

Drainage Statement including Flood Risk

Proposed Commercial Development at

Denver Poultry Farm, Okehurst Lane, Billingshurst, West Sussex

On behalf of

ECE Planning

November 2023

Document History and Status

Project Number 23516

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1 Non Technical Summary

- 1.1 This Drainage Statement including Flood Risk Assessment has been undertaken on behalf of ECE Planning in support of a Planning Application for the demolition of the existing buildings at Denver Poultry Farm, Okehurst Lane, Billingshurst and the construction of 2 steel framed storage sheds for Class B8 storage or distribution use together with site access, associated parking and landscaping.
- 1.2 This Statement is to be read in conjunction with all planning, architectural and other reports that accompany the Planning Application for the proposed development.
- 1.3 The site is located in Flood Zone 1 and is not at risk of flooding from tidal or fluvial sources, groundwater overland flows or reservoirs.
- 1.4 In terms of flood risk the proposed development is suitable at this location.
- 1.5 The proposed development will incorporate a sustainable drainage system that will discharge surface water at a suitably restricted rate to the existing watercourse at the south of the site.
- 1.6 Storage will be provided for all storm return periods up to and including the 1:100 year rainfall event with an allowance for climate change.
- 1.7 Foul drainage from the development will drain via gravity to an onsite sewage treatment plant at the southern end of the site adjacent to the site access.
- 1.8 This report concludes that suitable surface water and foul water drainage systems can be designed to accommodate the anticipated flows from the proposed development.

2 Planning Policy Context

2.1 National Planning Policy Framework

2.1.1 With regard to planning and flood risk the National Planning Policy Framework states that *‘when determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment.*

Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

- a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
- b) the development is appropriately flood resistant and resilient, such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;*
- c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*
- d) any residual risk can be safely managed; and*
- e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.’*

2.1.2 Footnote 55 reads *‘a site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.’*

2.1.3 With regard to major developments the NPPF states that *‘major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:*

- a) take account of advice from the lead local flood authority;*
- b) have appropriate proposed minimum operational standards;*
- c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and*

d) where possible, provide multifunctional benefits.'

2.1.4 Major development is defined as follows:

'For housing, development where 10 or more homes will be provided, or the site has an area of 0.5 hectares or more. For non-residential development it means additional floorspace of 1,000m² or more, or a site of 1 hectare or more, or as otherwise provided in the Town and Country Planning (Development Management Procedure) (England) Order 2015.'

2.2 Non Technical Standards for SuDS

2.2.1 The Non Technical Standards for SuDS dated March 2015 are intended to be used in conjunction with the National Planning Policy Framework.

2.2.2 With regards to peak runoff **Non Statutory Standard S3** states that *'for developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.'*

2.2.3 With regards to peak volume **Non Statutory Standard S5** states that *'where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.'*

2.2.4 **Non Statutory Standard S6** states that *'where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with S4 or S5 above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.'*

2.2.5 **Non Statutory Standard S7** states that *'the drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event.'*

2.2.6 **Non Statutory Standard S8** states that *'the drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part*

of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.'

2.3 Lead Local Flood Authority

2.3.1 West Sussex County Council became a Lead Local Flood Authority under the Flood and Water Management Act 2010 and was given a series of new responsibilities to coordinate the management of local flood risk.

2.3.2 Responsibilities included the role of statutory consultee for surface water management for Major Planning Applications. West Sussex County Council has devolved its statutory consultee role to local drainage engineers within the individual district authorities.

2.3.3 As part of its role West Sussex County Council has commissioned and produced the following documents:

- Strategic Flood Risk Assessment - January 2010
- Preliminary Flood Risk Assessment - May 2011
- Local Flood Risk Management Strategy - May 2014
- West Sussex County Council LLFA Policy for the Management of Surface Water – November 2018.

2.3.4 The above documents have been reviewed in the preparation of this report.

2.4 Horsham District Council

2.4.1 Horsham District council produce a Strategic Flood Risk Assessment that was revised in April 2010 which has been reviewed in the preparation of this report.

2.5 Local Planning Policy

2.5.1 The Horsham District Planning Framework was adopted in November 2015.

Policy 38 Strategic Policy for Flooding states:

1. Development proposals will follow a sequential approach to flood risk management, giving priority to development sites with the lowest risk of flooding and making required development safe without increasing flood risk elsewhere. Development proposals will;

a. take a sequential approach to ensure most vulnerable uses are placed in the lowest risk areas.

b. avoid the functional floodplain (Flood zone 3b) except for water-compatible uses and essential infrastructure.

- c. *only be acceptable in Flood Zone 2 and 3 following completion of a sequential test and exceptions test if necessary.*
 - d. *require a site-specific Flood Risk Assessments for all developments over 1 hectare in Flood Zone 1 and all proposals in Flood Zone 2 and 3.*
2. *Comply with the tests and recommendations set out in the Horsham District Strategic Flood Risk Assessment (SFRA).*
 3. *Where there is the potential to increase flood risk, proposals must incorporate the use of sustainable drainage systems (SuDS) where technically feasible or incorporate water management measures which reduce the risk of flooding and ensure flood risk is not increased elsewhere.*
 4. *Consider the vulnerability and importance of local ecological resources such as water quality and biodiversity when determining the suitability of SuDS. New development should undertake more detailed assessments to consider the most appropriate SuDS methods for each site. Consideration should also be given to amenity value and green infrastructure.*²³⁵¹⁶
 5. *Utilise drainage techniques that mimic natural drainage patterns and manage surface water as close to its source as possible will be required where technically feasible.*
 6. *Be in accordance with the objective of the Water Framework Directive, and accord with the findings of the Gatwick Sub Region Water Cycle Study in order to maintain water quality and water availability in rivers and wetlands and wastewater treatment requirement*
- 2.5.2 It is anticipated that the Strategic Policy for Flooding and suds will be based upon similar principles in the new Horsham Local Plan which has been delayed with Adoption now scheduled for May 2025.

3 Existing Site

3.1 Site Location

3.1.1 The development site is located at Denver Poultry Farm, Okehurst Lane, Billingshurst, West Sussex, RH14 9HR.

3.1.2 The site is centred on Ordnance Survey reference TQ 090 274.



Image 1: Site Location

3.1.3 A copy of the site location plan is located in Appendix 1 at the rear of this report.

3.2 Site Description

3.2.1 The site is approximately 0.76ha in area and currently comprises a former poultry farm and associated parking and hardstanding areas.

3.2.2 Existing ground levels are highest at the northern boundary of the site at approximately 51.0m AOD. The site falls towards its south western boundary to a level of approximately 47.5m AOD.

3.2.3 The existing total impermeable area of the site is approximately 0.24ha.

3.2.4 A copy of the existing site layout plan is located in Appendix 2 at the rear of this report.

3.3 Existing Drainage

- 3.3.1 There are no public surface water or foul water sewers within the vicinity of the site.
- 3.3.2 A 0.6m to 1m deep watercourse is located on the eastern and southern boundaries of the site and flows to the west.
- 3.3.3 Surface water runoff from existing farm buildings and hardstanding areas is assumed to be discharged in an unrestricted manner into the watercourse which is located on the eastern and southern boundaries of the site. With the remaining areas discharging in part to ground and in part overland as a greenfield runoff to the to the watercourse at the south of the site.
- 3.3.4 Pre-developed greenfield runoff rates have been established using the HR Wallingford tool for Greenfield runoff estimation based on the FEH Statistical method for rainfall estimation.
- 3.3.5 The Hydrology of Soil Type (HOST) has been confirmed by the National Soil Resources Institute at Cranfield University as soil type 25 which is classified as *'slowly permeable, seasonally waterlogged soils over impermeable clay substrates with no storage capacity.'*

Calculated by: Stuart Magowan

Site name: Denver Poultry Farm

Site location: Billingshurst

Site Details

Latitude: 51.03602° N

Longitude: 0.44593° W

Reference: 3319732976

Date: Nov 10 2023 13:10

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

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha): 1

Methodology

Q_{MED} estimation method: Calculate from BFI and SAAR

BFI and SPR method: Calculate from dominant HOST

HOST class: 25

BFI / BFIHOST: 0.209

Q_{MED} (l/s): 7.07

Q_{BAR} / Q_{MED} factor: 1.14

Notes

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

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

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

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

Hydrological characteristics

	Default	Edited
SAAR (mm):	770	770
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

(3) Is $SPR/SPRHOST \leq 0.3$?

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

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	8.03	8.03
1 in 1 year (l/s):	6.82	6.82
1 in 30 years (l/s):	18.46	18.46
1 in 100 year (l/s):	25.61	25.61
1 in 200 years (l/s):	30.02	30.02

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

Image 2: Greenfield Runoff Calculation

3.3.6 The pre-developed greenfield runoff rates are as follows:

Storm Return Period	Rate	Site Specific for 0.76ha site
Q _{bar}	8.0 l/s/ha	6.1 l/s
1:30 year	18.5 l/s/ha	14.0 l/s
1:100 year	25.6 l/s/ha	19.5 l/s

Table 1: Greenfield Runoff Rates

3.3.7 The peak hour surface water runoff rates for the existing impermeable areas of the site have been calculated using the Modified Rationale Method as follows:

Storm Period	Impermeable Area (ha)	C	Cr	Cv	i (mm/hour) Based on FEH	Q(l/s)
1 in 2 year (peak)	0.32	0.975	1.3	0.75	31.6	27.37
1 in 30 year (peak)	0.32	0.975	1.3	0.75	80.2	69.43
1 in 100 year (peak)	0.32	0.975	1.3	0.75	102.0	88.36

Table 2: Peak Runoff Rates for Existing Impermeable Area

3.3.8 The site currently has no positive foul water drainage infrastructure.

3.3.9 A copy of the sewer records is located in Appendix 3 at the rear of this report.

3.4 Geology and Groundwater

3.4.1 British Geological Survey map information indicates that the site is within an area underlain by Weald Clay Formation.

3.4.2 The closest available borehole log was recorded approximately 1.5km to the south of the site and recorded. The results of the borehole found Weald Clay to a depth of over 30m below ground level.

3.4.3 The geology and existing watercourse at the southern boundary of the site indicate that infiltration to ground is unlikely to be suitable method of draining surface water from the development. If required, this will be confirmed on site by testing at the detailed design stage.

3.4.4 A copy of the geological borehole data is located in Appendix 4 at the rear of this report.

4 Flood Zone and Flood History

4.1 Tidal Flood Zone

- 4.1.1 The Environment Agency's online mapping confirms that the site is located in Tidal Flood Zone 1 and is not at risk of tidal flooding from anything less extreme than a 1:1000 year flood event.

4.2 Fluvial Flood Zone

- 4.2.1 The Environment Agency's online mapping confirms that the site is located in Fluvial Flood Zone 1 and is not at risk of fluvial flooding from anything less extreme than a 1:1000 year flood event.

4.3 Surface Water Flooding

- 4.3.1 The Environment Agency's online mapping confirms that the site is at very low risk of surface water flooding, there is an area at low risk of surface water flooding to the north of the site on Oakhurst Lane and to the south east of the site in the adjacent field which appear to follow the edge of the field boundary to the south east and south of the site. There is no surface water flood risk indicated within the site boundary.

4.4 Reservoir Flooding

- 4.4.1 The Environment Agency's online mapping confirms that the site is not at risk of reservoir flooding.

4.5 Groundwater Flooding

- 4.5.1 The SFRA notes *"There are no records of groundwater flooding within the study area. However, the chalk areas to the south of the study area are classified as major aquifers with a high permeability. Many of the streams overlying this area are predominantly fed by groundwater and are dry for parts of the year. The high values of Base Flow Index (BFI) of these streams, coupled with the fact that they overly major aquifers leads to a potential for groundwater flooding in the area."*
- 4.5.2 Environment Agency's online mapping confirms that Flooding from groundwater is unlikely in the site area.

4.6 Flood History

4.6.1 Environment Agency

- 4.6.1.1 The Environment Agency online maps of historic flood incidents do not identify any historic incidents of flooding affecting the site.

4.6.2 West Sussex County Council

4.6.2.1 Neither the Strategic Flood Risk Assessment dated January 2010, the Preliminary Flood Risk Assessment dated May 2011 nor the Local Flood Risk Management Strategy dated May 2014 identify any specific flood incidents affecting the site.

4.6.3 Horsham District Council

4.6.3.1 The Strategic Flood Risk Assessment dated April 2010 does not identify any specific flood incidents affecting the site.

4.6.4 Copies of the available flood maps are located in Appendix 5 at the rear of this report.

5 Flooding Potential

5.1 Tidal Flooding

5.1.1 The site is located 25km from the coast and is not at risk of tidal flooding.

5.2 Fluvial Flooding

5.2.1 The site is located in Flood Zone 1 and is not at risk of fluvial flooding from anything less extreme than a 1:1000 year flood event.

5.3 Groundwater Flooding

5.3.1 There are no records identified within Horsham District Council's Strategic Flood Risk Assessment, Preliminary Flood Risk Assessment or Local Flood Risk Management Strategy of groundwater flooding affecting the site.

5.4 Overland Flow

5.4.1 The Environment Agency's maps identify the site to be at very low risk of flooding from overland surface water.

5.4.2 The locations identified are however minimal and all are isolated with no apparent flow route.

5.4.3 The flood mapping contained within the various flood documents produced by West Sussex County Council and Horsham District Council does not identify any flood risk associated with overland flow routes.

5.5 Reservoir Flooding

5.5.1 The Environment Agency's maps confirm the site is not at result of flooding from reservoirs.

5.6 Flood Routing

5.6.1 The natural route for flood waters to dissipate, should any event occur on the site, is towards the ditch at the southern / southwestern boundary mimicking the existing situation.

5.6.2 There is no associated flood risk to the downstream catchment area.



Image 2: Local Topography

6 Development Proposals

6.1 Description

6.1.1 The development proposals are for the demolition of the existing buildings at Denver Poultry Farm, Okehurst Lane, Billingshurst and the construction of 2 steel framed storage sheds for Class B8 storage or distribution use together with site access, associated parking and landscaping.

6.2 Impermeable areas

6.2.1 The proposed impermeable areas of the various elements of the development are summarised as follows:

- Hard Landscaping 1,875m²
- Building Roofs 2,010m²

6.2.2 A copy of the proposed site layout plan together with an impermeable areas plan is located in Appendix 6 at the rear of this report.

6.3 Surface Water Drainage

6.3.1 CIRIA report C753 The SuDS Manual-v6 provides guidance on the redevelopment of brownfield sites. The aim for surface water runoff is to match greenfield runoff rates and volumes where reasonably achievable.

6.3.2 For surface water discharge, the drainage hierarchy notes the following list of drainage options in order of preference:

1. Infiltration to ground
2. Discharge to a watercourse
3. Discharge to a surface water sewer
4. Discharge to a foul water sewer

6.3.3 The preferred surface water drainage strategy should where possible be based on infiltration to ground, however, the site is underlain by clay and infiltration is not a practical method of discharging surface water runoff from this site.

6.3.4 The proposed surface water drainage strategy is based on attenuating surface water on site with sufficient storage provided to accommodate a 1:100 year storm event including an additional 45% to account for the predicted effects of future climate change.

- 6.3.5 Surface water will be discharged at a restricted rate to the existing watercourse at the south of the site with a maximum surface water discharge rate set to mimic the predevelopment Qbar greenfield run off rate of 6.1l/s.
- 6.3.6 Restricting the discharge to Qbar provides a betterment compared to the peak pre-development surface water runoff rates for the site of approximately 21 l/s.
- 6.3.7 Calculations have been prepared in order to demonstrate that surface water drainage can be adequately accommodated within the site without any increased flood risk elsewhere.
- 6.3.8 All surface water runoff from the roofs and parking areas will be attenuated using a 540mm deep lined storage blanket beneath the permeable paving access road and parking areas.
- 6.3.9 The storage structure has a half drain time of 528 minutes (8.8 hours) following a 1:100 year storm event including an additional 45% to account for the predicted effects of future climate change.
- 6.3.10 If the design storm is exceeded then surface water will flow to the south of the site and the to the southwest mimicking the existing exceedance route.
- 6.4 Foul Water Drainage
- 6.4.1 Foul drainage from the development will drain via gravity to an onsite sewage treatment plant at the southern end of the site.
- 6.4.2 The sewage treatment plant will discharge treated effluent into the watercourse located on the southern boundary of the site.
- 6.4.3 Copies of the drainage strategy plan, exceedance route plan and calculations are located in Appendix 7 at the rear of this report.
- 6.4.4 A copy of the Horsham District Council Surface Water Drainage Statement Checklist is located in Appendix 8 at the rear of this report.
- 6.5 Water Quality
- 6.5.1 The proposed development is for commercial use. In accordance with CIRIA SuDS Manual 2015 (Report C753), the pollution hazard level for this type of development is between low and medium depending on the use / area of the site.
- 6.5.2 The surface water scheme will include mitigation to ensure that surface water is suitably treated, and any pollution risk adequately managed prior to discharge.

6.5.3 Table 26.2 in Chapter 26 of CIRIA report C753 The SuDS Manual provides Pollution Hazard Indices for varying land types. Those of relevance to the development proposals are as follows:

Land Use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Commercial / Industrial roofs	Low	0.3	0.2	0.05
Commercial yards and delivery areas	Medium	0.7	0.6	0.7
Non-residential car parking with frequent change (e.g. hospitals, retail), all roads except low traffic roads, trunk roads and motorways	Medium	0.7	0.6	0.7

Table 3: Pollution Hazard Indices

SuDS Type	Total suspended solids (TSS)	Metals	Hydro-carbons
Permeable pavement	0.7	0.6	0.7

Table 4: Pollution Mitigation Indices

6.5.4 The proposed use of permeable paving will meet the target treatment level required for runoff with low to medium risk of pollution hazard thus demonstrating that the surface water drainage system for the site can be designed to adequately mitigate against the risk of pollution.

6.5.5 An outline drainage maintenance schedule is located in Appendix 7 at the rear of this report.

7 Risk to Others

- 7.1 The proposed surface water drainage system will be designed to current standards incorporating SuDS elements providing treatment, attenuation and storage which will minimise runoff leaving the site during times of heavy rain.
- 7.2 Allowance has been made for a 45% increase in rainfall intensities which accords with the latest figures published by the Environment Agency and in accordance with the requirements under the National Planning Policy Framework.
- 7.3 The proposed drainage system will incorporate sufficient treatment prior to final discharge thus mitigating the risk of pollution from the site.
- 7.4 The risk of surface water flooding to others due to the development proposals is reduced and the resultant risk is negligible.
- 7.5 Land Drainage Consent will be applied for the new headwall structure constructed as part of the system to discharge surface water to the adjacent ordinary watercourse in accordance with the Land Drainage Act (2010).
- 7.6 In regard to treated foul water, should the Environment Agency's General binding rules not apply at detailed design an Environmental Permit for the treated foul discharge will be applied for to ensure protection of the receiving water body.

8 Conclusions

- 8.1 The site is located within Flood Zone 1 and is not at risk of flooding from tidal or fluvial sources, groundwater, overland surface water flows or reservoirs.
- 8.2 There are no historic records of flooding from any source affecting the site or its immediate area.
- 6.1 The geology of the area is predominantly clay and is not suitable to accommodate an infiltration drainage system.
- 6.2 A suitable SuDS drainage system is proposed which accords with the requirements of National and Local Policy.
- 6.3 Surface water will be discharged at a restricted rate to the to the existing watercourse at the south of the site to mimic the predevelopment greenfield runoff rate.
- 6.4 Calculations confirm that surface water runoff generated by the proposed development can be attenuated on site for all rainfall events up to the 1:100 year event including an allowance for climate change.
- 6.5 Water quality improvement will be provided to mitigate against any risk to any receiving waterbody.
- 6.6 Foul drainage from the development will drain via gravity to an onsite sewage treatment plant treatment plant at the southern end of the site and discharge treated effluent to the adjacent watercourse along the southern boundary.
- 6.7 A suitable surface water and foul water drainage system is proposed to accommodate the anticipated flows from the proposed development and in terms of drainage the development proposals are suitable at this location.

9 List of Appendices, Images and Tables

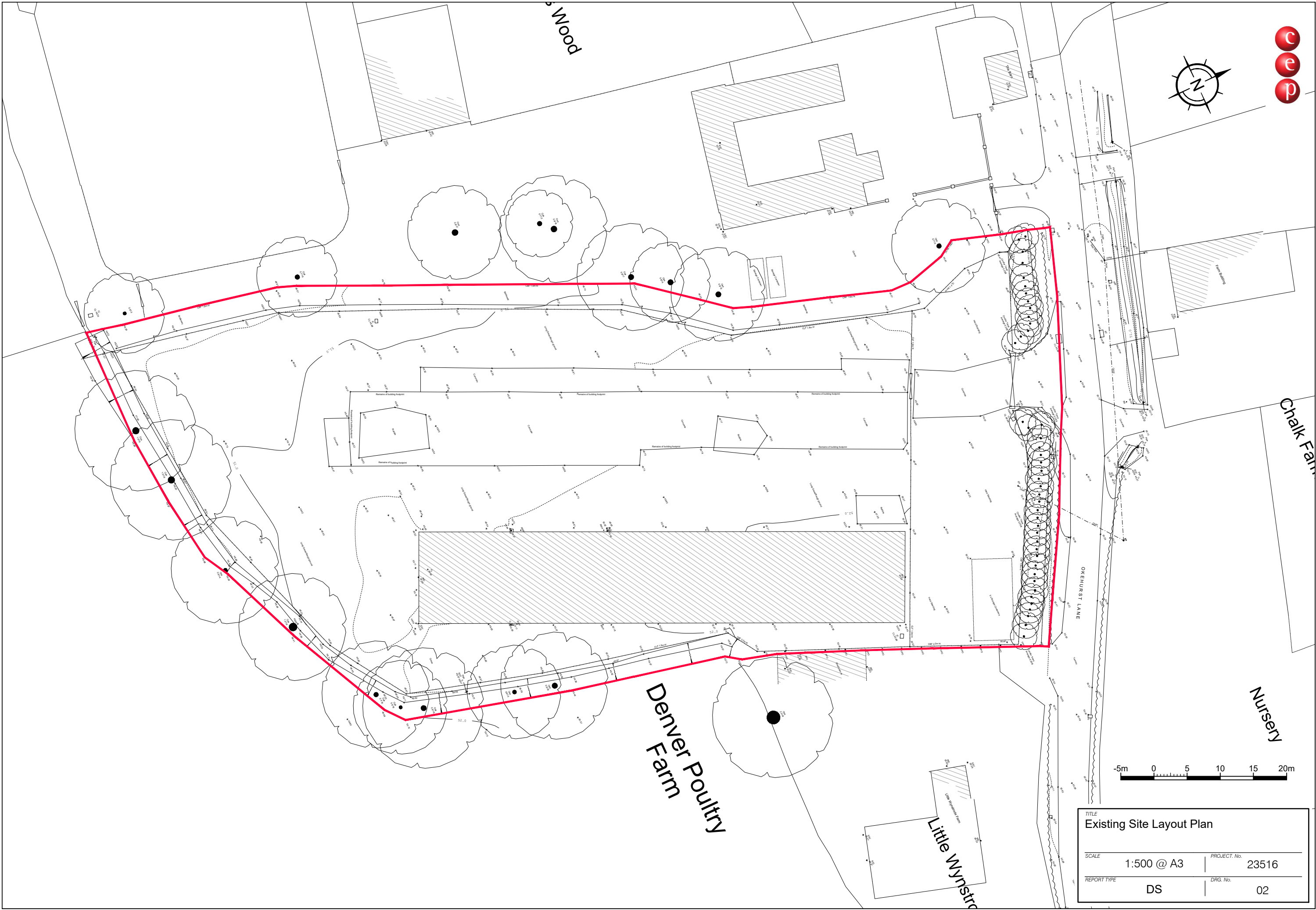
Appendix 1	Site Location Plan
Appendix 2	Existing Site Layout Plan
Appendix 3	Southern Water Sewer Records
Appendix 4	Geological Borehole Data
Appendix 5	Flood Maps
Appendix 6	Proposed Site Layout Plan and Impermeable Areas Plan
Appendix 7	Drainage Strategy Plan, Exceedance Route Plan and Calculations
Appendix 8	Surface Water Drainage Statement Checklist
Appendix 9	Outline Drainage Maintenance Schedule

Image 1 Site Location

Table 1	Greenfield Runoff Rates
Table 2	Peak Runoff Rates for Existing Impermeable Area
Table 3	Pollution Hazard Indices
Table 4	Pollution Mitigation Indices

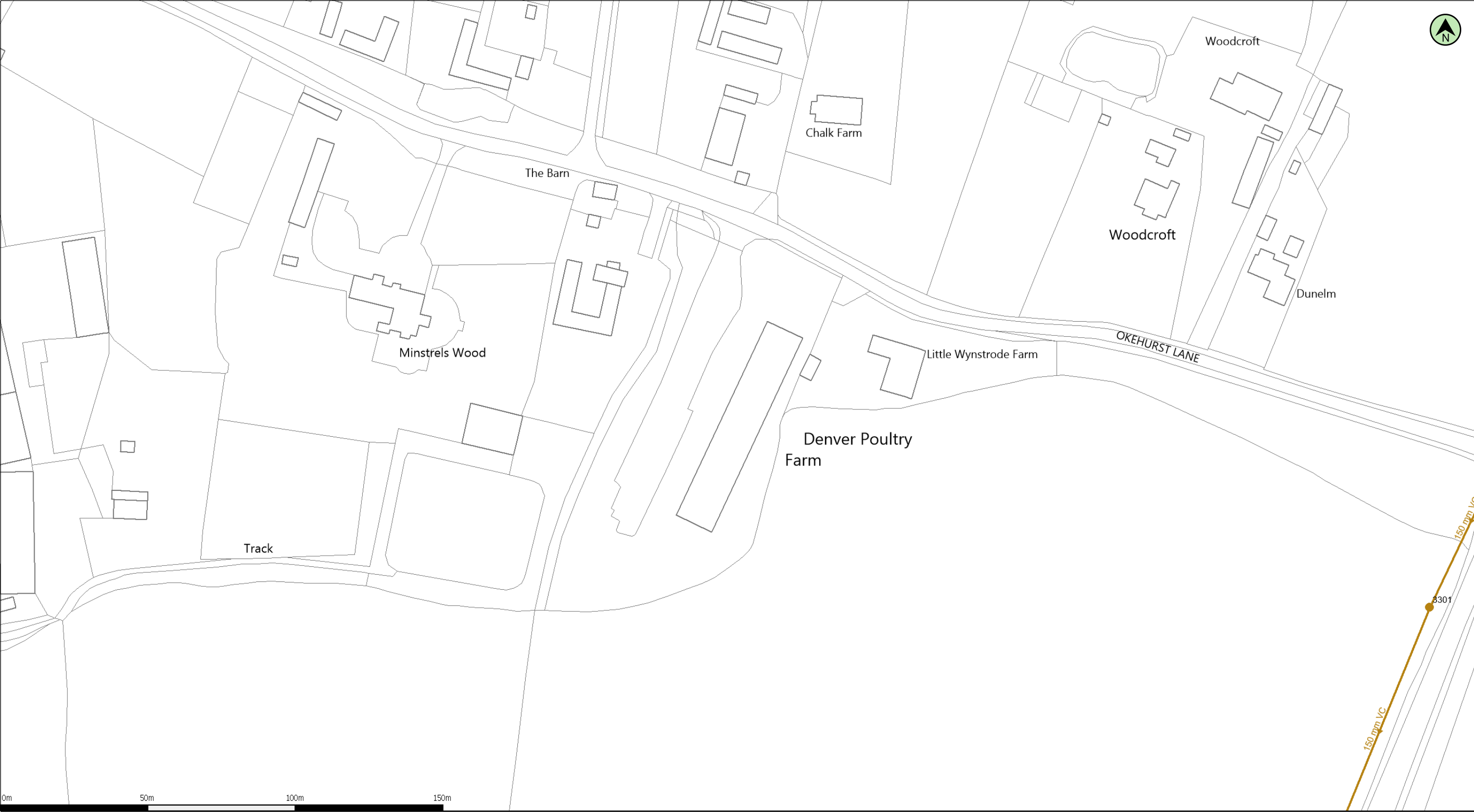
Appendix 1
Site Location Plan

Appendix 2
Existing Site Layout Plan



TITLE Existing Site Layout Plan	
SCALE 1:500 @ A3	PROJECT No. 23516
REPORT TYPE DS	DRG. No. 02

Appendix 3
Southern Water Sewer Records



(c) Crown copyright and database rights 2021 Ordnance Survey 100031673 Date: 06/05/21 Scale: 1:1250 Map Centre: 509075,127450 Data updated: 19/04/21 Our Ref: 553322 - 1 Wastewater Plan A3

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2021 Ordnance Survey 100031673. This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

mat@civil.co.uk
23516 Okehurst Lane



Appendix 4
Geological Borehole Data

British Geological Survey

British Geological Survey

British Geological Survey

BILLINGSHURST.

Sussex 23NE/E

From Topleys notes, where it is given as Pellingshurst.

W.S.S. II, p. 159. 1911

British Geological Survey

British Geological Survey

British Geological Survey

From notes and specimens sent by Messrs. Tilley.

Water at first stood $15\frac{1}{2}$ feet down. Started falling when the boring was $60\frac{1}{2}$ feet down and fell to 19 feet down. When the hole was 80 feet deep it stood at 52 feet down.

British Geological Survey

British Geological Survey

British Geological Survey

Weald Clay

	Thickness	Depth.
Sand	15	15
Red clay	5	20
Bluish sand clay	4	24
Brown & red clay	10	34
Bluish clay	6	40
Yellow sandy clay	5	45
Stiff yellow clay	5	50
Blue clay	17	67
Sandstone	$\frac{1}{2}$	$67\frac{1}{2}$
Blue clay	$32\frac{1}{2}$	100.

British Geological Survey

British Geological Survey

British Geological Survey

? Sussex 6 in. 23 N.E. (E) Site not traced in field survey.

S.E.H. 20.3.41.

? Possibly connected with old water works - see notes of MS notes on record 504/13

cross



British
Geological
Survey

Version 2.0.6.3

BGS ID: 12597898 : BGS Reference: TQ02NE19

British National Grid (27700) : 509000,126000

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301/115 Billingshurst. Site not determined

N/S TQ 02 NE/19
TQ02/24

W.S.Sx.II, p. 159. When bore less than 60%, R.W.L. 15% down; bore 60%. R.W.L. 19 down;
bore 80, R.W.L. 52 down. Tilley, 1911.

WC

100

100

British Geological Survey

British Geological Survey

British Geological Survey

301/115

Thickness

Depth.

Weald Clay
100

Sand	15	15
Red clay	5	20
Bluish sand clay	4	24
Brown + red clay	10	34
Bluish clay	6	40
Yellow sandy clay	5	45
Stiff yellow clay	5	50
Blue clay	17	67
Sandstone	$\frac{1}{2}$	$67\frac{1}{2}$
Blue clay	$32\frac{1}{2}$	100.

British Geological Survey

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British Geological Survey

British Geological Survey

British Geological Survey

British Geological Survey

British Geological Survey

British Geological Survey

British Geological Survey

301/115 Billingshurst. Site not determined

N/S TQ 02 NE/19
TQ 02/24W.S.Sx.II, p. 159. When bore less than 60%, R.W.L. 15% down; bore 60%. R.W.L. 19 down;
bore 80, R.W.L. 52 down. Tilley, 1911.

British Geological Survey

WC

British Geological Survey

100

100

British Geological Survey

301/115

Thickness Depth.

Weald Clay
100

Sand	15	15
Red clay	5	20
Bluish sand clay	4	24
Brown & red clay	10	34
Bluish clay	6	40
Yellow sandy clay	5	45
Stiff yellow clay	5	50
Blue clay	17	67
Sandstone	$\frac{1}{2}$	67 $\frac{1}{2}$
Blue clay	32 $\frac{1}{2}$	100.

British Geological Survey

British Geological Survey

British Geological Survey

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British
Geological
Survey

Version 2.0.6.3

BGS ID: 12597898 : BGS Reference: TQ02NE19

British National Grid (27700) : 509000,126000

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7
N/S 301/115
TQ02/24 301/115

BILLINGSHURST.

Sussex 23NE/E

From Topleys notes, where it is given as Billingshurst.

W.S.S. II, p. 159. 1911

From notes and specimens sent by Messrs. Tiley.

Water at first stood $15\frac{1}{2}$ feet down. Started falling when the boring was $60\frac{1}{2}$ feet down and fell to 19 feet down. When the hole was 80 feet deep it stood at 52 feet down.

	Thickness	Depth.
Sand	15	15
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Yellow sandy clay	5	45
Stiff yellow clay	5	50
Blue clay	17	67
Sandstone	$\frac{1}{2}$	$67\frac{1}{2}$
Blue clay	$32\frac{1}{2}$	100.

? Sussex Giv. 23 N.E. (E) Site not traced in field survey.

S.E.G.H. 20.3.41.

? Possibly connected with old water works - see notes on next sheet

Appendix 5

Flood Maps

Flood map for planning

Your reference
Denver RH14

Location (easting/northing)
509059/127449

Created
10 Nov 2023 10:47

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger than 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2022 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>



BETA This is a new service – your [feedback](#) will help us to improve it.

[Back](#)

Learn more about this area's flood risk

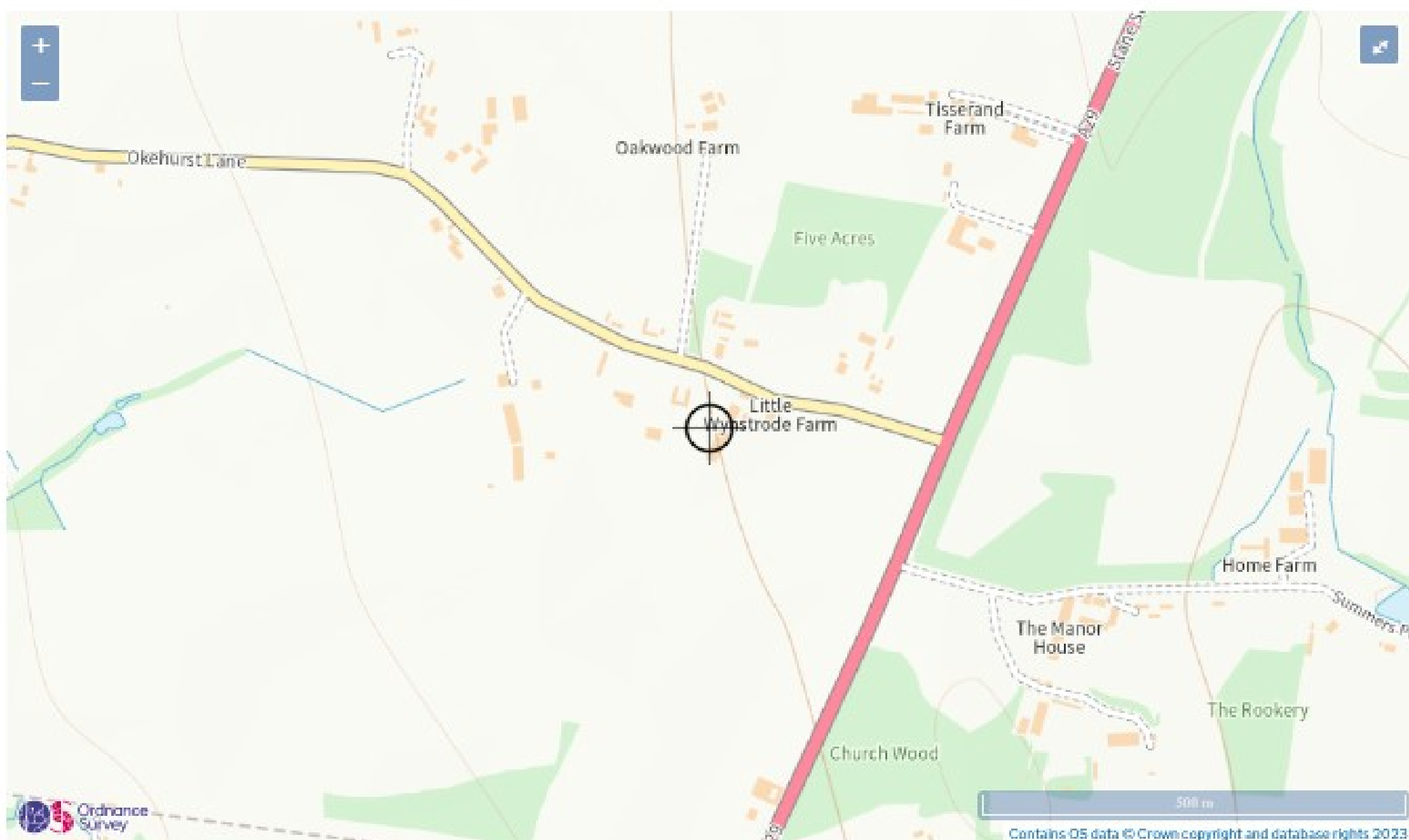
Select the type of flood risk information you're interested in. The map will then update.

Flood risk

Extent of flooding

Location

RH14 9HR



Maximum extent of flooding from reservoirs:

 when river levels are normal  when there is also flooding from rivers  Location you selected

BETA This is a new service – your [feedback](#) will help us to improve it.

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Learn more about this area's flood risk

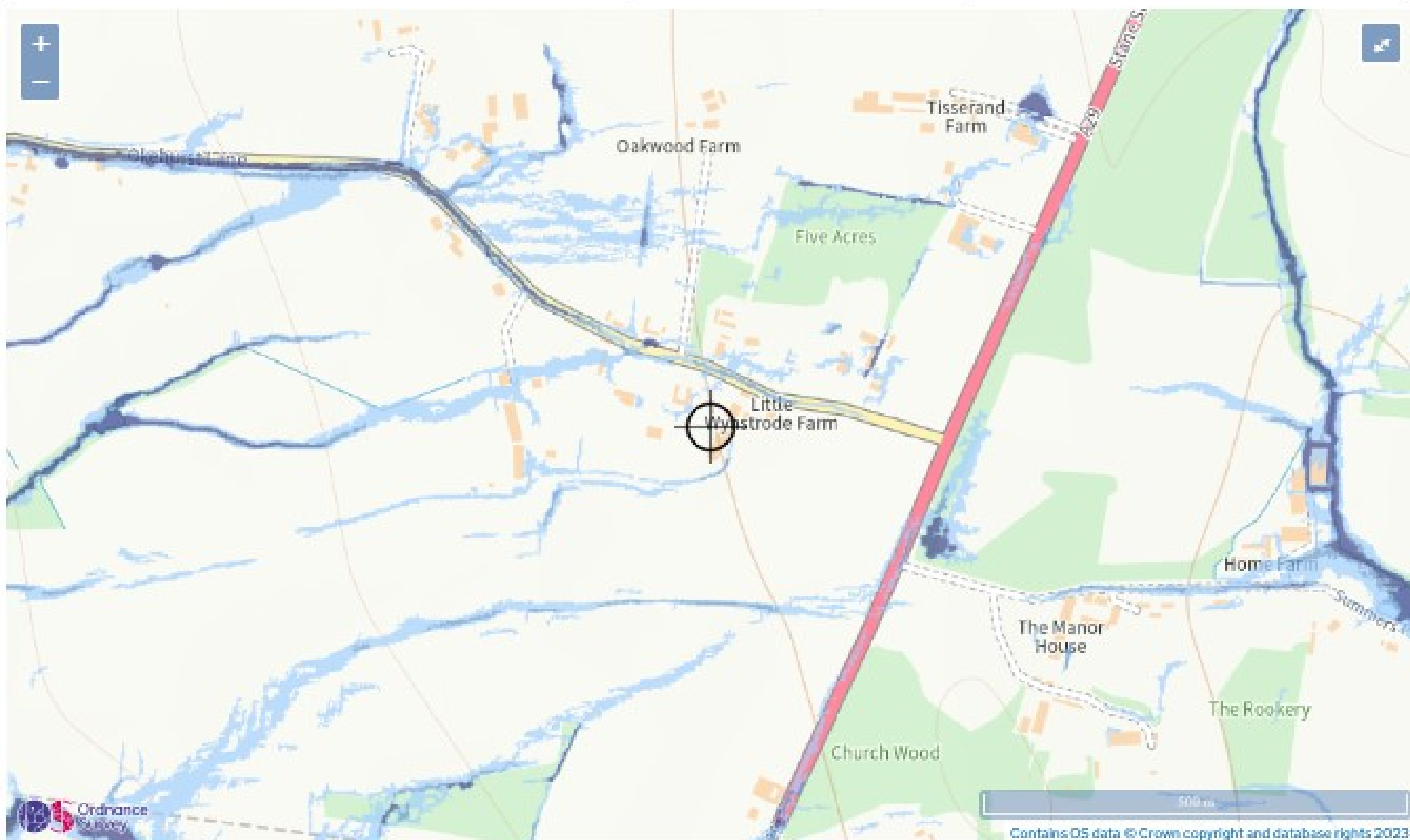
Select the type of flood risk information you're interested in. The map will then update.

Flood risk

Extent of flooding

Location

RH14 9HR

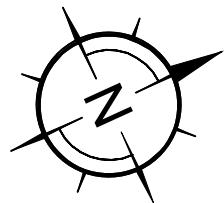


Extent of flooding from surface water

[High](#)
 [Medium](#)
 [Low](#)
 [Very low](#)
 [Location you selected](#)

Appendix 6

Proposed Site Layout and Impermeable Areas Plan



-5m 0 5 10 15 20m

c
e
p

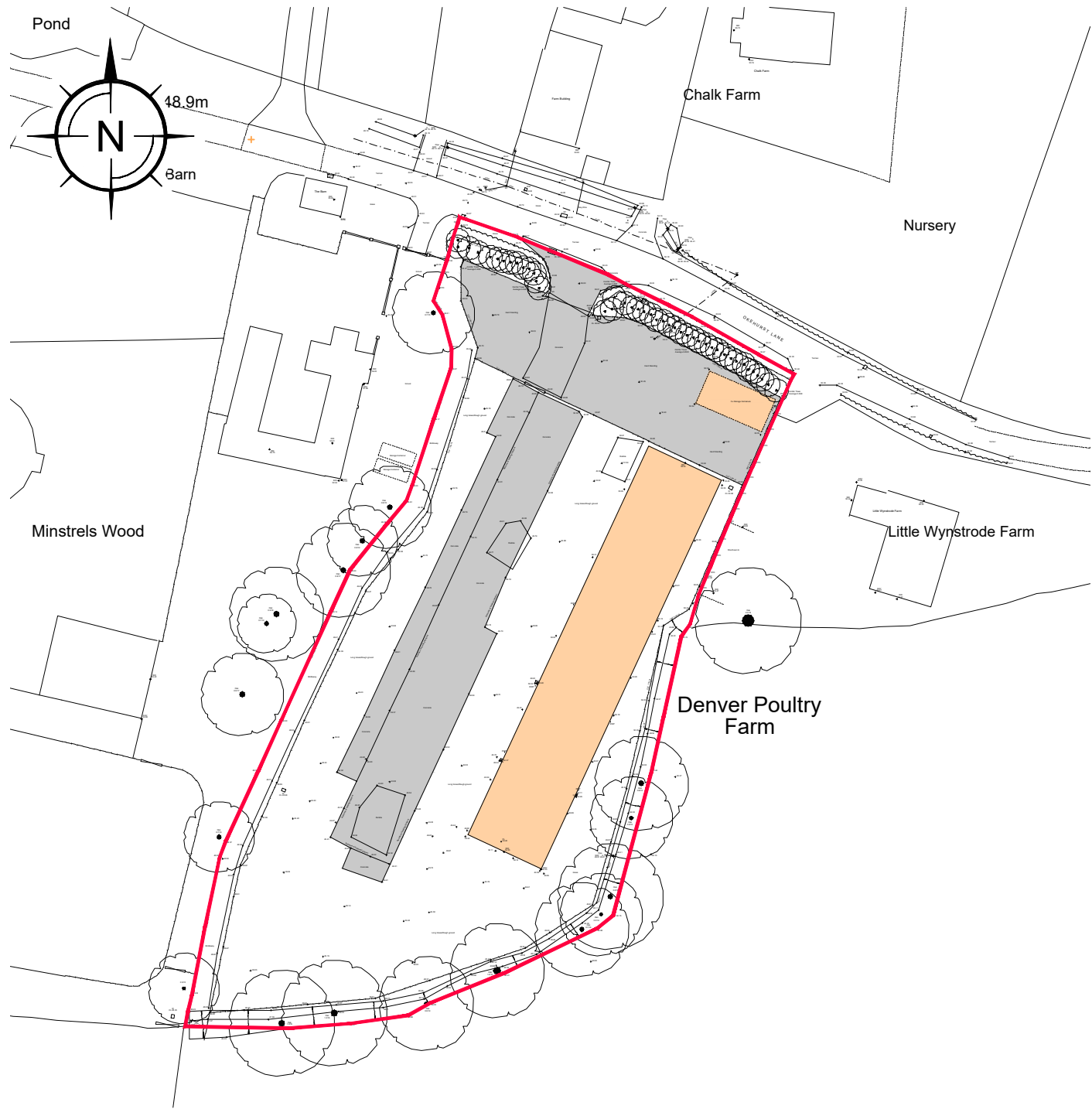
OKENURST LANE

Denver Poultry
Farm

Little Wynstrode

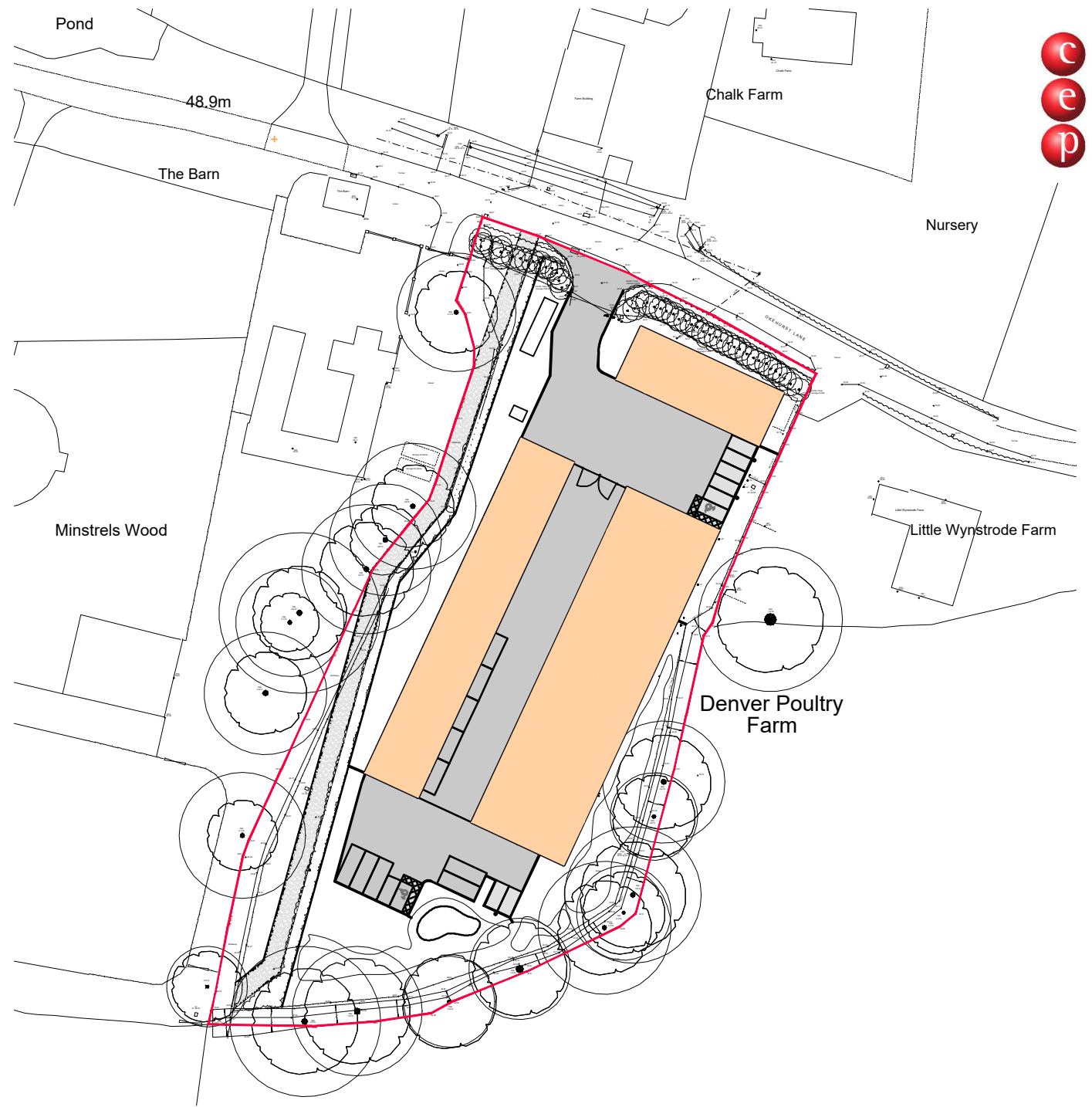
Nursery

TITLE Proposed Site Layout Plan			
SCALE 1:500 @ A3		PROJECT No. 23516	
REPORT TYPE DS		DRG. No. 03 A	



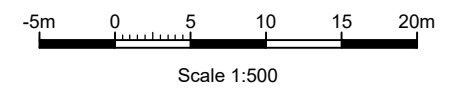
Existing Impermeable Areas

	Hard Landscaping	2,110m ²
	Buildings	1,085m ²
	TOTAL	3,195m²
	Site Boundary	7,740m ²



Proposed Impermeable Areas

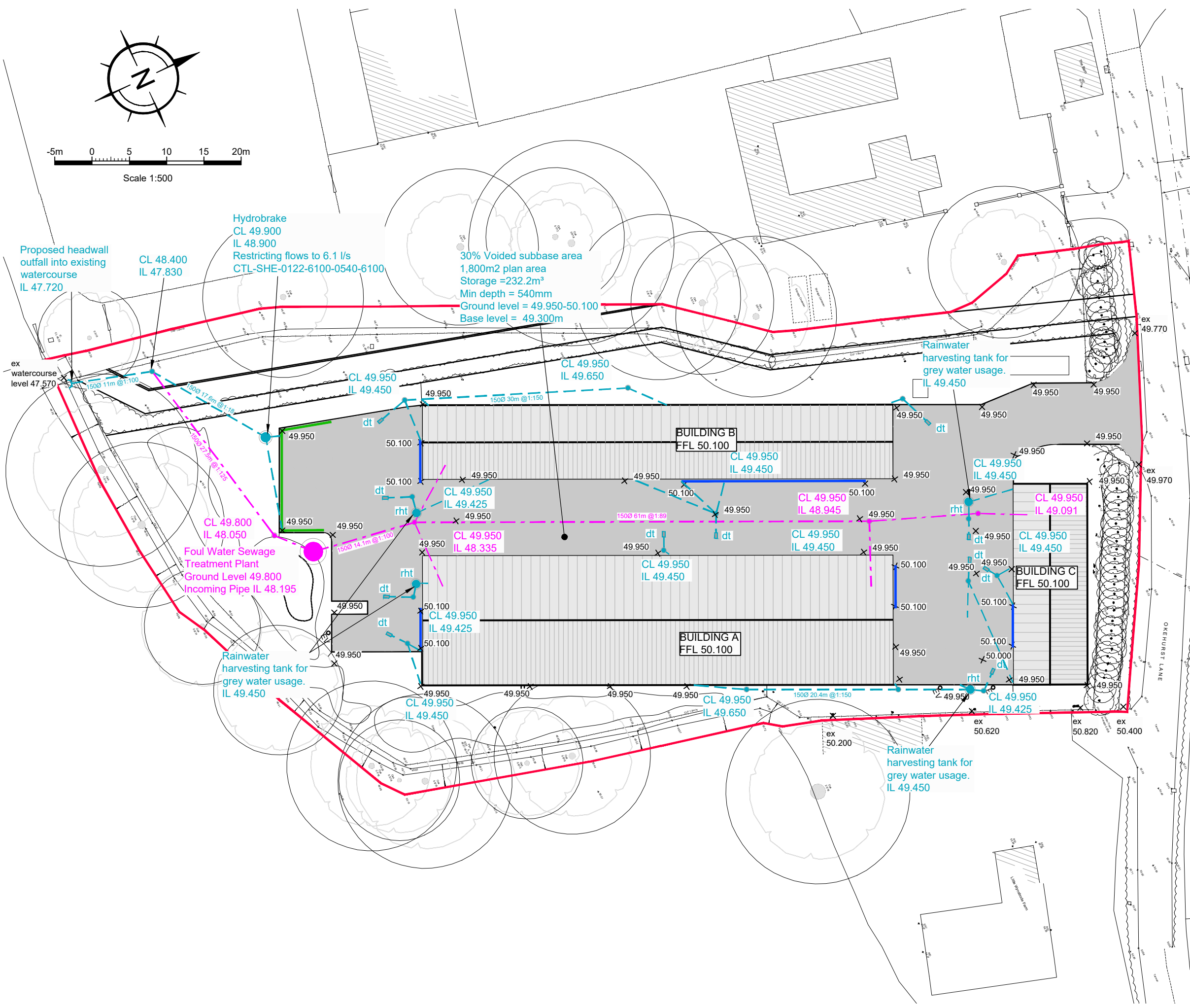
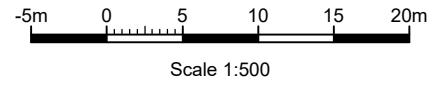
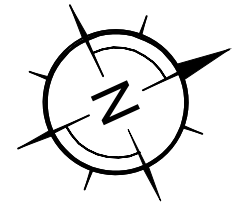
	Hard Landscaping	1,875m ²
	Buildings	2,010m ²
	TOTAL	3,885m²
	Site Boundary	7,740m ²



TITLE Impermeable Areas Plan		
SCALE 1:500 @ A3	PROJECT No. 23516	
REPORT TYPE DS	DRG. No. 04	A

Appendix 7

**Drainage Strategy Plan, Exceedance Route Plan
and Calculations**



DRAINAGE KEY:

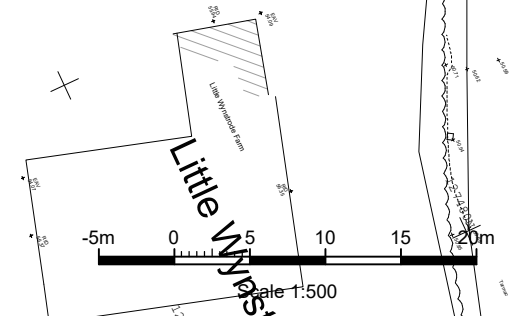
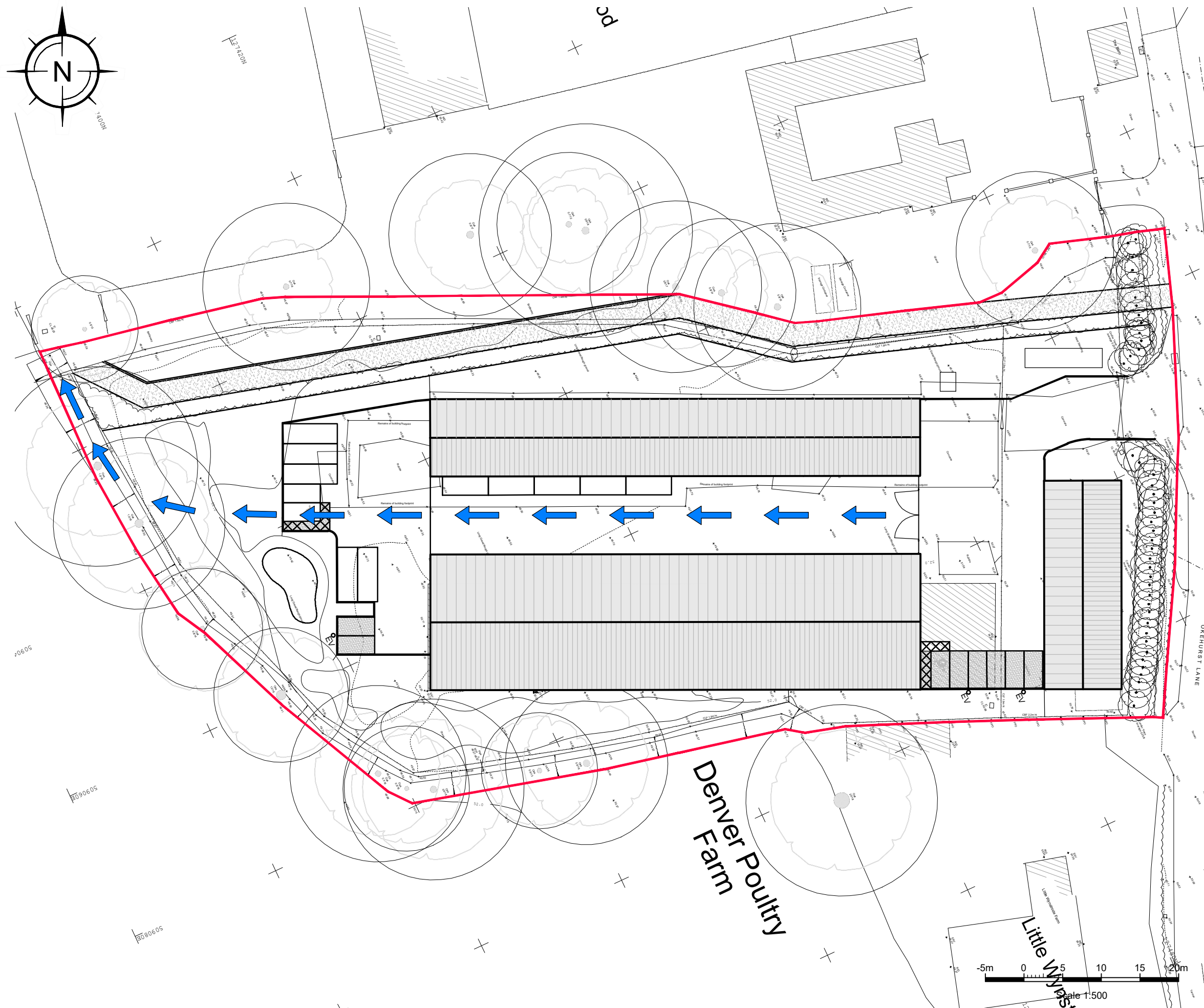
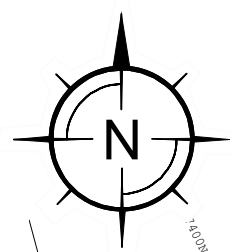
Private Storm Drainage

- CL 4.284 Chamber Cover Level
- IL 3.834 Chamber Invert Level
- Type D Inspection Chambers
- rht Rainwater Harvesting Tank
- ACO Channel
- dt Distribution Tank in voided stone
- Min 540mm deep 30% Voided Subbase
- Voided Subbase Collection Pipe

Private Foul Drainage

- CL 4.284 Chamber Cover Level
- IL 3.834 Chamber Invert Level
- Type D Inspection Chambers

TITLE Drainage Strategy Plan			
SCALE 1:500 @ A3		PROJECT No. 23516	
REPORT TYPE DS		DRG. No. 05 A	



TITLE Exceedance Flow Route Plan			
SCALE 1:500 @ A3		PROJECT No. 23516	
REPORT TYPE DS		DRG. No. 06	

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	150.0		

Nodes

Name	Area (ha)	Cover Level (m)	Diameter (mm)	Depth (m)
Storage	0.389	49.950	1200	0.650

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	2440	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	------

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

Node Storage Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	49.300	Product Number	CTL-SHE-0122-6100-0540-6100
Design Depth (m)	0.540	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	6.1	Min Node Diameter (mm)	1200

Node Storage Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	49.300	Slope (1:X)	9999.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	528	Depth (m)	0.540
Safety Factor	2.0	Width (m)	41.500	Inf Depth (m)	
Porosity	0.30	Length (m)	41.500		

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
360 minute summer	Storage	232	49.423	0.123	18.1	60.4133	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
360 minute summer	Storage	Hydro-Brake®	5.5	99.6

Results for 10 year Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
240 minute summer	Storage	176	49.502	0.202	38.1	100.3478	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
240 minute summer	Storage	Hydro-Brake®	6.1	143.8

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	Storage	192	49.563	0.263	48.0	131.4231	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
240 minute summer	Storage	Hydro-Brake®	6.1	181.2

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	Storage	176	49.643	0.343	49.5	172.3876	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute winter	Storage	Hydro-Brake®	6.1	213.1

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	Storage	236	49.832	0.532	57.7	269.3680	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
240 minute winter	Storage	Hydro-Brake®	6.1	328.7

Results for 2 year 15 minute summer. 2455 minute analysis at 1 minute timestep. Mass balance: 99.73%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute summer	Storage	19	49.361	0.061	70.9	29.7329	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
15 minute summer	Storage	Hydro-Brake®	2.0	29.9

Results for 2 year 15 minute winter. 2455 minute analysis at 1 minute timestep. Mass balance: 99.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	Storage	19	49.361	0.061	66.5	29.7426	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
15 minute winter	Storage	Hydro-Brake®	2.0	29.9

Results for 2 year 30 minute summer. 2470 minute analysis at 1 minute timestep. Mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
30 minute summer	Storage	33	49.376	0.076	62.8	37.1787	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
30 minute summer	Storage	Hydro-Brake®	2.9	38.9

Results for 2 year 30 minute winter. 2470 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
30 minute winter	Storage	33	49.376	0.076	50.7	37.2012	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
30 minute winter	Storage	Hydro-Brake®	2.9	38.8

Results for 2 year 60 minute summer. 2500 minute analysis at 1 minute timestep. Mass balance: 99.90%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
60 minute summer	Storage	61	49.390	0.090	47.3	43.8140	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
60 minute summer	Storage	Hydro-Brake®	3.7	49.3

Results for 2 year 60 minute winter. 2500 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
60 minute winter	Storage	60	49.390	0.090	34.2	44.0361	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
60 minute winter	Storage	Hydro-Brake®	3.8	49.3

Results for 2 year 120 minute summer. 2560 minute analysis at 2 minute timestep. Mass balance: 99.91%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	Storage	96	49.407	0.107	34.2	52.4405	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
120 minute summer	Storage	Hydro-Brake®	4.7	67.1

Results for 2 year 120 minute winter. 2560 minute analysis at 2 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	Storage	98	49.407	0.107	23.6	52.5891	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
120 minute winter	Storage	Hydro-Brake®	4.7	67.2

Results for 2 year 180 minute summer. 2620 minute analysis at 4 minute timestep. Mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
180 minute summer	Storage	128	49.415	0.115	26.7	56.7584	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
180 minute summer	Storage	Hydro-Brake®	5.1	78.7

Results for 2 year 180 minute winter. 2620 minute analysis at 4 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	Storage	136	49.415	0.115	18.4	56.4077	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute winter	Storage	Hydro-Brake®	5.1	78.8

Results for 2 year 240 minute summer. 2680 minute analysis at 4 minute timestep. Mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
240 minute summer	Storage	164	49.420	0.120	23.2	59.0462	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
240 minute summer	Storage	Hydro-Brake®	5.4	87.4

Results for 2 year 240 minute winter. 2680 minute analysis at 4 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	Storage	172	49.418	0.118	15.4	57.8741	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
240 minute winter	Storage	Hydro-Brake®	5.3	87.3

Results for 2 year 360 minute summer. 2800 minute analysis at 8 minute timestep. Mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
360 minute summer	Storage	232	49.423	0.123	18.1	60.4133	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
360 minute summer	Storage	Hydro-Brake®	5.5	99.6

Results for 2 year 360 minute winter. 2800 minute analysis at 8 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	Storage	248	49.418	0.118	11.8	57.9133	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
360 minute winter	Storage	Hydro-Brake®	5.3	99.7

Results for 2 year 480 minute summer. 2920 minute analysis at 8 minute timestep. Mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
480 minute summer	Storage	296	49.422	0.122	14.5	60.2321	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
480 minute summer	Storage	Hydro-Brake®	5.5	109.1

Results for 2 year 480 minute winter. 2920 minute analysis at 8 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	Storage	312	49.415	0.115	9.6	56.3835	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
480 minute winter	Storage	Hydro-Brake®	5.1	109.0

Results for 2 year 600 minute summer. 3045 minute analysis at 15 minute timestep. Mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
600 minute summer	Storage	360	49.419	0.119	11.9	58.7727	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
600 minute summer	Storage	Hydro-Brake®	5.3	115.9

Results for 2 year 600 minute winter. 3045 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	Storage	390	49.411	0.111	8.1	54.4183	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
600 minute winter	Storage	Hydro-Brake®	4.9	116.4

Results for 2 year 720 minute summer. 3165 minute analysis at 15 minute timestep. Mass balance: 99.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
720 minute summer	Storage	435	49.417	0.117	10.7	57.8016	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
720 minute summer	Storage	Hydro-Brake®	5.2	122.9

Results for 2 year 720 minute winter. 3165 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Storage	450	49.407	0.107	7.2	52.5904	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
720 minute winter	Storage	Hydro-Brake®	4.7	123.2

Results for 2 year 960 minute summer. 3405 minute analysis at 15 minute timestep. Mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	Storage	555	49.412	0.112	8.9	55.0820	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute summer	Storage	Hydro-Brake®	5.0	133.6

Results for 2 year 960 minute winter. 3405 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Storage	585	49.400	0.100	5.9	48.8269	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute winter	Storage	Hydro-Brake®	4.3	133.1

Results for 2 year 1440 minute summer. 3900 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	Storage	810	49.402	0.102	6.5	49.8503	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute summer	Storage	Hydro-Brake®	4.4	149.7

Results for 2 year 1440 minute winter. 3900 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Storage	840	49.388	0.088	4.4	43.0620	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute winter	Storage	Hydro-Brake®	3.6	149.4

Results for 10 year 15 minute summer. 2455 minute analysis at 1 minute timestep. Mass balance: 99.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute summer	Storage	19	49.416	0.116	138.3	57.1674	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
15 minute summer	Storage	Hydro-Brake®	5.2	58.9

Results for 10 year 15 minute winter. 2455 minute analysis at 1 minute timestep. Mass balance: 99.94%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	Storage	19	49.416	0.116	129.7	57.2129	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
15 minute winter	Storage	Hydro-Brake®	5.2	58.9

Results for 10 year 30 minute summer. 2470 minute analysis at 1 minute timestep. Mass balance: 99.83%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
30 minute summer	Storage	33	49.446	0.146	123.7	72.2603	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
30 minute summer	Storage	Hydro-Brake®	6.0	77.2

Results for 10 year 30 minute winter. 2470 minute analysis at 1 minute timestep. Mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
30 minute winter	Storage	32	49.446	0.146	100.0	72.4191	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
30 minute winter	Storage	Hydro-Brake®	6.0	77.2

Results for 10 year 60 minute summer. 2500 minute analysis at 1 minute timestep. Mass balance: 99.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	Storage	62	49.474	0.174	93.2	86.4373	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
60 minute summer	Storage	Hydro-Brake®	6.1	97.7

Results for 10 year 60 minute winter. 2500 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
60 minute winter	Storage	61	49.475	0.175	67.3	86.7050	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
60 minute winter	Storage	Hydro-Brake®	6.1	97.7

Results for 10 year 120 minute summer. 2560 minute analysis at 2 minute timestep. Mass balance: 99.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
120 minute summer	Storage	112	49.493	0.193	60.7	95.7863	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
120 minute summer	Storage	Hydro-Brake®	6.1	119.7

Results for 10 year 120 minute winter. 2560 minute analysis at 2 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	Storage	116	49.493	0.193	41.8	96.1054	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
120 minute winter	Storage	Hydro-Brake®	6.1	119.7

Results for 10 year 180 minute summer. 2620 minute analysis at 4 minute timestep. Mass balance: 99.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
180 minute summer	Storage	144	49.499	0.199	45.2	98.9635	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
180 minute summer	Storage	Hydro-Brake®	6.1	133.4

Results for 10 year 180 minute winter. 2620 minute analysis at 4 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	Storage	148	49.497	0.197	31.1	98.1816	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute winter	Storage	Hydro-Brake®	6.1	133.6

Results for 10 year 240 minute summer. 2680 minute analysis at 4 minute timestep. Mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
240 minute summer	Storage	176	49.502	0.202	38.1	100.3478	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
240 minute summer	Storage	Hydro-Brake®	6.1	143.8

Results for 10 year 240 minute winter. 2680 minute analysis at 4 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	Storage	184	49.498	0.198	25.3	98.6666	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
240 minute winter	Storage	Hydro-Brake®	6.1	144.0

Results for 10 year 360 minute summer. 2800 minute analysis at 8 minute timestep. Mass balance: 99.94%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
360 minute summer	Storage	248	49.500	0.200	28.8	99.6334	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
360 minute summer	Storage	Hydro-Brake®	6.1	158.6

Results for 10 year 360 minute winter. 2800 minute analysis at 8 minute timestep. Mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	Storage	264	49.493	0.193	18.7	95.7826	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
360 minute winter	Storage	Hydro-Brake®	6.1	158.9

Results for 10 year 480 minute summer. 2920 minute analysis at 8 minute timestep. Mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
480 minute summer	Storage	312	49.496	0.196	22.5	97.5641	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
480 minute summer	Storage	Hydro-Brake®	6.1	170.3

Results for 10 year 480 minute winter. 2920 minute analysis at 8 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	Storage	336	49.484	0.184	15.0	91.2616	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
480 minute winter	Storage	Hydro-Brake®	6.1	170.4

Results for 10 year 600 minute summer. 3045 minute analysis at 15 minute timestep. Mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
600 minute summer	Storage	390	49.489	0.189	18.3	93.7483	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
600 minute summer	Storage	Hydro-Brake®	6.1	179.1

Results for 10 year 600 minute winter. 3045 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	Storage	405	49.472	0.172	12.5	85.4290	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
600 minute winter	Storage	Hydro-Brake®	6.1	179.2

Results for 10 year 720 minute summer. 3165 minute analysis at 15 minute timestep. Mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	Storage	450	49.482	0.182	16.3	90.2461	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
720 minute summer	Storage	Hydro-Brake®	6.1	186.7

Results for 10 year 720 minute winter. 3165 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Storage	465	49.461	0.161	10.9	80.0140	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
720 minute winter	Storage	Hydro-Brake®	6.0	187.4

Results for 10 year 960 minute summer. 3405 minute analysis at 15 minute timestep. Mass balance: 99.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
960 minute summer	Storage	570	49.468	0.168	13.3	83.1191	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
960 minute summer	Storage	Hydro-Brake®	6.1	200.2

Results for 10 year 960 minute winter. 3405 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Storage	600	49.442	0.142	8.8	70.4549	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute winter	Storage	Hydro-Brake®	6.0	200.9

Results for 10 year 1440 minute summer. 3900 minute analysis at 30 minute timestep. Mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	Storage	840	49.442	0.142	9.6	70.3014	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute summer	Storage	Hydro-Brake®	6.0	220.0

Results for 10 year 1440 minute winter. 3900 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Storage	840	49.419	0.119	6.4	58.4133	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute winter	Storage	Hydro-Brake®	5.3	219.8

Results for 30 year 15 minute summer. 2455 minute analysis at 1 minute timestep. Mass balance: 99.83%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute summer	Storage	19	49.450	0.150	179.9	74.4469	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
15 minute summer	Storage	Hydro-Brake®	6.0	76.8

Results for 30 year 15 minute winter. 2455 minute analysis at 1 minute timestep. Mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	Storage	19	49.450	0.150	168.8	74.4867	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
15 minute winter	Storage	Hydro-Brake®	6.0	76.8

Results for 30 year 30 minute summer. 2470 minute analysis at 1 minute timestep. Mass balance: 99.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
30 minute summer	Storage	33	49.494	0.194	163.6	96.5321	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
30 minute summer	Storage	Hydro-Brake®	6.1	102.2

Results for 30 year 30 minute winter. 2470 minute analysis at 1 minute timestep. Mass balance: 99.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
30 minute winter	Storage	33	49.494	0.194	132.1	96.7000	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
30 minute winter	Storage	Hydro-Brake®	6.1	102.2

Results for 30 year 60 minute summer. 2500 minute analysis at 1 minute timestep. Mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
60 minute summer	Storage	63	49.536	0.236	123.8	117.8819	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
60 minute summer	Storage	Hydro-Brake®	6.1	130.1

Results for 30 year 60 minute winter. 2500 minute analysis at 1 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
60 minute winter	Storage	61	49.536	0.236	89.5	117.9419	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
60 minute winter	Storage	Hydro-Brake®	6.1	130.0

Results for 30 year 120 minute summer. 2560 minute analysis at 2 minute timestep. Mass balance: 99.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
120 minute summer	Storage	120	49.558	0.258	78.2	128.7446	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
120 minute summer	Storage	Hydro-Brake®	6.1	154.3

Results for 30 year 120 minute winter. 2560 minute analysis at 2 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	Storage	118	49.558	0.258	53.9	128.8363	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
120 minute winter	Storage	Hydro-Brake®	6.1	154.4

Results for 30 year 180 minute summer. 2620 minute analysis at 4 minute timestep. Mass balance: 99.94%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
180 minute summer	Storage	164	49.562	0.262	57.4	130.9263	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
180 minute summer	Storage	Hydro-Brake®	6.1	169.6

Results for 30 year 180 minute winter. 2620 minute analysis at 4 minute timestep. Mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	Storage	172	49.562	0.262	39.5	130.8127	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute winter	Storage	Hydro-Brake®	6.1	169.8

Results for 30 year 240 minute summer. 2680 minute analysis at 4 minute timestep. Mass balance: 99.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
240 minute summer	Storage	192	49.563	0.263	48.0	131.4231	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
240 minute summer	Storage	Hydro-Brake®	6.1	181.2

Results for 30 year 240 minute winter. 2680 minute analysis at 4 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	Storage	196	49.560	0.260	31.9	129.8679	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
240 minute winter	Storage	Hydro-Brake®	6.1	181.2

Results for 30 year 360 minute summer. 2800 minute analysis at 8 minute timestep. Mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
360 minute summer	Storage	256	49.559	0.259	35.9	129.5228	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
360 minute summer	Storage	Hydro-Brake®	6.1	197.6

Results for 30 year 360 minute winter. 2800 minute analysis at 8 minute timestep. Mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	Storage	272	49.553	0.253	23.4	126.3208	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
360 minute winter	Storage	Hydro-Brake®	6.1	198.4

Results for 30 year 480 minute summer. 2920 minute analysis at 8 minute timestep. Mass balance: 99.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
480 minute summer	Storage	328	49.553	0.253	27.9	126.3827	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
480 minute summer	Storage	Hydro-Brake®	6.1	210.7

Results for 30 year 480 minute winter. 2920 minute analysis at 8 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	Storage	344	49.541	0.241	18.5	120.3777	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
480 minute winter	Storage	Hydro-Brake®	6.1	211.0

Results for 30 year 600 minute summer. 3045 minute analysis at 15 minute timestep. Mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
600 minute summer	Storage	390	49.544	0.244	22.6	121.7998	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
600 minute summer	Storage	Hydro-Brake®	6.1	220.7

Results for 30 year 600 minute winter. 3045 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	Storage	420	49.528	0.228	15.5	113.7514	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
600 minute winter	Storage	Hydro-Brake®	6.1	221.7

Results for 30 year 720 minute summer. 3165 minute analysis at 15 minute timestep. Mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
720 minute summer	Storage	465	49.536	0.236	20.0	117.6180	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
720 minute summer	Storage	Hydro-Brake®	6.1	230.1

Results for 30 year 720 minute winter. 3165 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Storage	495	49.514	0.214	13.5	106.4396	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
720 minute winter	Storage	Hydro-Brake®	6.1	230.4

Results for 30 year 960 minute summer. 3405 minute analysis at 15 minute timestep. Mass balance: 99.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
960 minute summer	Storage	600	49.518	0.218	16.3	108.4047	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
960 minute summer	Storage	Hydro-Brake®	6.1	245.6

Results for 30 year 960 minute winter. 3405 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Storage	630	49.488	0.188	10.8	93.2633	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute winter	Storage	Hydro-Brake®	6.1	246.2

Results for 30 year 1440 minute summer. 3900 minute analysis at 30 minute timestep. Mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	Storage	840	49.484	0.184	11.7	91.5190	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute summer	Storage	Hydro-Brake®	6.1	270.2

Results for 30 year 1440 minute winter. 3900 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Storage	870	49.446	0.146	7.9	72.2939	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute winter	Storage	Hydro-Brake®	6.0	270.8

Results for 100 year 15 minute summer. 2455 minute analysis at 1 minute timestep. Mass balance: 99.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute summer	Storage	19	49.492	0.192	228.9	95.2061	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
15 minute summer	Storage	Hydro-Brake®	6.1	97.9

Results for 100 year 15 minute winter. 2455 minute analysis at 1 minute timestep. Mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	Storage	19	49.492	0.192	214.8	95.3716	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
15 minute winter	Storage	Hydro-Brake®	6.1	98.0

Results for 100 year 30 minute summer. 2470 minute analysis at 1 minute timestep. Mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	Storage	34	49.551	0.251	210.0	125.3714	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
30 minute summer	Storage	Hydro-Brake®	6.1	131.3

Results for 100 year 30 minute winter. 2470 minute analysis at 1 minute timestep. Mass balance: 99.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
30 minute winter	Storage	33	49.551	0.251	169.5	125.4422	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
30 minute winter	Storage	Hydro-Brake®	6.1	131.4

Results for 100 year 60 minute summer. 2500 minute analysis at 1 minute timestep. Mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
60 minute summer	Storage	63	49.610	0.310	159.7	155.1875	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
60 minute summer	Storage	Hydro-Brake®	6.1	167.9

Results for 100 year 60 minute winter. 2500 minute analysis at 1 minute timestep. Mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
60 minute winter	Storage	62	49.610	0.310	115.4	155.2247	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
60 minute winter	Storage	Hydro-Brake®	6.1	167.9

Results for 100 year 120 minute summer. 2560 minute analysis at 2 minute timestep. Mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	Storage	122	49.636	0.336	98.8	168.5861	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
120 minute summer	Storage	Hydro-Brake®	6.1	195.1

Results for 100 year 120 minute winter. 2560 minute analysis at 2 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	Storage	120	49.636	0.336	68.0	168.4288	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
120 minute winter	Storage	Hydro-Brake®	6.1	195.0

Results for 100 year 180 minute summer. 2620 minute analysis at 4 minute timestep. Mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
180 minute summer	Storage	180	49.643	0.343	71.9	172.2428	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
180 minute summer	Storage	Hydro-Brake®	6.1	212.7

Results for 100 year 180 minute winter. 2620 minute analysis at 4 minute timestep. Mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	Storage	176	49.643	0.343	49.5	172.3876	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute winter	Storage	Hydro-Brake®	6.1	213.1

Results for 100 year 240 minute summer. 2680 minute analysis at 4 minute timestep. Mass balance: 99.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
240 minute summer	Storage	224	49.643	0.343	59.9	172.2059	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
240 minute summer	Storage	Hydro-Brake®	6.1	226.4

Results for 100 year 240 minute winter. 2680 minute analysis at 4 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	Storage	232	49.643	0.343	39.8	172.0919	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
240 minute winter	Storage	Hydro-Brake®	6.1	226.7

Results for 100 year 360 minute summer. 2800 minute analysis at 8 minute timestep. Mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
360 minute summer	Storage	280	49.637	0.337	44.7	169.3006	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
360 minute summer	Storage	Hydro-Brake®	6.1	246.0

Results for 100 year 360 minute winter. 2800 minute analysis at 8 minute timestep. Mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	Storage	288	49.633	0.333	29.1	167.0149	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
360 minute winter	Storage	Hydro-Brake®	6.1	246.9

Results for 100 year 480 minute summer. 2920 minute analysis at 8 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
480 minute summer	Storage	344	49.631	0.331	34.7	166.1343	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
480 minute summer	Storage	Hydro-Brake®	6.1	262.1

Results for 100 year 480 minute winter. 2920 minute analysis at 8 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	Storage	360	49.622	0.322	23.1	161.4428	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
480 minute winter	Storage	Hydro-Brake®	6.1	262.9

Results for 100 year 600 minute summer. 3045 minute analysis at 15 minute timestep. Mass balance: 99.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
600 minute summer	Storage	420	49.621	0.321	28.1	161.0626	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
600 minute summer	Storage	Hydro-Brake [®]	6.1	274.3

Results for 100 year 600 minute winter. 3045 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	Storage	435	49.607	0.307	19.2	153.8572	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
600 minute winter	Storage	Hydro-Brake®	6.1	275.4

Results for 100 year 720 minute summer. 3165 minute analysis at 15 minute timestep. Mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
720 minute summer	Storage	480	49.613	0.313	24.9	156.8075	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
720 minute summer	Storage	Hydro-Brake®	6.1	286.4

Results for 100 year 720 minute winter. 3165 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Storage	510	49.593	0.293	16.8	146.6067	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
720 minute winter	Storage	Hydro-Brake®	6.1	287.4

Results for 100 year 960 minute summer. 3405 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
960 minute summer	Storage	615	49.593	0.293	20.3	146.7408	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
960 minute summer	Storage	Hydro-Brake®	6.1	305.8

Results for 100 year 960 minute winter. 3405 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Storage	660	49.563	0.263	13.5	131.2686	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute winter	Storage	Hydro-Brake®	6.1	307.1

Results for 100 year 1440 minute summer. 3900 minute analysis at 30 minute timestep. Mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	Storage	900	49.555	0.255	14.7	127.3840	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute summer	Storage	Hydro-Brake®	6.1	338.3

Results for 100 year 1440 minute winter. 3900 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Storage	930	49.507	0.207	9.9	103.0085	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute winter	Storage	Hydro-Brake®	6.1	339.2

Results for 100 year +45% CC 15 minute summer. 2455 minute analysis at 1 minute timestep. Mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute summer	Storage	19	49.579	0.279	331.9	139.3581	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
15 minute summer	Storage	Hydro-Brake®	6.1	142.3

Results for 100 year +45% CC 15 minute winter. 2455 minute analysis at 1 minute timestep. Mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	Storage	19	49.579	0.279	311.4	139.4641	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
15 minute winter	Storage	Hydro-Brake®	6.1	142.4

Results for 100 year +45% CC 30 minute summer. 2470 minute analysis at 1 minute timestep. Mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
30 minute summer	Storage	34	49.667	0.367	304.4	184.5467	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
30 minute summer	Storage	Hydro-Brake®	6.1	190.6

Results for 100 year +45% CC 30 minute winter. 2470 minute analysis at 1 minute timestep. Mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
30 minute winter	Storage	34	49.667	0.367	245.9	184.6640	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
30 minute winter	Storage	Hydro-Brake®	6.1	190.8

Results for 100 year +45% CC 60 minute summer. 2500 minute analysis at 1 minute timestep. Mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
60 minute summer	Storage	64	49.757	0.457	231.6	230.7686	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
60 minute summer	Storage	Hydro-Brake®	6.1	243.7

Results for 100 year +45% CC 60 minute winter. 2500 minute analysis at 1 minute timestep. Mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
60 minute winter	Storage	63	49.757	0.457	167.4	230.7677	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
60 minute winter	Storage	Hydro-Brake®	6.1	243.8

Results for 100 year +45% CC 120 minute summer. 2560 minute analysis at 2 minute timestep. Mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
120 minute summer	Storage	124	49.804	0.504	143.3	254.7337	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
120 minute summer	Storage	Hydro-Brake®	6.1	282.9

Results for 100 year +45% CC 120 minute winter. 2560 minute analysis at 2 minute timestep. Mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	Storage	120	49.804	0.504	98.7	254.9789	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
120 minute winter	Storage	Hydro-Brake®	6.1	283.1

Results for 100 year +45% CC 180 minute summer. 2620 minute analysis at 4 minute timestep. Mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
180 minute summer	Storage	184	49.823	0.523	104.3	264.6085	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
180 minute summer	Storage	Hydro-Brake [®]	6.1	308.5

Results for 100 year +45% CC 180 minute winter. 2620 minute analysis at 4 minute timestep. Mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	Storage	180	49.824	0.524	71.8	265.1217	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
180 minute winter	Storage	Hydro-Brake®	6.1	308.9

Results for 100 year +45% CC 240 minute summer. 2680 minute analysis at 4 minute timestep. Mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
240 minute summer	Storage	240	49.830	0.530	86.9	268.4893	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
240 minute summer	Storage	Hydro-Brake®	6.1	328.2

Results for 100 year +45% CC 240 minute winter. 2680 minute analysis at 4 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	Storage	236	49.832	0.532	57.7	269.3680	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
240 minute winter	Storage	Hydro-Brake®	6.1	328.7

Results for 100 year +45% CC 360 minute summer. 2800 minute analysis at 8 minute timestep. Mass balance: 99.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
360 minute summer	Storage	336	49.827	0.527	64.8	266.7511	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
360 minute summer	Storage	Hydro-Brake [®]	6.1	357.0

Results for 100 year +45% CC 360 minute winter. 2800 minute analysis at 8 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	Storage	344	49.830	0.530	42.1	268.1690	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
360 minute winter	Storage	Hydro-Brake®	6.1	358.0

Results for 100 year +45% CC 480 minute summer. 2920 minute analysis at 8 minute timestep. Mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
480 minute summer	Storage	392	49.821	0.521	50.3	263.6321	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
480 minute summer	Storage	Hydro-Brake®	6.1	380.3

Results for 100 year +45% CC 480 minute winter. 2920 minute analysis at 8 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	Storage	408	49.818	0.518	33.4	261.9088	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
480 minute winter	Storage	Hydro-Brake®	6.1	380.7

Results for 100 year +45% CC 600 minute summer. 3045 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
600 minute summer	Storage	450	49.812	0.512	40.8	259.2232	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
600 minute summer	Storage	Hydro-Brake®	6.1	398.6

Results for 100 year +45% CC 600 minute winter. 3045 minute analysis at 15 minute timestep. Mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	Storage	480	49.807	0.507	27.9	256.3022	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
600 minute winter	Storage	Hydro-Brake®	6.1	399.6

Results for 100 year +45% CC 720 minute summer. 3165 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
720 minute summer	Storage	525	49.804	0.504	36.1	254.9505	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
720 minute summer	Storage	Hydro-Brake®	6.1	415.6

Results for 100 year +45% CC 720 minute winter. 3165 minute analysis at 15 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Storage	555	49.795	0.495	24.3	250.1277	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
720 minute winter	Storage	Hydro-Brake®	6.1	415.8

Results for 100 year +45% CC 960 minute summer. 3405 minute analysis at 15 minute timestep. Mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
960 minute summer	Storage	660	49.787	0.487	29.5	245.9458	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
960 minute summer	Storage	Hydro-Brake®	6.1	444.0

Results for 100 year +45% CC 960 minute winter. 3405 minute analysis at 15 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Storage	705	49.768	0.468	19.5	236.5161	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute winter	Storage	Hydro-Brake®	6.1	445.3

Results for 100 year +45% CC 1440 minute summer. 3900 minute analysis at 30 minute timestep. Mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	Storage	960	49.749	0.449	21.3	226.4974	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute summer	Storage	Hydro-Brake®	6.1	490.2

Results for 100 year +45% CC 1440 minute winter. 3900 minute analysis at 30 minute timestep. Mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
1440 minute winter	Storage	1020	49.707	0.407	14.3	204.8808	0.0000	OK

Link Event	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
1440 minute winter	Storage	Hydro-Brake®	6.1	491.1

Appendix 8

Surface Water Drainage Statement Checklist

Surface Water Drainage Statement

In order to provide the required information on surface water drainage from the proposed development this pro-forma must be completed in full and be submitted with any planning application which seeks permission for 'major' development. This information contained in this form will be used by West Sussex County Council in its role as Lead Local Flood Authority and 'statutory consultee' on SuDs for all 'major' planning applications. The pro-forma is supported by the [Defra/EA Guidance on Rainfall Runoff Management](#) and can be completed using freely available tools including [SuDS Tools](#). The pro-forma should be considered alongside other supporting SuDS Guidance, but focuses on ensuring flood risk is not made worse elsewhere. The SuDS solution must operate effectively for as long as the development exists. This pro-forma is based upon current industry standard practice.

1. Site Details

Site	Denver, Okehurst Lane, Billingshurst, West Sussex
Address & post code or LPA reference	Denver, Okehurst Lane, Billingshurst, West Sussex, RH14 9HR.
Grid reference	Ordnance Survey reference TQ 090 274
Is the existing site developed or Greenfield?	Brownfield
Total Site Area served by drainage system (excluding open space) (Ha)*	0.38ha
Topographical survey plan showing existing site layout, site levels and drainage system	Yes

* The Greenfield runoff off rate from the development which is to be used for assessing the requirements for limiting discharge flow rates and attenuation storage from a site should be calculated for the area that forms the drainage network for the site whatever size of site and type of drainage technique. Please refer to the Rainfall Runoff Management document or CIRIA manual for detail on this.

2. Impermeable Area

	Existing	Proposed	Difference (Proposed-Existing)	Notes for developers & Local Authorities
Impermeable area (ha) (areas to be shown on a plan)	0.32ha	0.38ha	0.06ha	If the proposed amount of impermeable surface is greater, then runoff rates and volumes will increase. Section 6 must be filled in. If proposed permeability is equal or less than existing, then section 6 can be skipped & section 7 filled in.
Drainage Method (infiltration/sewer/watercourse)	Watercourse	Watercourse	N/A	If different from the existing, please fill in section 3. If existing drainage is by infiltration and the proposed is not, discharge volumes may increase. Fill in section 6.

PPG Paragraph 080

3. Proposing to Discharge Surface Water via

	Yes	No	Evidence that this is possible	Notes for developers & Local Authorities
Existing and proposed micro-drainage calculations	X			Please provide micro-drainage calculations of existing and proposed run-off rates and volumes in accordance with a recognised methodology or the results of a full infiltration test (see line below) if infiltration is proposed.
Infiltration		X		e.g. soakage tests. Section 6 (infiltration) must be filled in if infiltration is proposed.
To watercourse	X			e.g. Is there a watercourse nearby? Please provide details of any watercourse to which the site drains including cross-sections of any adjacent water courses for appropriate distance upstream and downstream of the discharge point (as agreed with the LLFA and/or EA)
To surface water sewer		X		Confirmation from sewer provider that sufficient capacity exists for this connection.
Combination of above		X		e.g. part infiltration part discharge to sewer or watercourse. Provide evidence above.
Has the drainage proposal had regard to the SuDS hierarchy?	X			Evidence must be provided to demonstrate that the proposed Sustainable Drainage proposal has had regard to the SuDS hierarchy.
Layout plan showing where the sustainable drainage infrastructure will be located on site.	X		05_Proposed Drainage Plan	Please provide plan reference numbers showing the details of the site layout showing where the sustainable drainage infrastructure will be located on the site. If the development is to be constructed in phases this should be shown on a separate plan and confirmation should be provided that the sustainable drainage proposal for each phase can be constructed and can operate independently and is not reliant on any later phase of development.

Technical Standards S2 and S3

4. Peak Discharge Rates – This is the maximum flow rate at which surface water runoff leaves the site during a particular storm event.

	Existing Rates (l/s)	Proposed Rates (l/s)	Difference (l/s) (Proposed-Existing)	Notes for developers & Local Authorities
Greenfield QBAR	6.1	6.1	N/A	Mean annual Greenfield peak flow - QBAR is approx. 1 in 2 storm events. Use that figure in Section 7a.
1 in 1	27.37	6.1	21.27	Proposed discharge rates (with mitigation) should be no greater than existing rates for all corresponding storm events. e.g. discharging all flow from site at the existing 1 in 100 event increases flood risk during smaller events.
1 in 30	69.43	6.1	63.33	
1 in 100	88.36	6.1	82.26	
1 in 100 plus climate change	N/A	6.1	N/A	To mitigate for climate change the proposed 1 in 100 +CC must be no greater than the existing 1 in 100 runoff rate. If not, flood risk increases under climate change should be added to the peak rainfall intensity. EA Guidance - Flood Risk Assessments: Climate Change Allowances (Published Feb 2016) https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Technical Standards S4 to S9

5. Calculate discharge volumes –The total volume of water leaving the development site for a particular rainfall event. Introducing new impermeable surfaces increases surface water runoff and may increase flood risk outside the development.

	Existing Volume (m³)	Proposed Volume (m³)	Difference (m³) (Proposed-Existing)	Notes for developers & Local Authorities
1 in 1	49.3(1in2 year)	58.7 (1in2 year)		Proposed discharge volumes (without mitigation) should be no greater than existing volumes for all corresponding storm events. Any increase in volume increases flood risk elsewhere. Where volumes are increased section 6 must be filled in.
1 in 30	77.9	109		
1 in 100	104	140		
1 in 100 plus climate change	150	196		To mitigate for climate change the volume discharge from site must be no greater than the existing 1 in 100 storm event. If not, flood risk increases under climate change.

6. Calculate attenuation storage – In order to minimise the negative impact on flood risk resulting from increased volumes runoff from the proposed development, storage must be provided.

		Notes for developers & Local Authorities
Storage volume required to retain discharge rates as existing (m ³)	N/A	Volume of water to attenuate on site if discharging at existing rates. Can't be used where discharge volumes are increasing
Where will the storage be provided on site?	Voided Subbase	

7. How is Storm Water stored on site?

Storage is required for the additional volume from site but also for holding back water to slow down the rate from the site. This is known as attenuation storage and long term storage. The intention is to not discharge that volume into the watercourses so as not to increase flood risk elsewhere.

			Notes for developers & Local Authorities
Infiltration	State the Site's Geology/drift material overlaying)	Weald Clay Formation	Avoid infiltrating in made ground.
	Does the site have a high ground water table? Yes/No?	No	If yes, please provide details of the site's hydrology.
	Is the site within a known Source Protection Zones (SPZ)? Yes/No?	No	Infiltration rates are highly variable and refer to Environment Agency website to identify and source protection zones (SPZ)
	Are infiltration rates suitable?	No	Infiltration rates should be no lower than 1×10^{-6} m/s.
	Is the site contaminated? If yes, consider advice from others on whether infiltration can happen.	No	Water should not be infiltrated through land that is contaminated. The Environment Agency may provide bespoke advice in planning consultations for contaminated sites that should be considered.
	State the distance between a proposed infiltration device base and the ground water (GW) level	N/A	Need 1m (min) between the base of the infiltration device & the water table to protect Groundwater quality & ensure GW doesn't enter infiltration devices. Avoid infiltration where this isn't possible.
	Were infiltration rates obtained by desk study or infiltration test?	Desk Based	Infiltration rates can be estimated from desk studies at most stages of the planning system if a back-up attenuation scheme is provided.
Is infiltration feasible?	Yes/No?	No	If infiltration is not feasible how will the additional volume be stored?. The applicant should then consider the following options in the next section.

7a. Storage requirements

Where infiltration is not possible, then the developer must confirm that either of the two options below will be implemented for dealing with the amount of water that needs to be stored on site.

Option 1 Simple – Store both the additional volume and attenuation volume in order to make a final discharge from site at **QBAR**. This is preferred if no infiltration can be made on site. This very simply satisfies the runoff rates and volume criteria.

Option 2 Complex – If some of the additional volume of water can be infiltrated back into the ground, the remainder can be discharged at a very low rate of 2 l/sec/hectare. A combined storage calculation using the partial permissible rate of 2 l/sec/hectare and the attenuation rate used to slow the runoff from site.

		Notes for developers & Local Authorities
Please confirm what option has been chosen and how much storage is required on site.	Simple – 270m ³	The developer at this stage should understand the site characteristics and be able to explain what the storage requirements are on site and how it will be achieved.

8. Additional Consideration to comply with the Technical Standards and PPG

		Notes for developers & Local Authorities
Which Drainage Systems measures have been used?	Permeable Paving	SUDS can be adapted for most situations even where infiltration isn't feasible e.g. impermeable liners beneath some SUDS devices allows treatment but not infiltration. See CIRIA SUDS Manual C753.
How will exceedance events be catered on site without increasing flood risks (both on site and outside the development)?	Exceedance events will flow away from / around the buildings to the existing watercourse on the southern and south western boundary of the site	Safely: not causing property flooding or posing a hazard to site users i.e. no deeper than 300mm on roads/footpaths
How are rates being restricted?	Hydrobrake	Hydrobrakes to be used where rates are between 2l/s to 5l/s. Orifices not be used below 5l/s as the pipes may block. Pipes with flows < 2l/s are prone to blockage.
Drainage during construction period	Temporary storage and treatment – Details TBC by Contractor	Provide details of how drainage will be managed during the construction period including any necessary connections, impacts, diversions and erosion control.
Key Drainage components / Features	Hydrobrake / outfall	Which component if blocked (even partial) will lead to flooding?

Technical Standards S10 to S12

9. Management and Maintenance of SuDs

Details are required to be provided of the management and maintenance plan for the SUD, including for the individual plots in perpetuity.

How is the entire drainage system to be maintained in perpetuity?	See Drainage Maintenance Schedule	Clear details of the maintenance proposals of all elements of the proposed drainage system must be provided to show that all parts of SuDs are effective and robust. Provide a management plan to describe the SUDS scheme and set out the management objectives for the site. It should consider how the SuDs will perform and develop over time anticipating any additional maintenance tasks to ensure the system continues to perform as designed. — Specification notes that describe how work is to be undertaken and the materials to be used. — A maintenance schedule describes what work is to be done and when it is to be done using frequency and performance requirements as appropriate. — A site plan showing maintenance areas, control points and outfalls. Responsibility for the management and maintenance of each element of the SUDS scheme will also need to be detailed within the Management Plan. Where open water is involved please provide a health and safety plan within the management plan.
Please confirm the owners/adopters of the entire drainage systems throughout the development. Please list all the owners.	See Drainage Maintenance Schedule	If these are multiple owners then a drawing illustrating exactly what features will be within each owner's remit must be submitted with this Proforma. Please give details of each feature and how it will be managed in accordance with the details in the management plan.
Please provide details demonstrating that any third party agreements required using land outside the application site have been secured.	N/A	

The above form should be completed using evidence from information which should be appended to this form. The information being submitted should be proportionate to the site conditions, flood risks and magnitude of development. It should serve as a summary of the drainage proposals and should clearly show that the proposed discharge rate and volume as a result of development will not be increasing. Where there is an increase in discharge rate or volume, then the relevant section of this form must be completed with clear evidence demonstrating how the requirements will be met.

This form is completed using factual information and can be used as a summary of the surface water drainage strategy on this site.

Form Completed By **S Magowan**.....

Qualification of person responsible for signing off this pro-forma **IEng MICE**.....

Company **The Civil Engineering Practice**,.....

On behalf of (Client's details) **ECE Planning**

Date: **10/11/2023**.....

Appendix 9

Outline Drainage Maintenance Schedule

Drainage Maintenance Schedule



The Civil Engineering Practice
11 Tungsten Building
George Street
Fishersgate
Sussex
BN41 1RA
01273 424424
reception@civil.co.uk
www.civil.co.uk

Project	Denver, Okehurst Lane, Billingshurst, West Sussex
Project Number	23675

By Stuart Magowan

Date 10 November 2023

1 Schedule of Maintenance

- 1.1 Once appointed the Contractor will prepare a site specific method statement for the control of silt and other pollutants during construction. CIRIA Report C532, Control of water pollution from construction sites, provides further guidance on this.
- 1.2 During the construction phase of the permeable paving, the permeable subbase layer will be constructed and covered with a sacrificial layer of geotextile overlaid by 100mm tarmac layer as a temporary road surface. The tarmac layer will have holes cored to allow surface water to drain into the subbase.
- 1.3 The Contractor will maintain the proposed drainage system during construction and until the handing over of the site.
- 1.4 Upon completion management of all drainage facilities will be passed on to a Management Company appointed by the Developer on behalf of the Tenants.
- 1.5 In the event that the Management Company becomes unable to discharge its duties within two years of first appointment the Developer will endeavour to appoint an alternative on behalf of the Tenants.
- 1.6 The proposed permeable paving system is low maintenance although the flow control device will require inspection every 6 months.
- 1.7 The following maintenance schedule details the typical tasks to be undertaken at different intervals.

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Manage vegetation and remove nuisance plants – aesthetics	As required
	Litter and debris removal – catchpits	Monthly or as required
	Remove sediment and debris from silt trap chambers	6 monthly
	Visual inspection of permeable paving for defects and settlement	Annually
	Sweeping / brushing of permeable paving	Every 2 years
	Surface and foul water pipework – jetting / rodding	Every 2 years or as required
Corrective Maintenance	Remove debris / blockages to silt traps	As required
	Repairs to access chambers / manhole covers	As required



Maintenance Schedule	Required Action	Frequency
	Replace any broken permeable blocks / surface, remedial works to any depressions or rutting	As required
	Inspect inlet, outlet from downpipes for blockages, standing water and clear	As required
Monitoring	Inspect silt traps and note the rate sediment has accumulated	Monthly in the first year and then annually

Indicative Schedule of Maintenance for the Proposed Drainage System

- 1.8 Any parts, materials or products that require replacement or come to the end of the manufacture's recommended design life will be replaced by the Management Company as required.

Component	Inspection Frequency				
	1 Month	6 Months	1 Year	After leaf fall in Autumn	2 Years
Catchpits	✓			✓	
Surface and Foul Water Pipework					✓
Permeable Paving			✓		
Flow Control		✓			

Inspection Frequency Summary

2 Design Life

- 2.1 The design life of the development is likely to exceed the design life of the components within the SuDS network. During the routine drainage inspections it may be determined that some components have reached the end of their functional life cycle.
- 2.2 Where possible repairs should be the first option considered however if repairs are unviable it will be necessary for the Management Company owner to replace the faulty component.
- 2.3 The design life of permeable paving is approximately 25 years with adequate maintenance as outlined. The system will be fully serviced after 25 years.

3 Emergency Plan

- 3.1 Potential flood and maintenance indicators:
- Manhole chambers / PPICs overflowing
 - Other visual indicators of the drainage system not performing as it should
- 3.2 Should any of the items above occur then immediate action as outlined below should be undertaken:
- Inspect for blockages in the problem area
 - Should the problem not be identified via an initial inspection:
 - For unadopted onsite drainage the property owner should appoint a suitable drainage engineer to inspect and survey the system and jet any blockages
 - Where it is suspected that there is a problem with the downstream drainage network the Owner or relevant statutory undertaker of that system should be alerted

3.3 Spillages

- 3.3.1 If a serious spillage in volume or toxicity occurs on site then the spillage should be isolated with soil, turf or specialist fabric and all downstream outlets should be bunged / blocked.
- 3.3.2 Once the spillage is contained the Environment Agency should be contacted immediately on 0370 850 6506.