Countryside Partnerships and Vistry Homes

LAND AT BUNTINGFORD WEST

Outline Drainage Strategy Addendum

10537-WSP-SW-XX-RP-C-0005
May 2024

Public

Countryside Partnerships and Vistry Homes

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Outline Drainage Strategy Addendum

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WSP

WSP House
70 Chancery Lane
London
WC2A 1AF

Phone: +44 20 7314 5000

Fax: +44 20 7314 5111

WSP.com

Quality control

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Prepared by	Chloe Haffenden			
Signature				
Checked by	Andy Twyford			
Signature				
Authorised by	Andy Twyford			
Signature				
Project number	70084844			
File reference				

Contents

Appendices

1 Introduction

1.1 Commission

1.1.1 This Outline Drainage Strategy Addendum (ODSA) has been prepared by WSP in to support the outline planning application for a proposed mixed-use development at the land west of Luynes Rise, Buntingford, Hertfordshire, hereafter referred to as the 'Proposed Development'

1.1.2 This ODSA should be read in conjunction with the previously submitted Flood Risk Assessment and Outline Drainage Strategy and other supporting documents submitted with the planning application [3/23/1447/OUT].

1.1.3 This ODSA has been prepared to respond to queries raised by LLFA and provide additional information to support an updated Surface Water Drainage Strategy which follows the drainage hierarchy, makes use of the existing ordinary watercourse that traverses the Site and minimises pumping.

1.2 Report Structure

1.2.1 This ODSA, in effect, looks to update the following chapters from the previously submitted Flood Risk Assessment and Outline Drainage Strategy Ref 10537-WSP-SW-XX-RP-C-0002;

- Chapter 7: Outline Surface Water Drainage Strategy;
- Chapter 10: Offsite Effects;
- Chapter 11: Residual Flood Risk
- Chapter 12: Conclusions

1.2.2 Therefore, following this introductory section, the remainder of this report is set out as follows:

- Chapter 2: Outline Surface Water Drainage Strategy;
- Chapter 3: Offsite Effects;
- Chapter 4: Residual Flood Risk
- Chapter 5: Conclusions

1.2.3 Relevant Drawings and Calculations are found within Appendices.

2 Outline Surface Water Drainage Strategy

2.1 Overview

2.1.1 This section discusses the principles of the proposed Outline Surface Water Drainage Strategy and defines parameters supported by appropriate design calculations and drainage maintenance requirements provided thereafter.

2.1.2 As a principle, all proposed drainage will be designed in accordance with local policy, local SuDS guidance, national standards and best practice where applicable during detailed design stages. This Strategy identifies the principles of drainage management for the development and all agreements, permits and applications for connections to the public sewer network will be made post discharge of the Planning Conditions through engagement with the LLFA, Thames Water and other relevant stakeholders.

2.2 General Comments

2.2.1 The risk to the Site from all sources of flooding has been demonstrated to be negligible to low, therefore, there are no Site-specific flood mitigation measures required on-Site apart from adhering to best practice measures such as:

- Ground levels should fall away from building entrances/thresholds in order to mitigate against surface water runoff entering the ground floor during extreme storm events; and
- Raised thresholds should be implemented where possible.

2.3 Proposed Surface Water Discharge Method and SuDS

2.3.1 Best practice for the management of surface water, based on best practice, National Planning Policy Framework and Building Regulations 2010 Part H (2015 Version) states that surface water runoff from a Site shall discharge to one of the following in order of priority:

- An adequate soakaway or some other adequate infiltration system;
- A watercourse; and
- Sewer.

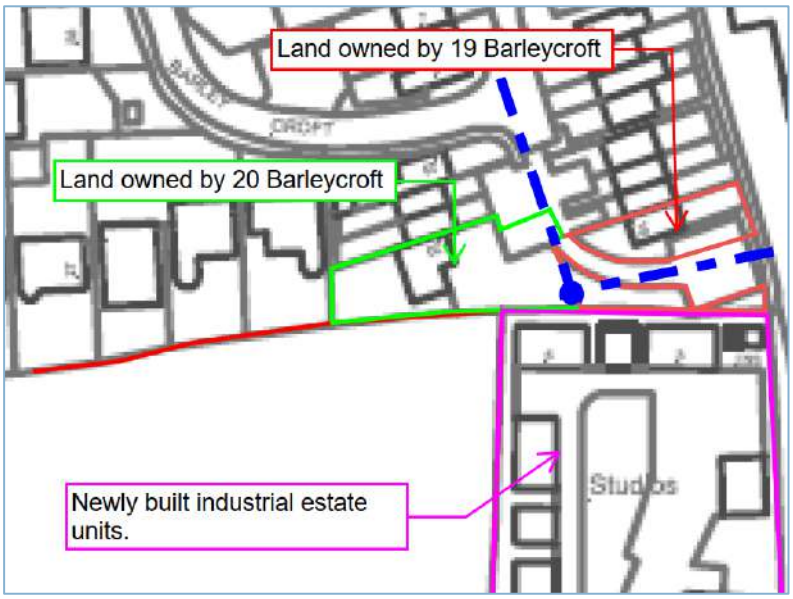
2.3.2 The use of infiltration techniques at the Site is limited as Site investigation identified little or no infiltration rates. Furthermore the development is located within a groundwater source protection zone and therefore discharge to the groundwater is not considered to be an appropriate method of discharge for the Site.

2.3.3 There are a number of ditches which traverse the site, only one of which has a proven outfall and hence classified as an Ordinary Watercourse (OWC). It is proposed to employ this OWC as discharge for surface water from the Proposed Development as far as reasonably possible. Assessing the existing topography of the Site has allowed the existing catchment to be appraised from which greenfield run-off rates shall be mimicked to ensure flood risk is not increased elsewhere.

2.3.4 The eastern end of the site, which due to existing topography is the natural low point of the Site, is surrounded entirely by third-party owned land. This includes the property at 19 and 20 Barleycroft (where TWU sewerage traverses in close proximity), the newly constructed industrial estate and

Thames Water's waste-water treatment works (WWTW). An indicative land ownership arrangement at the eastern boundary is shown in Figure 1 below.

Figure 1 – Land ownership at Eastern Boundary



2.3.5 The remainder of the Proposed Development is therefore proposed to discharge surface water to the existing Thames Water surface water sewer network located within Peasmead. It is noted that this local surface water sewer network discharges to the River Rib via an existing outfall approximately 490m downstream of the Proposed Development connection.

2.3.6 We would confirm that the existing land ownership arrangement as pertains to the site boundary. The applicant retains title deeds for the land between 7 and 8 Peasmead required to make connection to the TW MH0804 as per the proposed outline drainage strategy. This connection would therefore not require any agreement from, or works within, third-party owned land excluding the public highway. An extract from title plans showing this ownership to application boundary is shown below in figure 2.

Figure 2 – Land ownership of Applicant bounded red

2.3.7 Discharge via gravity to this surface water sewer is again maximised from the Proposed Development, however some of the Site will need to pumped to this sewer. The Site has a significant topographical level change of around 20m falling from northwest to east, and consequently the eastern end of the Site is too low to discharge to the Peasmead sewer under gravity. Both pumped discharge and gravity discharge will be maintained at greenfield run-off rates, with flows limited by pump specification or a vortex flow control such as a HydroBrake.

2.3.8 The proposed surface water drainage concept is illustrated by WSP Drainage Strategy drawing 10537-WSP-XX-XX-DR-C-0001 Rev P04, included within Appendix A. In general, Source Control methodologies such as rainwater harvesting (in the form of water butts) and permeable paving will, be employed whilst SuDS techniques such as swales, filter drains, pipes, tanks and detention basins/ponds will combine to form residual attenuation requirements. Surface water discharge will be restricted to the Qbar Greenfield rate as per the requirements of 'SuDS Design in Hertfordshire (2021)' guidance.

2.3.9 Permeable paving is proposed for incorporation across any non-adoptable roads and parking areas with a suggested 300mm sub-base. Permeable paving provides a volume of storage that will be considered at detailed design stage and is not considered within the total attenuation volume requirements at this stage. Permeable paving supports evaporation potential and form part of the suds treatment train prior to discharge to the storage basins. Permeable paving improves the filtration of silts, biodegradation of pollutants and retention of solids.

2.3.10 Roadside swales are proposed to create a green corridor through the centre of the development to collect surface water run-off from the carriageway and provide a level or surface water treatment. As infiltration is not suitable for the development, any swales would require underdraining with a perforated pipe connecting to main spine sewers throughout the development, conveying surface water to the detention basins. Surface water will be conveyed towards the swale via levels design as per the concept provided in the CIRIA SuDS Manual 2015. Due to the fall in levels across the development, check dams should be provided where the gradient is greater than 3%.

2.3.11 2 no. indicative surface water detention basin attenuation features are shown on WSP Drainage Strategy drawing 10537-WSP-XX-XX-DR-C-0001 Rev P04. The basins will serve to provide attractive water features with the additional benefit of the eastern benefit provided public open amenity space. The basins will have an over-deepened area with a permanent pool that will enhance biodiversity and also provide additional treatment for the capture of sediment.

2.3.12 For any detention basin, a sediment forebay is proposed to be installed at the basin inlets based on CIRIA suds manual C365 guidance. The sediment forebay allows sediment build-up to be easily monitored and concentrates any required sediment removal activities within a small area, thereby minimising potential damage to the rest of the pond or wetland. The plan area of the sedimentation bay should be at least 10% of the total basin area and could consist of a separate basin or be formed by building an earth berm, stone-or rock-filled gabion or rip-rap across the upstream portion of the basin.

2.3.13 A summary of the proposed discharge methods in relation to the drainage hierarchy is provided in Table 1 overleaf.

Table 1 - Drainage Hierarchy - Discharge Method Summary

Surface Water Discharge Method	Feasible (Y/N)	Proposed (Y/N)	Proposed Drainage Strategy and Reasons:
Store rainwater for later use	Y	Y	Source Control Measures such as rainwater harvesting eg water butts will be assessed at the detailed design stage.
Use infiltration techniques, such as porous surface in non-clay areas	N	N	Inadequate geological conditions
Attenuate rainwater in ponds or open water features for gradual release	Y	Y	Detention basins and ponds are proposed to assist in attenuating surface water to Qbar rate.
Rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)	Y	Y	Green/blue roofs are not suitable for the proposed pitched roof houses. The incorporation of rain gardens will be assessed at the detailed design stage.
Attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y	N/A
Discharge rainwater direct to a watercourse	Y	Y	Strategy maximises catchment to the existing OWC and mimics greenfield run-off.
Discharge rainwater to a surface water sewer/drain	Y	Y	Where unfeasible to discharge to watercourse, it is proposed to discharge to the existing surface water sewer within Peasmead. This sewer discharges to the River Rib after 490m.
Discharge rainwater to the combined sewer	N	N	N/A

2.4 Proposed Surface Water Discharge Rates

Existing Greenfield run-off rate

2.4.1 Existing runoff rates have been calculated using the FEH Statistical Method provided on www.UKSUDS.com , this method being deemed suitable as per table 24.1 of the CIRIA C753 SuDS Manual. The base flow index (BFI) based on the Hydrology of Soil Types (HOST) has been determined from the FEH22 dataset for the site, the latest BFIHOST19 has been used within the calculation as recommended by UK Centre for Ecology and Hydrology. As this is an outline strategy and the extent of development area could change throughout the design process the greenfield rate has been expressed in l/s/ha, refer to Table 2. Full calculations for the greenfield runoff rate can be found in Appendix B):

Table 2 – Estimation of Greenfield run-off rate

Return Period	Flow (l/s/ha)
Qbar	1.52
1 in 1 Year	1.29
1 in 30 Year	3.50
1 in 100 Year	4.85

2.4.2 The existing Qbar **greenfield discharge rate** has been calculated as **1.52l/s/ha**. It is therefore proposed the Site will discharge at this rate in line with 'SuDS Design in Hertfordshire (2015) best practice guidance provided which negates the need to provide additional long-term storage and helps reduce the overall impact off Site to the downstream sewer network.

Thames Water Consultation

2.4.3 A pre-development enquiry to identify if capacity is available within the existing public sewer network for the discharge of surface water flows from the Site was submitted to Thames Water (TW) in May 2022.

2.4.4 TW confirmed that there are capacity concerns in the local surface water network to accommodate surface water flows from the Site. Thames Water will undertake hydraulic network capacity modelling post planning to determine whether any upgrade works will be required to the local sewer network as a result of the development.

2.4.5 TW are obligated to provide capacity and necessary upgrades works within 24 months of a Planning Application being approved to ensure the development can drain surface water. Thames Water indicated in their pre-development response that a typical timescale for a development of the magnitude of the proposed is 20 months.

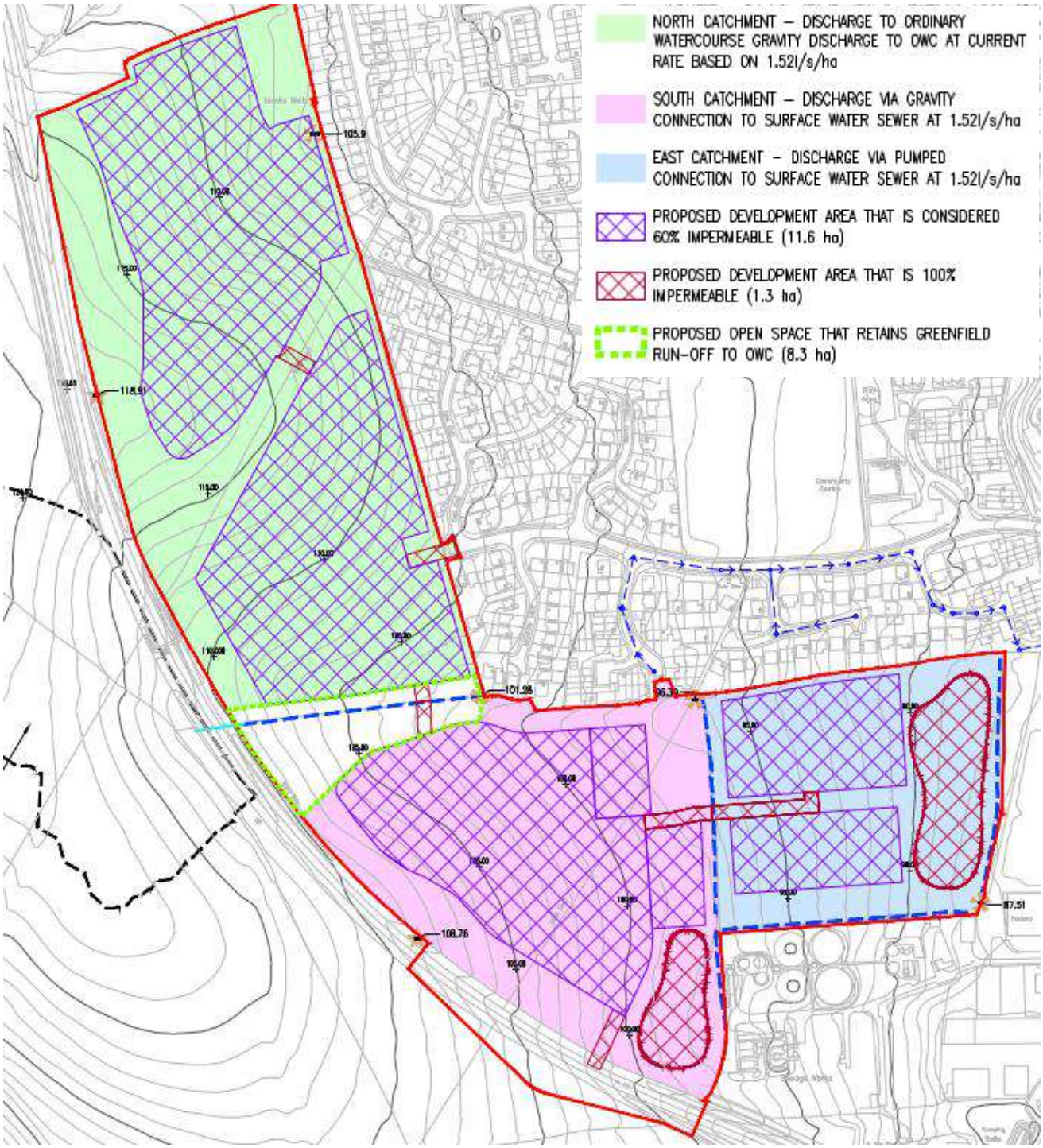
2.4.6 It should however be noted that from TW records the diameter of the proposed connection to existing sewer is 600mm. This is at the current head of the run and such a diameter would seemingly not be warranted from existing flows discharging to this point. It is therefore reasonable to assume that this sewer was designed oversized to potentially receive discharge from future development such as this current application. In any case, discharge flows from the proposed development mimic greenfield run off and, as noted previously, TW will undertake capacity assessment upon developer receipt of an Outline Planning Approval.

2.5 Surface Water Modelling Results

2.5.1 As discussed previously, the development has been split into 3 no. catchments each with their natural discharge point and method to mimic greenfield run-off rates. These catchments have been modelled using Info-Drainage to determine the required amount of attenuation to accommodate the 1:100 year + 40% climate change storm event. The results of this modelling are provided within Appendix B.

2.5.2 A representation of these Catchments is provided overleaf in Figure 3 overleaf whilst a description of their respective surface water strategies follows.

Figure 3 – Proposed Development Catchments (extract from 1057-WSP-XX-XX-SK-C-0003)



North Catchment

- North Catchment will discharge to the existing Ordinary Watercourse that runs through the site at a discharge rate no higher than the existing run-off.
- An appraisal of the existing topography to understand the current drainage regime at the Site has been undertaken. The existing catchment draining to the existing ordinary watercourse has been measured at 6.2ha as shown on 10537-WSP-XX-XX-SK-C-0001. Using the

greenfield runoff rate of 1.52l/s/ha a total of 9.43l/s discharges to the existing ditch. So as to increase any flood risk this discharge rate from the development site east of the A10 is maintained in the proposed Drainage Strategy.

- For robustness an area of this existing catchment, green open space adjacent to OWC in proposals, is retained at greenfield run-off rate discharge to the OWC. This area is 0.84 ha, hence 1.3 l/s (0.84 x 1.52) resulting in an available 8.1 l/s available for the North Catchment development.
- The proposed catchment will need to discharge to the OWC is approximately 10ha, shown on drawing 10537-WSP-XX-XX-SK-C-0003.
- Based on the current development proposals at 60% impermeable area +8% urban creep with a CV value of 1.0 a discharge rate of 8.1l/s is proposed resulting in 4,625m^3 of attenuation.

South Catchment

- The South Ctachment will discharge at greenfield rate of 1.52l/s/ha
- Surface water will discharge to the existing TW manhole 0804 via a gravity connection at a rate of 3.6l/s (2.42ha impermeable area x 1.52l/s/ha) resulting in 3,120m^3 of attenuation.

East Catchment

- The East Catchment will discharge at greenfield rate of 1.52l/s/ha
- Surface Water will discharge to the existing TW manhole 0804 via a pumped connection at a rate of 2.6l/s (1.74ha impermeable area x 1.52l/s/ha) resulting in 2,165m^3 of attenuation.
- 24hr storage for the surface water is to be provided in case of pump or power fail ie no discharge, and this can be provided within the indicative basin. The basin will have enough storage for the longest storm we can model within the software (10080min storm) this would result in 3,325m^3 water within the basin and hence a 525mm freeboard.

Water Quality Control

2.5.3 The committed permeable paving and wetland attenuation basins are to provide levels of surface water pre-treatment prior to discharge. These devices will provide sufficient stages of pre-treatment to satisfy Section 26 of the CIRIA C753 SuDS Manual. This is proven in the calculations below.

2.5.4 It has been assumed that the adoptable spine road (known as the Boulevard) running through the development will experience more than 300 traffic movements per day and that these roads will drain to the on-Site basins via swales. Table 26.2 of the CIRIA C753 SuDS notes that pollution hazard levels for all roads except low traffic roads and trunk roads/motorways are as follows:

- TSS is 0.7;
- Metals is 0.6;
- Hydrocarbons is 0.7.

2.5.5 It is anticipated that the Site will have three levels of treatment which consists of a sediment forebay, the wetland attenuation basin itself, and where feasible permeable paving. It cannot however be guaranteed that some areas of the roads will pass through permeable paving. Table 26.3 – "*Indicative*

SuDS mitigation indices for discharges to surface waters" shows that a sediment forebay (detention basin) and wetland are able to provide treatment to the following levels:

- Detention Basin TSS at 0.5 + 0.5(Wetland at 0.8) = 0.9
- Detention Basin Metals at 0.5 + 0.5(Wetland at 0.8) = 0.9
- Detention Basin Hydrocarbons at 0.6 + 0.5(Wetland at 0.8) = 1.0

2.5.6 Each of the above is beyond the level of pollutants expected from the proposed usage. Therefore, the use of just an attenuation basin and sediment forebay is an adequate level of pre-treatment for the Site. This assessment is subject to further detailed design.

3 Offsite Effects

3.1.1 The proposed development will significantly reduce the rate of surface water discharge leaving the Site for representative rainfall events up to 1% annual probability including a climate change allowance, in accordance with the NPPF.

3.1.2 The Outline Drainage Strategy demonstrates that the drainage network of the Site will be designed to accommodate runoff during all events up to and including the 100-year return period plus 40% climate change allowance rainfall event and reduce the discharge rate from the Site when compared to the existing Site. As such, the Proposed Development will not have a negative impact on surface water flooding offsite.

3.1.3 Due to the Topography of the site and land ownership, particularly along the eastern boundary of the Site, as discussed it is necessary for some of surface water from the Proposed Development to be pumped. In this regard the surface water drainage system has to mitigate the residual risk of failure of the pump (either through mechanical, power or blockage) whilst still ensuring flood risk elsewhere is not increased for the critical design storm (the 1 in 100 (1%) AEP plus climate change).

3.1.4 In essence if such a failure occurs it must be ensured that the water does not flow uncontrolled off site as this would increase flood risk to others. The time period for this failure is set at 24 hours. Therefore to ensure the residual risk is appropriately managed in accordance with NPPF, and that flood risk is not increased to the surrounding area, it has to be demonstrated that a failure of 24 hours does not increase flood risk to the site or surrounding area with the preference of passive measures over active measures as per NPPF. The water must not leave the site uncontrolled and unrestricted during the design storm when considering the residual risk of failure and must still be safe and suitably mitigated.

3.1.5 To satisfy this requirement the basin located to the east, within east Catchment, has been oversized to cater for such an event.:

- Volume provided = 4,957m^3
- Volume required = 2,165m^3 (for critical storm event 1 in 100yr +40% cc)
- Volume required = 3,325m^3 (for 10080min storm with 0l/s if pump failure) hence 525mm freeboard provided.

3.1.6 This requirement is therefore satisfied, and although the basin is currently shown indicatively, the commitment to provide such an oversized detention basin is provided with parameters subject to future parameters, detailed design and LLFA agreement.

4 Residual Flood Risk

4.1.1 The ODS demonstrates that the drainage network at the Site is designed to accommodate runoff during all events up to and including the 100-year return period plus a climate change allowance preventing potential exceedance flows off-Site, including additional freeboard allowances within the storage basins.

5 Conclusions

5.1.1 This Outline Drainage Strategy Addendum (ODSA) has been prepared by WSP in to support the outline planning application for a proposed mixed-use development at the land west of Luynes Rise, Buntingford, Hertfordshire, hereafter referred to as the 'Proposed Development'. This ODSA should be read in conjunction with the previously submitted Flood Risk Assessment and Outline Drainage Strategy and other supporting documents submitted with the planning application [3/23/1447/OUT].

5.1.2 The Site is shown in the EA Flood Maps as being located predominantly within Flood Zone 1, which based on the NPPF, is classified as having a 'low' probability of tidal and fluvial flooding. Other potential sources of flooding have been investigated and the probability of flooding has also been assessed as low to negligible

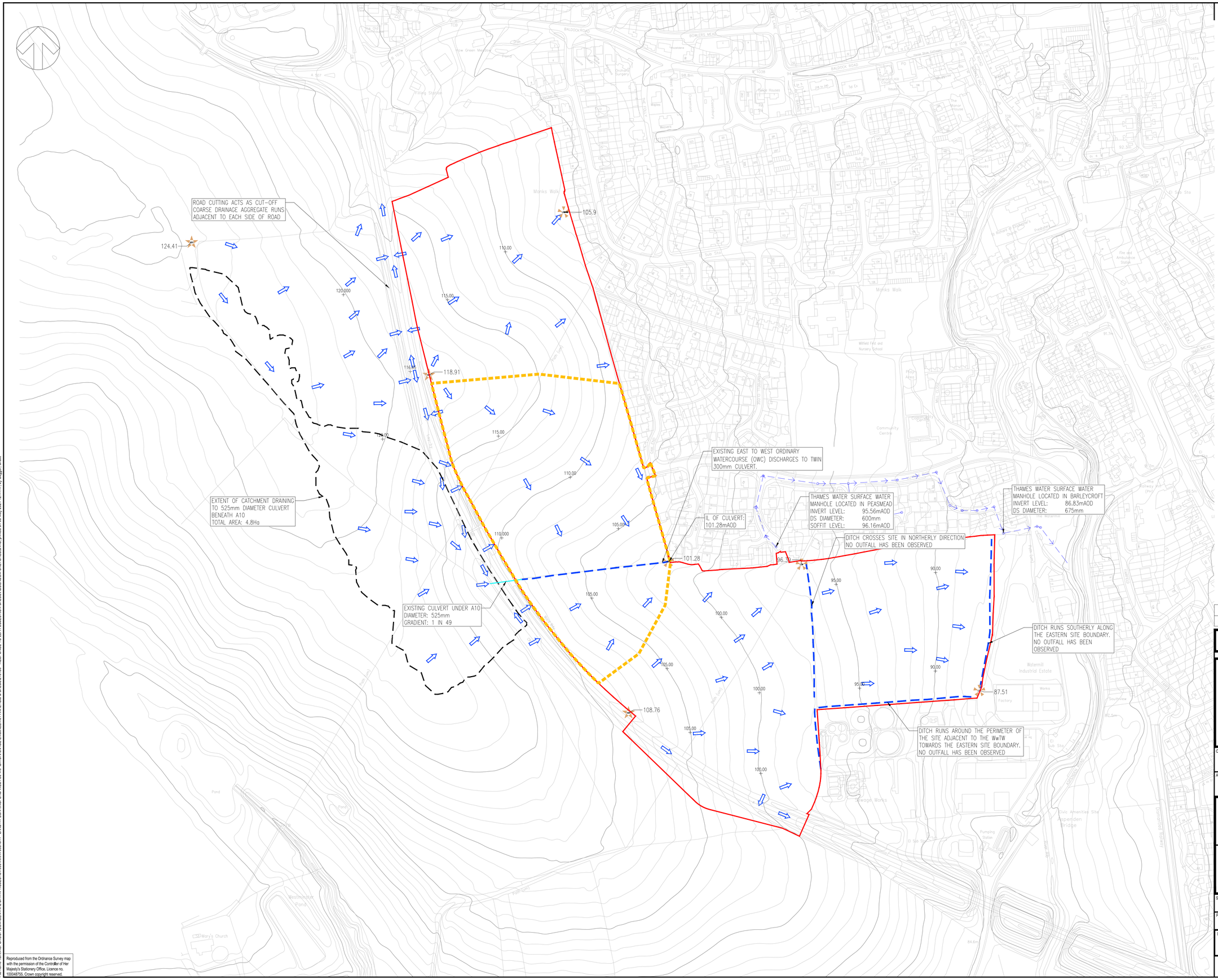
5.1.3 This ODSA has been prepared to respond to queries raised by the LLFA and provide additional information to support the updated Surface Water Drainage Strategy as presented which follows the drainage hierarchy, makes use of the existing ordinary watercourse that traverses the Site and minimises pumping. The Surface Water Drainage Strategy therefore;

- Adheres to the drainage hierarchy as far as possible;
- Mimics existing greenfield run-off rate of 1.52l/s/ha;
- Maximises use of the existing Ordinary Watercourse (OWC) that traverses the site for surface water discharge;
- Manages surface water runoff within the proposed development, taking into account potential climate change impact with the overall aim to reduce the rate of surface water run-off from the proposed building and limit the impact on the public sewer network in line with policy and best practice.
- Commits to appropriate attenuation storage via source controls such as permeable paving, swales and detention basins to form part of the SuDS management train.
- Demonstrates that the Proposed Development is safe for its lifetime without increasing flood risk elsewhere, this in particular regard to the area requiring a pumped solution where on-site detention basin is proven to adequately store critical design storm for 24 hr period without discharge.

5.1.4 The Proposed Development drainage strategy has therefore been designed in accordance with the relevant Local and National Planning Policy.

Appendix A

Drawings



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5. CULVERT CATCHMENT DELINEATED USING GIS AND ENVIRONMENT AGENCY 1m LIDAR

KEY

- SITE RED LINE BOUNDARY
- CULVERT CATCHMENT CONTRIBUTING TO FLOW THROUGH CULVERT
- 525mm DIAMETER A10 CULVERT
- EXISTING LAND DRAINAGE DITCHES
- EXISTING OVERLAND FLOW ROUTE
- EXISTING THAMES WATER SURFACE WATER SEWERS (NOT ALL SEWERS SHOWN)
- HIGH (OR LOW) POINT MARKER
- AREA OF PROPOSED DEVELOPMENT THAT CURRENTLY DISCHARGES TO OWC (AREA 6.2 HA)

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	03/05/2024	CC	FIRST ISSUE	CH	AT

DRAWING STATUS: S2 - FOR INFORMATION

wsp
One Queens Drive, Birmingham, B5 4PJ, UK
T+ 44 (0) 121 352 4700, F+ 44 (0) 121 352 4701
wsp.com

CLIENT: COUNTRYSIDE PARTNERSHIPS AND VISTRY HOMES

ARCHITECT: FPCR

SITE/PROJECT: BUNTINGFORD WEST

TITLE: EXISTING DRAINAGE FEATURES

SCALE @ A1:	CHECKED:		APPROVED:
1 : 2000 m	CH		AT
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70007498	CC	CC	May 24

DRAWING No: 10537-WSP-XX-XX-SK-C-0001 REV: P01

File name: \\UK.WSPGROUP.COM\CENTRAL DATA\PROJECTS\70084XXX\70084844 - LAND A1 BUNTINGFORD WEST\03 WIP\DR DRAINAGE ENGINEER\01 ANALYSIS & CALCS\24\430 - RESPONSE TO LLFA OBJECTION CALCS\ADDENDUM SKETCHES.DWG, printed on 03 May 2024 12:41:47, by Coggar, Chloe

ROAD CUTTING ACTS AS CUT-OFF COARSE DRAINAGE AGGREGATE RUNS ADJACENT TO EACH SIDE OF ROAD

124.41

120.000

115.00

118.41

116.00

110.00

105.9

115.00

110.00

105.00

110.000

EXTENT OF CATCHMENT DRAINING TO 525mm DIAMETER CULVERT BENEATH A10
TOTAL AREA: 4.8Ha

EXISTING CULVERT UNDER A10
DIAMETER: 525mm
GRADIENT: 1 IN 49

EXISTING EAST TO WEST ORDINARY WATERCOURSE (OWC) DISCHARGES TO TWIN 300mm CULVERT.

IL OF CULVERT:
101.28mAOD

101.28

THAMES WATER SURFACE WATER MANHOLE LOCATED IN PEASMEAD
INVERT LEVEL: 95.56mAOD
DS DIAMETER: 600mm
SOFFIT LEVEL: 96.16mAOD

96.30

DITCH CROSSES SITE IN NORTHERLY DIRECTION NO OUTFALL HAS BEEN OBSERVED

THAMES WATER SURFACE WATER MANHOLE LOCATED IN BARLEYCROFT
INVERT LEVEL: 86.83mAOD
DS DIAMETER: 675mm

DITCH RUNS SOUTHERLY ALONG THE EASTERN SITE BOUNDARY. NO OUTFALL HAS BEEN OBSERVED

DITCH RUNS AROUND THE PERIMETER OF THE SITE ADJACENT TO THE WwTW TOWARDS THE EASTERN SITE BOUNDARY. NO OUTFALL HAS BEEN OBSERVED

87.51

108.76

95.00

100.00

105.00

90.00

85.00

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- EXISTING THAMES WATER SURFACE WATER SEWERS (NOT ALL SEWERS SHOWN)
- HIGH (OR LOW) POINT MARKER
- PROPOSED DEVELOPMENT AREAS CONSIDERED 60% IMPERMEABLE (11.6 ha)

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	03/05/2024	CC	FIRST ISSUE	CH	AT

DRAWING STATUS: S2 - FOR INFORMATION

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One Queens Drive, Birmingham, B5 4PJ, UK
T+ 44 (0) 121 352 4700, F+ 44 (0) 121 352 4701
wsp.com

CLIENT: COUNTRYSIDE PARTNERSHIPS AND VISTRY HOMES

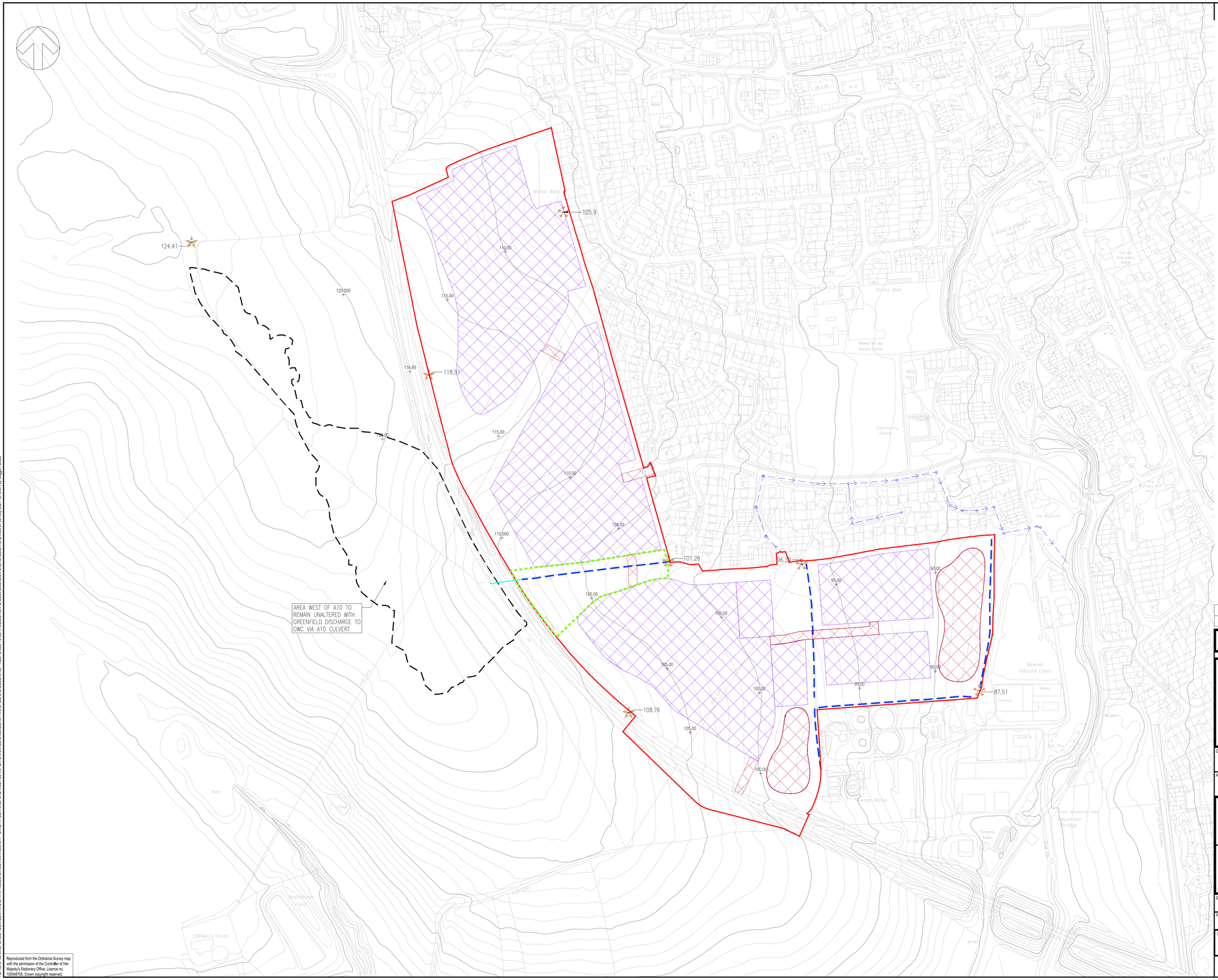
ARCHITECT: FPCR

SITE/PROJECT: BUNTINGFORD WEST

TITLE: EXISTING DRAINAGE FEATURES WITH PROPOSED IMPERMEABLE DEVELOPMENT AREAS

SCALE @ A1:	CHECKED:		APPROVED:
1 : 2000 m	CC		AT
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70007498	CC	CC	May 24

DRAWING No: 10537-WSP-XX-XX-SK-C-0002 REV: P01



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- HIGH (OR LOW) POINT MARKER
- NORTH CATCHMENT – DISCHARGE TO ORDINARY WATERCOURSE GRAVITY DISCHARGE TO OWC AT CURRENT RATE BASED ON 1.52l/s/ha
- SOUTH CATCHMENT – DISCHARGE VIA GRAVITY CONNECTION TO SURFACE WATER SEWER AT 1.52l/s/ha
- EAST CATCHMENT – DISCHARGE VIA PUMPED CONNECTION TO SURFACE WATER SEWER AT 1.52l/s/ha
- PROPOSED DEVELOPMENT AREA THAT IS CONSIDERED 60% IMPERMEABLE (11.6 ha)
- PROPOSED DEVELOPMENT AREA THAT IS 100% IMPERMEABLE (1.3 ha)
- PROPOSED OPEN SPACE THAT RETAINS GREENFIELD RUN-OFF TO OWC (8.3 ha)

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	03/05/2024	CC	FIRST ISSUE	CH	AT

DRAWING STATUS: S2 - FOR INFORMATION

wsp
One Queens Drive, Birmingham, B5 4PJ, UK
T+ 44 (0) 121 352 4700, F+ 44 (0) 121 352 4701
wsp.com

CLIENT: COUNTRYSIDE PARTNERSHIPS AND VISTRY HOMES

ARCHITECT: FPCR

SITE/PROJECT: BUNTINGFORD WEST

TITLE: PROPOSED CATCHMENT PLAN

SCALE @ A1:	CHECKED:		APPROVED:
1 : 2000 m	CH		AT
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70007498	CC	CC	May 24

DRAWING No: 10537-WSP-XX-XX-SK-C-0003 REV: P01

DO NOT SCALE

NOTES:

1. LEVELS ARE IN METERS ABOVE ORDNANCE DATUM UNLESS OTHERWISE STATED.
2. DIMENSIONS ARE IN METERS UNLESS OTHERWISE STATED.
3. EXISTING THAMES WATER ASSETS BASED ON THAMES WATER ASSET RECORDS "ALS/ALS STANDARD/2013_2474942".
4. INFILTRATION TESTING CONFIRMED THAT THE SITE INFILTRATION RATES ARE INSUFFICIENT TO ACHIEVE DISCHARGE VIA INFILTRATION (REFER TO WSP INFILTRATION TESTING REPORT)
5. MODELLING UNDERTAKEN USING FEH22 RAINFALL DATA.
6. PROPOSED MASTERPLAN BASED ON 10537-FPCR-XX-XX-DR-A-1002_P05 PREPARED BY FPCR ENVIRONMENT AND DESIGN LTD.
7. SURFACE WATER FROM THE SITE WILL BE RESTRICTED TO THE QBAR GREENFIELD RATE FOR ALL STORMS UP TO & INCLUDING THE DESIGN 1 IN 100 YEAR + 40% CLIMATE CHANGE EVENT. A TOTAL OF 7971m^3 OF ATTENUATION STORAGE IS CALCULATED TO BE REQUIRED, AND THE BASINS HAVE BEEN SIZED TO ATTENUATE THEIR CONTRIBUTING CATCHMENTS. THE ATTENUATION BASIN EXTENTS ARE SUBJECT TO DETAILED DESIGN.
8. CALCUATED EXISTING GREENFIELD RUN-OFF RATE OF 1.52/L/S/HA APPLIED FOR DRAINAGE STRATEGY
9. LAND OUTSIDE THE CATCHMENTS IDENTIFIED, INCLUDING THE A10 AND LAND WEST OF THE A10 ARE NOT INCLUDED WITHIN THE DRAINAGE STRATEGY AND ARE ASSUMED TO DRAIN AS PER THE EXISTING ARRANGEMENT. THE CATCHMENT PARAMETERS OF THIS LAND IS NOT CHANGING AS A RESULT OF THE DEVELOPMENT.
10. A SEDIMENT FOREBAY IS PROPOSED TO BE INSTALLED AT THE BASIN INLETS. BASED ON CIRIA SUDS MANUAL C365 GUIDANCE. THE SEDIMENT FOREBAY ALLOWS SEDIMENT BUILD-UP TO BE EASILY MONITORED, AND CONCENTRATES ANY REQUIRED SEDIMENT REMOVAL ACTIVITIES WITHIN A SMALL AREA, THEREBY MINIMISING POTENTIAL DAMAGE TO THE REST OF THE POND OR WETLAND. THE PLAN AREA OF THE SEDIMENTATION BAY SHOULD BE AT LEAST 10% OF THE TOTAL BASIN AREA AND COULD CONSIST OF A SEPARATE BASIN OR BE FORMED BY BUILDING AN EARTH BERM, STONE-OR ROCK-FILLED GABION OR RIP-RAP ACROSS THE UPSTREAM PORTION OF THE BASIN.
11. PERMEABLE PAVING IS PROPOSED FOR INCORPORATION ACROSS ALL NON-ADOPTABLE ROADS AND PARKING AREAS WITH 300mm SUB-BASE. PERMEABLE PAVING PROVIDES A VOLUME OF STORAGE THAT WILL BE CONSIDERED AT DETAILED DESIGN STAGE AND IS NOT CONSIDERED WITHIN THE TOTAL ATTENUATION VOLUME REQUIREMENTS AT THIS STAGE. PERMEABLE PAVING SUPPORTS EVAPORATION POTENTIAL AND FORM PART OF THE SUDS TREATMENT TRAIN PRIOR TO DISCHARGE TO THE STORAGE BASINS. PERMEABLE PAVING IMPROVES FILTRATION OF SILTS, BIODEGRADATION OF POLLUTANTS AND RETENTION OF SOLIDS.
12. COVER LEVELS SHOWN ARE INDICATIVE AND SUBJECT TO DETAILED DESIGN.
13. CHECK DAMS TO BE INCORPORATED WHERE SWALE SLOPE IS GREATER THAN 3%.
14. DRAWING IS TO BE READ IN CONJUNCTION WITH WSP OUTLINE DRAINAGE STRATEGY AND FLOOD RISK ASSESSMENT AND ODS ADDENDUM.
15. WATER BUTTS TO BE PROVIDED TO ENCOURAGE RAINWATER RE-USE.

KEY:

- SITE BOUNDARY
- EXISTING THAMES WATER FOUL SEWER AND MANHOLE
- EXISTING THAMES WATER SURFACE WATER SEWER AND MANHOLE
- EXISTING THAMES WATER STORM RELIEF
- 8402 — EXISTING THAMES WATER MANHOLE REFERENCE AND PIPE DIAMETER
- PROPOSED FOUL SEWER AND MANHOLE
- PROPOSED SURFACE WATER SEWER AND MANHOLE
- PROPOSED FOUL RISING MAIN
- PROPOSED SURFACE WATER RISING MAIN
- PROPOSED SWALE
- PROPOSED ATTENUATION BASIN
- --95.00--- — PROPOSED CONTOUR AND LEVEL
- +113.04 — EXISTING SPOT LEVEL
- CATCHMENT A: FOUL WATER – GRAVITY DISCHARGE TO TWMH8906; SURFACE WATER – GRAVITY DISCHARGE TO OWC AT CURRENT RATE BASED ON 1.52l/s/ha
- CATCHMENT B: FOUL WATER– GRAVITY DISCHARGE TO TWMH0802; SURFACE WATER – GRAVITY DISCHARGE TO TWMH0804 AT 1.52l/s/ha
- CATCHMENT C: FOUL WATER– PUMPED DISCHARGE TO TWMH0802; SURFACE WATER – PUMPED DISCHARGE TO TWMH0804 AT 1.52l/s/ha
- PROPOSED OPEN SPACE THAT RETAINS GREENFIELD RUN-OFF TO OWC (8.3 ha)
- EXISTING DRAINAGE DITCH TO BE RETAINED WHERE NECESSARY, TO BE AGREED IN FUTURE DISCUSSION WITH LLFA

UNTIL TECHNICAL APPROVAL HAS BEEN OBTAINED FROM THE RELEVANT LOCAL AUTHORITIES OR STATUTORY BODIES, IT SHOULD BE UNDERSTOOD THAT ALL DRAWINGS ARE ISSUED AS PRELIMINARY AND NOT FOR CONSTRUCTION. SHOULD THE CONTRACTOR AND / OR EMPLOYER COMMENCE WORK PRIOR TO APPROVAL BEING GIVEN, IT IS ENTIRELY AT THEIR OWN RISK

REV	DATE	BY	DESCRIPTION	CHK	APP
P04	03/05/2023	CC	UPDATED TO ADDRESS LLFA COMMENTS	CH	AT
P03	15/11/2023	BB	UPDATED TO SUIT LLFA COMMENTS	KM	KM
P02	16/06/2023	BB	REVISED BACKGROUND	BH	BH
P01	30/06/2022	BB	FIRST ISSUE	KM	KM

DRAWING STATUS: S2 - FOR INFORMATION

WSP House, 70 Chancery Lane, London, WC2A 1AF, UK
T+ 44 (0) 207 314 5000, F+ 44 (0) 207 314 5111
wsp.com

CLIENT: VISTRY

ARCHITECT: fpcr

PROJECT: BUNTINGFORD WEST, BUNTINGFORD, HERTFORDSHIRE

TITLE: FOUL AND SURFACE WATER DRAINAGE STRATEGY

SCALE @ A0: 1:500	CHECKED: CH		APPROVED: AT
PROJECT No: 70084844	DESIGNED: CC	DRAWN: CC	DATE: May 24

DRAWING No: 10537-WSP-XX-XX-DR-C-0001 — REV: P04

Appendix B

Calculations

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Chloe Lauren Cogger
Site name:	Buntingford West
Site location:	Land East of the A10, Peasmead, Buntingford, SG9 9SF

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

Site Details

Latitude:	51.94072° N
Longitude:	0.02429° W
Reference:	1110964139
Date:	Apr 30 2024 16:32

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha): 20.09

Methodology

Q_{MED} estimation method:	Calculate from BFI and SAAR
BFI and SPR method:	Specify BFI manually
HOST class:	7
BFI / BFIHOST:	0.639
Q_{MED} (l/s):	22.58
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.

Hydrological characteristics

	Default	Edited
SAAR (mm):		630
Hydrological region:		6
Growth curve factor 1 year:		0.85
Growth curve factor 30 years:		2.3
Growth curve factor 100 years:		3.19
Growth curve factor 200 years:		3.74

Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

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

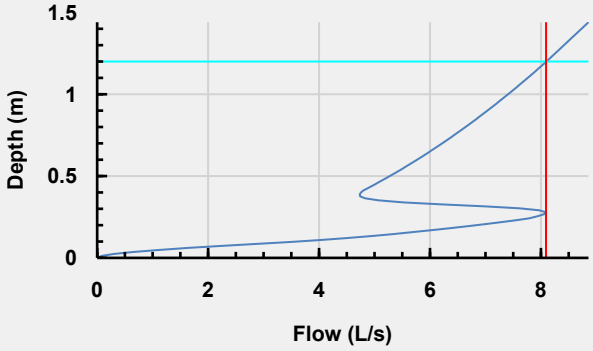
Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):		30.56
1 in 1 year (l/s):		25.98
1 in 30 years (l/s):		70.29
1 in 100 year (l/s):		97.49
1 in 200 years (l/s):		114.29

Buntingford West: Catchment A Surface Water Calculations	Date: 30/04/2024		
	Designed by: CC	Checked by: CH	Approved By: AT
Report Details: Type: Junctions Storm Phase: Phase	Company Address:		

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
Outfall	Outlet	(None)	Hydro-Brake®
	Invert Level (m)	102.500	
	Design Depth (m)	1.200	
	Design Flow (L/s)	8.1	
	Objective	Minimise Upstream Storage Requirements	
	Application	Surface Water Only	
	Sump Available	☐	
	Unit Reference	CHE-0122-8100-1200-8100	



Pond

Type : Pond

Dimensions

Exceedance Level (m)	104.000
Depth (m)	1.500
Base Level (m)	102.500
Freeboard (mm)	300
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	3.007
Total Volume (m³)	4670.479

Depth (m)	Area (m²)	Volume (m³)
0.000	3500.00	0.000
1.500	4510.00	5991.517

Advanced

Perimeter	Circular
Length (m)	105.946
Friction Scheme	Manning's n
n	0.02

Buntingford West: Catchment A Surface Water Calculations	Date: 30/04/2024		
	Designed by: CC	Checked by: CH	Approved By: AT
Report Title: Rainfall Analysis Criteria	Company Address:		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	8
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FEH

Type: FEH

Site Location	GB 535761 228934 TL 35761 28934
Rainfall Version	2022
Data Type	Point
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
100.0	40.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Buntingford West: Catchment A Surface Water Calculations	Date: 30/04/2024		
	Designed by: CC	Checked by: CH	Approved By: AT
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m^3)
Catchment A	FEH: 100 years: +40 %: 15 mins: Summer	4.09	3265.3	1450.914

Buntingford West: Catchment A Surface Water Calculations	Date: 30/04/2024		
	Designed by: CC	Checked by: CH	Approved By: AT
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Outfall	FEH: 100 years: +40 %: 10080 mins: Summer	104.000	102.500	103.687	1.187	8.1	1.342	0.000	8.1	7342.931	OK

Buntingford West: Catchment A Surface Water Calculations	Date: 30/04/2024		
	Designed by: CC	Checked by: CH	Approved By: AT
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

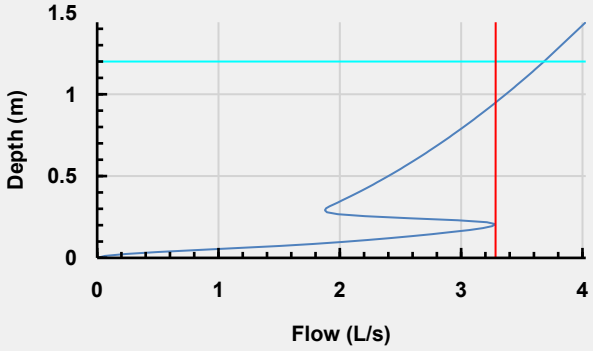
Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	FEH: 100 years: +40 %: 10080 mins: Summer	103.689	103.689	1.189	1.189	50.4	4622.199	0.000	0.000	8.1	7343.091	1.034	OK

Buntingford West: Catchment B Surface Water Calculations	Date: 30/04/2024		
	Designed by: CC	Checked by:	Approved By:
Report Details: Type: Junctions Storm Phase: Phase	Company Address:		

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
Outfall	Outlet	(None)	Hydro-Brake®
	Invert Level (m)	97.400	
	Design Depth (m)	1.200	
	Design Flow (L/s)	3.68	
	Objective	Minimise Upstream Storage Requirements	
	Application	Surface Water Only	
	Sump Available	☐	
	Unit Reference	CHE-0084-3680-1200-3680	



Buntingford West: Catchment B Surface Water Calculations	Date: 30/04/2024		
	Designed by: CC	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Pond

Type : Pond

Dimensions

Exceedance Level (m)	98.900
Depth (m)	1.500
Base Level (m)	97.400
Freeboard (mm)	300
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	3.073
Total Volume (m³)	3537.046

Depth (m)	Area (m²)	Volume (m³)
0.000	2600.00	0.000
1.500	3500.00	4558.310

Advanced

Perimeter	Circular
Length (m)	153.730
Friction Scheme	Manning's n
n	0.02

Buntingford West: Catchment B Surface Water Calculations	Date: 30/04/2024		
	Designed by: CC	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address:		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	8
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FEH

Type: FEH

Site Location	GB 535761 228934 TL 35761 28934
Rainfall Version	2022
Data Type	Point
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
100.0	40.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Buntingford West: Catchment B Surface Water Calculations	Date: 30/04/2024		
	Designed by: CC	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m^3)
Catchment B	FEH: 100 years: +40 %: 15 mins: Summer	2.42	1911.2	861.008

Buntingford West: Catchment B Surface Water Calculations	Date: 30/04/2024		
	Designed by: CC	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Outfall	FEH: 100 years: +40 %: 10080 mins: Winter	98.900	97.400	98.472	1.072	3.5	1.212	0.000	3.5	3308.247	OK

Buntingford West: Catchment B Surface Water Calculations	Date: 30/04/2024		
	Designed by: CC	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	FEH: 100 years: +40 %: 10080 mins: Winter	98.472	98.472	1.072	1.072	19.2	3119.243	0.000	0.000	3.5	3310.447	11.812	OK

Buntingford Wesr: Catchment C Surface Water Calcualtions	Date: 30/04/2024		
	Designed by: CC	Checked by:	Approved By:
Report Details: Type: Junctions Storm Phase: Phase	Company Address:		

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
	Outlet	(None)	Pump
	Invert Level (m)	88.400	
	Depth (m)	Outflow (L/s)	
	0.100	2.65	
	0.200	2.65	
	0.300	2.65	
	0.400	2.65	
	0.500	2.65	
	0.600	2.65	
	0.700	2.65	
	0.800	2.65	
	0.900	2.65	
	1.000	2.65	
	1.100	2.65	
	1.200	2.65	
	1.300	2.65	
	1.400	2.65	
	1.500	2.65	
	1.600	2.65	
	1.700	2.65	
	1.800	2.65	
	1.900	2.65	
	2.000	2.65	
	2.100	2.65	
	2.200	2.65	
	2.300	2.65	
	2.400	2.65	
	2.500	2.65	
	2.600	2.65	
	2.700	2.65	
	2.800	2.65	
	2.900	2.65	
	3.000	2.65	
	3.100	2.65	
	3.200	2.65	
	3.300	2.65	
	3.400	2.65	
	3.500	2.65	
	3.600	2.65	
	3.700	2.65	
	3.800	2.65	
	3.900	2.65	
	4.000	2.65	
	4.100	2.65	
	4.200	2.65	
	4.300	2.65	
	4.400	2.65	
	4.500	2.65	
	4.600	2.65	
	4.700	2.65	
Outfall	4.800	2.65	
	4.900	2.65	
	5.000	2.65	
	5.100	2.65	
	5.200	2.65	
	5.300	2.65	
	5.400	2.65	
	5.500	2.65	
	5.600	2.65	
	5.700	2.65	
	5.800	2.65	
	5.900	2.65	
	6.000	2.65	
	6.100	2.65	

Buntingford Wesr: Catchment C Surface Water Calcualtions	Date: 30/04/2024		
	Designed by: CC	Checked by:	Approved By:
Report Details: Type: Junctions Storm Phase: Phase	Company Address:		

Junction	Outlet Name	Outgoing Connection	Outlet Type
	6.200	2.65	
	6.300	2.65	
	6.400	2.65	
	6.500	2.65	
	6.600	2.65	
	6.700	2.65	
	6.800	2.65	
	6.900	2.65	
	7.000	2.65	
	7.100	2.65	
	7.200	2.65	
	7.300	2.65	
	7.400	2.65	
	7.500	2.65	
	7.600	2.65	
	7.700	2.65	
	7.800	2.65	
	7.900	2.65	
	8.000	2.65	
	8.100	2.65	
	8.200	2.65	
	8.300	2.65	
	8.400	2.65	
	8.500	2.65	
	8.600	2.65	
	8.700	2.65	
	8.800	2.65	
	8.900	2.65	
	9.000	2.65	
	9.100	2.65	
	9.200	2.65	
	9.300	2.65	
	9.400	2.65	
	9.500	2.65	
	9.600	2.65	
	9.700	2.65	
	9.800	2.65	
	9.900	2.65	
	10.000	2.65	

Buntingford Wesr: Catchment C Surface Water Calcualtions	Date: 30/04/2024		
	Designed by: CC	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Pond

Type : Pond

Dimensions

Exceedance Level (m)	89.700
Depth (m)	1.300
Base Level (m)	88.400
Freeboard (mm)	300
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	10.034
Total Volume (m³)	4657.540

Depth (m)	Area (m²)	Volume (m³)
0.000	3500.00	0.000
1.300	6770.00	6559.692

Advanced

Perimeter	Circular
Length (m)	145.382
Friction Scheme	Manning's n
n	0.02

Buntingford Wesr: Catchment C Surface Water Calcualtions	Date: 30/04/2024		
	Designed by: CC	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address:		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	8
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FEH

Type: FEH

Site Location	GB 535761 228934 TL 35761 28934
Rainfall Version	2022
Data Type	Point
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
100.0	40.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Buntingford Wesr: Catchment C Surface Water Calcualtions	Date: 30/04/2024		
	Designed by: CC	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m^3)
Catchment C	FEH: 100 years: +40 %: 15 mins: Summer	1.75	1382.1	622.898

Buntingford Wesr: Catchment C Surface Water Calcualtions	Date: 30/04/2024		
	Designed by: CC	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Outfall	FEH: 100 years: +40 %: 10080 mins: Summer	89.700	88.400	88.929	0.529	2.7	0.598	0.000	2.6	2833.522	OK

Buntingford Wesr: Catchment C Surface Water Calcualtions	Date: 30/04/2024		
	Designed by: CC	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	FEH: 100 years: +40 %: 10080 mins: Summer	88.929	88.929	0.529	0.529	21.6	2163.273	0.000	0.000	2.7	2834.900	53.553	OK

Buntingford West: Catchment C Surface Water Calculations Pump Failure	Date: 30/04/2024		
	Designed by: CC	Checked by:	Approved By:
Report Details: Type: Junctions Storm Phase: Phase	Company Address:		

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
	Outlet	(None)	Pump
	Invert Level (m)	88.400	
Outfall	Depth (m)	Outflow (L/s)	
	0.100	0.0	
	0.200	0.0	
	0.300	0.0	
	0.400	0.0	
	0.500	0.0	
	0.600	0.0	
	0.700	0.0	
	0.800	0.0	
	0.900	0.0	
	1.000	0.0	
	1.100	0.0	
	1.200	0.0	
	1.300	0.0	
	1.400	0.0	
	1.500	0.0	
	1.600	0.0	
	1.700	0.0	
	1.800	0.0	
	1.900	0.0	
	2.000	0.0	
	2.100	0.0	
	2.200	0.0	
	2.300	0.0	
	2.400	0.0	
	2.500	0.0	
	2.600	0.0	
	2.700	0.0	
	2.800	0.0	
	2.900	0.0	
	3.000	0.0	
	3.100	0.0	
	3.200	0.0	
	3.300	0.0	
	3.400	0.0	
	3.500	0.0	
	3.600	0.0	
	3.700	0.0	
	3.800	0.0	
	3.900	0.0	
	4.000	0.0	
	4.100	0.0	
	4.200	0.0	
	4.300	0.0	
	4.400	0.0	
	4.500	0.0	
	4.600	0.0	
	4.700	0.0	
	4.800	0.0	
	4.900	0.0	
	5.000	0.0	
	5.100	0.0	
	5.200	0.0	
	5.300	0.0	
	5.400	0.0	
	5.500	0.0	
	5.600	0.0	
	5.700	0.0	
	5.800	0.0	
	5.900	0.0	
	6.000	0.0	
	6.100	0.0	

Buntingford West: Catchment C Surface Water Calculations Pump Failure	Date: 30/04/2024		
	Designed by: CC	Checked by:	Approved By:
Report Details: Type: Junctions Storm Phase: Phase	Company Address:		

Junction	Outlet Name	Outgoing Connection	Outlet Type
	6.200	0.0	
	6.300	0.0	
	6.400	0.0	
	6.500	0.0	
	6.600	0.0	
	6.700	0.0	
	6.800	0.0	
	6.900	0.0	
	7.000	0.0	
	7.100	0.0	
	7.200	0.0	
	7.300	0.0	
	7.400	0.0	
	7.500	0.0	
	7.600	0.0	
	7.700	0.0	
	7.800	0.0	
	7.900	0.0	
	8.000	0.0	
	8.100	0.0	
	8.200	0.0	
	8.300	0.0	
	8.400	0.0	
	8.500	0.0	
	8.600	0.0	
	8.700	0.0	
	8.800	0.0	
	8.900	0.0	
	9.000	0.0	
	9.100	0.0	
	9.200	0.0	
	9.300	0.0	
	9.400	0.0	
	9.500	0.0	
	9.600	0.0	
	9.700	0.0	
	9.800	0.0	
	9.900	0.0	
	10.000	0.0	

Pond

Type : Pond

Dimensions

Exceedance Level (m)	89.700
Depth (m)	1.300
Base Level (m)	88.400
Freeboard (mm)	300
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	10.034
Total Volume (m³)	4657.540

Depth (m)	Area (m²)	Volume (m³)
0.000	3500.00	0.000
1.300	6770.00	6559.692

Advanced

Perimeter	Circular
Length (m)	145.382
Friction Scheme	Manning's n
n	0.02

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	8
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☑
Rainfall Depth (mm)	1.0
Run Time (mins)	10080

Rainfall

FEH

Type: FEH

Site Location	GB 535761 228934 TL 35761 28934
Rainfall Version	2022
Data Type	Point
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
100.0	40.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Buntingford West: Catchment C Surface Water Calculations Pump Failure	Date: 30/04/2024		
	Designed by: CC	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

FEH: 100 years: Increase Rainfall (%): +40: 1440 mins: Summer

Inflow	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m^3)
Catchment Area C	1.75	97.9	2156.930

Buntingford West: Catchment C Surface Water Calculations Pump Failure	Date: 30/04/2024		
	Designed by: CC	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		

FEH: 100 years: Increase Rainfall (%): +40: 10080 mins: Summer

Inflow	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m^3)
Catchment Area C	1.75	21.6	3327.320

Buntingford West: Catchment C Surface Water Calculations Pump Failure	Date: 30/04/2024		
	Designed by: CC	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		

FEH: 100 years: Increase Rainfall (%): +40: 1440 mins: Summer

Junction	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m^3)	Max. Flooded Volume (m^3)	Max. Outflow (L/s)	Total Discharge Volume (m^3)	Status
Outfall	89.700	88.400	88.928	0.528	0.2	0.597	0.000	0.0	0.318	OK

FEH: 100 years: Increase Rainfall (%): +40: 10080 mins: Summer

Junction	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Outfall	89.700	88.400	89.162	0.762	0.0	0.862	0.000	0.0	2.910	OK

Buntingford West: Catchment C Surface Water Calculations Pump Failure	Date: 30/04/2024		
	Designed by: CC	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		

FEH: 100 years: Increase Rainfall (%): +40: 1440 mins: Summer

Stormwater Control	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	88.927	88.927	0.527	0.527	97.9	2153.276	0.000	0.000	0.2	3.948	53.768	OK

Buntingford West: Catchment C Surface Water Calculations Pump Failure	Date: 30/04/2024		
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FEH: 100 years: Increase Rainfall (%): +40: 10080 mins: Summer

Stormwater Control	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	89.162	89.162	0.762	0.762	21.6	3323.131	0.000	0.000	0.0	7.130	28.651	OK

WSP House
70 Chancery Lane
London
WC2A 1AF

wsp.com