS standards. HR Wallingford is not liable for the use of any output from the use of this tool and the performance of the drainage system. It is recommended that detailed design using appropriately experienced engineers' professionals and tools is undertaken before finalising any drainage scheme arrangement for a site.

THE CONTENT OF THE REPORT

This report is split into 8 sections as follows:

- Generic SuDS Best Practice Principles
- Runoff Destination
- Hydraulic Design Criteria
- Water Quality Design Criteria
- Site-Specific Drainage Design Considerations
- SuDS Construction
- SuDS Components Performance
- Guidance on The Use of Individual Components

2. GENERIC SuDS BEST PRACTICE PRINCIPLES

To comply with current best practice, the drainage system should:

- (i) manage runoff at or close to its source.
- (ii) manage runoff at the surface.

(iii) be integrated with public open space areas and contribute towards meeting the objectives of the urban plan.

(iv) be cost-effective to operate and maintain.

The drainage system should endeavour to ensure that, for any particular site:

(i) natural hydrological processes are protected through maintaining Interception of an initial depth of rainfall and prioritising infiltration, where appropriate.

(ii) flood risk is managed through the control of runoff peak flow rates and volumes discharged from the site.

(iii) stormwater runoff is treated to prevent detrimental impacts to the receiving water body as a result of urban contaminants.

In addition, it is desirable to maximise the amenity and ecological benefits associated with the drainage system where there are appropriate opportunities. SuDS are green infrastructure components and can provide health benefits and reduce the vulnerability of developments to the impacts of climate change.

3. RUNOFF DESTINATION

Introduction

Infiltration should be prioritised as the method of controlling surface water runoff from the development site, unless it can be demonstrated that the use of infiltration would have a detrimental environmental impact.

Groundwater (via Infiltration)

Infiltration may not be appropriate for managing runoff from this site. Robust studies are required to confirm the significance of the following constraints to infiltration:

(1) The maximum groundwater level beneath the site is within 2 m of the ground surface. This means that there is unlikely to be in excess of the required 1m depth of unsaturated zone between the infiltration surface and the water table.

The groundwater beneath the site is designated as Hydrologically linked to sensitive receptor, and this designation will define the treatment requirement for any infiltrated water (See Water Quality Design Criteria).

Surface water body

All runoff that cannot be discharged to groundwater will be managed on site and discharged to a surface water body.

The receiving surface water body for runoff from the site is: the. The riparian owner is:

4. HYDRAULIC DESIGN CRITERIA

Introduction

Best practice criteria for hydraulic control require Interception, runoff and volume control.

Interception

To fulfil the requirements for Interception, there should normally be no runoff from the site for an initial depth of rainfall - usually 5mm. This is achieved through the use of infiltration, evapotranspiration, or rainwater harvesting.

Flow and Volume Control

The site has been previously developed. It is likely that there will be a requirement for the runoff to be constrained to levels as close to the equivalent greenfield rates and volumes as possible. Discharges that exceed equivalent pre-development rates and volumes will not, generally, be acceptable.

Rainwater harvesting, or the use of Long-Term Storage provide the means to achieve runoff volume control. Where volume control is not practicable, flows discharged from the site will need to be constrained to 2 l/s/ha.

5. WATER QUALITY DESIGN CRITERIA

Introduction

Current best practice takes a risk-based approach to managing discharges of surface runoff to the receiving environment. The following text provides guidance on the extent of water quality management likely to be appropriate for the site.

Hazard Classification

Runoff from clean roof surfaces (i.e., not metal roofs, roofs close to polluted atmospheric discharges, or roofs close to populations of flocking birds) is classified as Low in terms of hazard status.

Runoff from roads, parking and other areas of residential, commercial and industrial sites (that are not contaminated with waste, high levels of hydrocarbons, or other chemicals) is classified as Medium in terms of hazard status.

Treatment requirements for disposal to surface water systems

The catchment area of stream to the point of the discharge from the site is <50km², therefore it is classified as a sensitive receptor.

The level of urbanisation of the catchment at the point of the discharge from the site is >20%, therefore it may be classified as a sensitive receptor.

The receiving catchment is designated as an environmentally sensitive receptor.

Roof runoff will not require 1 treatment stage prior to discharge.

Runoff from other parts of this site such as roads, parking and other areas will require at least 3 treatment stages prior to discharge.

6. SITE-SPECIFIC DRAINAGE DESIGN CONSIDERATIONS

The design of SuDS with access to temporary or permanent water should consider public health and safety as well as issues associated with construction and operational management of the structures. Health and safety issues and risk mitigation features are presented in the CIRIA SuDS Manual.

Individual SuDS components should not be treated in isolation but should be seen together as providing a suite of drainage features which are appropriate in different combinations for varying scales. It is always desirable to have a mix of SuDS components across the site as different components have different capacities for treatment of individual pollutants.

7. SuDS CONSTRUCTION

SuDS are a combination of civil engineering structures and landscaping practice. Due to the limited experience of building SuDS in the water industry, there are a number of key issues which need to be particularly considered as their construction requires a change in approach to some standard construction practices.

- SuDS components should be constructed in line with either the manufacturer's guidelines or best practice methods.
- The construction of SuDS usually only requires the use of fairly standard civil engineering construction and landscaping operations, such as excavation, filling, grading, top soiling, seeding, planting etc. These operations are specified in various standard construction documents, such as the Civil Engineering Specification for the Water Industry (CESWI).
- Construction of soakaways is regulated by the Buildings Regulations part H (Drainage and waste disposal) which sets out the requirements for drainage of rainwater from the roofs of buildings.
- During construction, any surfaces which are intended to enable infiltration must be protected from compaction. This includes protecting from heavy traffic or storage of materials.
- Water contaminated with silt must not be allowed to enter a watercourse or drain as it can cause pollution. All parts of the drainage system must be protected from construction runoff to prevent silt clogging the system and causing pollution downstream. Measures to prevent this include soil stabilisation, early construction of sediment management basins, channelling run-off away from watercourses and surface water drains, and erosion prevention measures.
- After the end of the construction period and prior to handover to the site owner/operator:
 - Subsoil that has been compacted during construction activities should be broken up prior to the re-application of topsoil to garden areas and other areas of public open space to reinstate the natural infiltration performance of the ground.
 - Any areas of the SuDS that have been compacted during construction but are intended to permit infiltration must be completely refurbished.
 - Checks must be made for blockages or partial blockages of orifices or pipe systems.
 - Any silt deposited during the construction must be completely removed.
 - Soils must be stabilised and protected from erosion whilst planting becomes established.

Detailed guidance on construction related issues for SuDS is available in the SuDS Manual and the associated Construction Site handbook (CIRIA, 2007).

8. SuDS COMPONENTS PERFORMANCE

	Interception	Peak flow control: Low	Peak flow control: High	Volume reduction	Volume control	Gross sediments	Fine sediments	Hydrocarbons/PAHs	Metals	Nutrients
Rainwater Harvesting	Y	Y	S	Y	N	N	N	N	N	N
Pervious Pavement	Y	Y	Y	Y	Y	Y	Y	Y	Y	Var
Filter Strips	Y	N	N	N	N	Y	N	Y	Y	Var
Swales	Y	Y	S	Y(*)	N	Y	Y(+)	Y	Y	Y(-)
Trenches	Y	Y	S	Y(*)	N	N	N	Y	Y	Y(-)
Detention Basins	Y	Y	Y	N	Y	Y	Y(+)	Y	Y	Var
Ponds	N	Y	Y	N	Y	N(~)	Y	Limited	Y	Var
Wetlands	N	Y	S	N	Y	N(~)	Y	Limited	Y	Y

Notes:

S: Not normally with standard designs, but possible where space is available, and designs mitigate impact of high flow rates.

Y (*): Where infiltration is facilitated by the design.

N (~): Gross sediment retention is possible, but not recommended due to negative maintenance and performance implications.

Y (+): Where designs minimise the risk of fine sediment mobilisation during larger events.

Y (!): Where designs specifically promote the trapping and breakdown of oils and PAH based constituents.

Y ("): Where subsurface soil structure facilitates the trapping and breakdown of oils and PAH based constituents.

Var: The nutrient removal performance is variable and can be negative in some situations.

Y (-): Good nutrient removal performance where subsurface biofiltration systems with a permanently saturated zone included within the design.

9. GUIDANCE ON THE USE OF INDIVIDUAL COMPONENTS

Rainwater Harvesting

- Roofs

Rainwater harvesting systems can be used to effectively drain roofs and provide both water supply and stormwater management benefits.

Pervious Pavement

- Roofs

Roof water can be drained into pervious pavement areas using diffusers to dissipate the point inflows. Detailed design of the pavement will need to take account of the additional impermeable roof area.

- Roads

Some types of pervious pavement can be used for relatively highly trafficked roads and pavement manufacturers should be consulted on the appropriate specification.

- Car parks/other impermeable surfaces

Pervious pavements provide effective drainage, storage and treatment of car park surfacing,

- Groundwater < 2m below surface

The design of the drainage system will need to fully mitigate the risks posed by a) the groundwater surface potentially rising above the base of the drainage system; and b) the reduction in unsaturated zone depth which may compromise any treatment function provided by the subsurface soils.

Filter Strips

- Roads

Filter strips can provide treatment for road runoff, upstream of swales or trench components. They can reduce the need for kerbing and runoff collection systems.

- Car parks/other impermeable surfaces

Filter strips can provide treatment for runoff from impermeable surfaces, upstream of swales or trench components. They can reduce the need for kerbing and runoff collection systems.

- Site size > 50ha

The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

- Groundwater < 2m below surface

The design of the drainage system will need to fully mitigate the risks posed by a) the groundwater surface potentially rising above the base of the drainage system; and b) the reduction in unsaturated zone depth which may compromise any treatment function provided by the subsurface soils.

Swales

- Roofs

Swales can be used to convey roof water to other parts of the site.

- Roads

Swales provide treatment and conveyance of road runoff. There are a range of swale types - standard grass channels, under drained swales, and wetland swales - depending on drainage requirements.

- Car parks/other impermeable surfaces

Swales provide treatment and conveyance of runoff from impermeable areas. There are a range of swale types - standard grass channels, under drained swales, and wetland swales - depending on drainage requirements.

- Site size > 50ha

The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

- Groundwater < 2m below surface

The design of the drainage system will need to fully mitigate the risks posed by a) the groundwater surface potentially rising above the base of the drainage system; and b) the

reduction in unsaturated zone depth which may compromise any treatment function provided by the subsurface soils.

Trenches

- Roofs

Trenches can be used to convey roof water to other parts of the site.

- Roads

Trenches can provide treatment and conveyance of road runoff. They require effective pre-treatment to minimise the risk of blockage.

- Car parks/other impermeable surfaces

Trenches can provide treatment and conveyance of runoff for impermeable areas.

- Site size > 50ha

The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

- Groundwater < 2m below surface

The design of the drainage system will need to fully mitigate the risks posed by a) the groundwater surface potentially rising above the base of the drainage system; and b) the reduction in unsaturated zone depth which may compromise any treatment function provided by the subsurface soils.

Detention Basins

- Roofs

Detention basins can be used to attenuate and treat runoff.

- Roads

Detention basins can be used to attenuate and treat runoff.

- Car parks/other impermeable surfaces

Detention basins can be used to attenuate and treat runoff.

- Site size > 50ha

The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria. A risk assessment should be to determine the maximum appropriate depth of stored water in the basin.

Ponds

- Roofs

Ponds can be used to attenuate and treat roof runoff.

- Roads

Ponds can be used to attenuate and treat runoff. However, they are best implemented at the lower end of the treatment train as a 'polishing' component. They should not be used as sediment management devices, as sediment and wet vegetation is relatively costly to extract and dispose of. If poor quality water remains in ponds for extended periods, nutrient concentrations can rise - particularly in the summer months, and the pond can become unattractive with poor amenity and biodiversity potential.

- Car parks/other impermeable surfaces

Ponds can be used to attenuate and treat runoff. However, they are best implemented at the lower end of the treatment train as a 'polishing' component. They should not be used as sediment management devices, as sediment and wet vegetation is relatively costly to extract and dispose of. If poor quality water remains in ponds for extended periods, nutrient concentrations can rise - particularly in the summer months, and the pond can become unattractive with poor amenity and biodiversity potential.

- Site size > 50ha

The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

- Other

Ponds built in permeable soils will require lining to maintain the water level of the permanent pool. The lining may be finished 100 or 200 mm lower than the outlet invert to encourage some infiltration to take place to contribute to interception.

Wetlands

- Roofs

Wetlands can be used to attenuate and treat roof runoff.

- Roads

Wetlands can be used to attenuate and treat runoff. However, they are best implemented at the lower end of the treatment train as a 'polishing' component. They should not be used as sediment management devices, as sediment and wet vegetation is relatively costly to extract and dispose of. If poor quality water remains in wetlands for extended periods, nutrient concentrations can rise - particularly in the summer months, and the wetland can become unattractive with poor amenity and biodiversity potential.

- Car parks/other impermeable surfaces

Wetlands can be used to attenuate and treat runoff. However, they are best implemented at the lower end of the treatment train as a 'polishing' component. They should not be used as sediment management devices, as sediment and wet vegetation is relatively costly to extract and dispose of. If poor quality water remains in wetlands for extended periods, nutrient concentrations can rise - particularly in the summer months, and the wetland can become unattractive with poor amenity and biodiversity potential.

- Site size > 50ha

The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

- Groundwater < 2m below surface

Wetlands can perform satisfactorily where the groundwater level supports baseflows in the system. However, if there is a risk of higher levels then the loss in wetland capacity should be evaluated in the design. Consideration should also be given to any potential lowering of levels which may cause exfiltration from the system, and the system to dry out.

Green Roofs

- Roofs

Green roofs can be designed to provide interception, management and treatment of rainfall up to specified rainfall depths.

Bioretention Systems

- Roofs

Bioretention systems can be used to attenuate and treat roof runoff.

- Roads

Linear bioretention systems (i.e., biofiltration swales) can be used to attenuate and treat road runoff.

- Car parks/other impermeable surfaces

Bioretention systems can be used for car park drainage.

- Site size > 50ha

Bioretention systems will tend to be suitable for managing small areas only. The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

- Groundwater < 2m below surface

Infiltration systems should not be designed where maximum predicted groundwater levels are less than 1m below base of the proposed infiltration unit.

Proprietary Treatment Systems

- Roads

Proprietary treatment systems can be used where surface vegetated systems are impracticable. However, regular monitoring needs to be ensured so that they are maintained so that they continue to function effectively.

- Car parks/other impermeable surfaces

Proprietary treatment systems could be used where surface vegetated systems are impracticable. However, regular monitoring needs to be ensured so that they are maintained so that they continue to function effectively.

- Site size > 50ha

Proprietary treatment systems will tend to be suitable for managing small areas only. The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

Subsurface Storage

- Roofs

Subsurface storage can be used to attenuate roof runoff.

- Roads

Subsurface storage can be used to attenuate road runoff.

- Car parks/other impermeable surfaces

Subsurface storage can be used to attenuate car park runoff.



APPENDIX 2

HR WALLINGFORD SURFACE WATER STORAGE REQUIREMENTS

Surface water storage
requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by: michael keogh

Site name: Jepco

Site location: Gedney Marsh

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SCD030219 (2013), the SuDS Manual C753 (Cris, 2015) and the non-statutory standards for SuDS (Defra, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site Details

Latitude: 52.82177° N

Longitude: 0.09589° E

Reference: 1441812333

Date: Apr 13 2022 15:19

Site characteristics

Total site area (ha):	0.126
Significant public open space (ha):	0
Area positively drained (ha):	0.126
Impermeable area (ha):	0.126
Percentage of drained area that is impermeable (%):	100
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	0.13
Net impermeable area for storage volume design (ha):	0.13
Pervious area contribution to runoff (%):	30

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Design criteria

Climate change allowance factor:	1.4
Urban creep allowance factor:	1.1
Volume control approach	Flow control to max of 2 l/s/ha or Q_{bar}
Interception rainfall depth (mm):	5
Minimum flow rate (l/s):	2

Methodology

esti	IH124
Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
SPR:	0.3	0.3

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	63
Rainfall 100 yrs 12 hrs:	--	102.41
FEH / FSR conversion factor:	1.33	1.33
SAAR (mm):	578	650
M5-60 Rainfall Depth (mm):	20	20
'r' Ratio M5-60/M5-2 day:	0.4	0.4
Hydrological region:	5	5
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 10 year:	1.65	1.65
Growth curve factor 30 year:	2.45	2.45
Growth curve factor 100 years:	3.56	3.56
Q_{BAR} for total site area (l/s):	0.18	0.21
Q_{BAR} for net site area (l/s):	0.18	0.21

Site discharge rates

	Default	Edited
1 in 1 year (l/s):	2	2
1 in 30 years (l/s):	2	2
1 in 100 years (l/s):	2	2

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m³):	89	89
Long term storage 1/100 years (m³):	0	0
Total storage 1/100 years (m³):	89	89

Surface water storage
requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by: michael keogh

Site name: Jepco

Site location: Gedney Marsh

Site Details

Latitude: 52.82149° N

Longitude: 0.10003° E

Reference: 1676255030

Date: Apr 13 2022 15:31

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SCD00219 (2013), the SuDS Manual C753 (Cata, 2015) and the non-statutory standards for SuDS (Defra, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site characteristics

Total site area (ha):	0.6
Significant public open space (ha):	0
Area positively drained (ha):	0.6
Impermeable area (ha):	0.6
Percentage of drained area that is impermeable (%):	100
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	0.6
Net impermeable area for storage volume design (ha):	0.6
Pervious area contribution to runoff (%):	30

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{SAAR} and other flow rates will have been reduced accordingly.

Design criteria

Climate change allowance factor:	1.4
Urban creep allowance factor:	1.1
Volume control approach	Flow control to max of 2 l/s/ha or Other
Interception rainfall depth (mm):	5
Minimum flow rate (l/s):	2

Methodology

estl	IH124
Q_{SAAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
SPR:	0.3	0.3

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	63
Rainfall 100 yrs 12 hrs:	--	102.41
FEH / FSR conversion factor:	1.33	1.33
SAAR (mm):	578	650
M5-60 Rainfall Depth (mm):	20	20
'r' Ratio M5-60/M5-2 day:	0.4	0.4
Hydrological region:	5	5
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 10 year:	1.65	1.65
Growth curve factor 30 year:	2.45	2.45
Growth curve factor 100 years:	3.56	3.56
Q_{SAAR} for total site area (l/s):	0.87	1
Q_{SAAR} for net site area (l/s):	0.87	1

Site discharge rates

	Default	Edited
1 in 1 year (l/s):	2	2
1 in 30 years (l/s):	2	2
1 in 100 year (l/s):	2	2

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m ³):	696	696
Long term storage 1/100 years (m ³):	0	0
Total storage 1/100 years (m ³):	696	696

This report was produced using the storage estimation 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 <http://uksuds.com/terms-and-conditions.htm>. The outputs from this tool have been used to estimate storage volume requirements. 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 these data in the design or operational characteristics of any drainage scheme.

