



Title: FRA & Drainage Strategy Update
Date: 30th May 2025

1.0 Introduction

- 1.1 Jubb has been commissioned by Hallam Land Management Ltd to provide flood risk and drainage advice in relation to the proposed development of land to the west of the A10 and north of the A507 in Buntingford, Hertfordshire.
- 1.2 A planning application (Reference: 3/24/0966/OUT) was submitted in May 2024 for the following:

“Outline planning application for development of up to 600 dwellings (C3), elderly accommodation (C3), Mixed Use Local Centre (including flexible use E, F and Sui Generis), First School, informal and formal open space, associated works and infrastructure including a new access from the A507 and pedestrian bridge over the A10, with all matters reserved except access.”
- 1.3 A Flood Risk Assessment and Drainage Strategy (FRADN(N)-01_v5), dated 15th May 2024, was prepared by Jubb and submitted as part of the planning application.
- 1.4 Following the submission, Hertfordshire County Council (HCC) in its role as the Lead Local Flood Authority (LLFA), provided consultation responses in relation to the submitted flood risk and drainage information.
- 1.5 The proposals have been amended to reflect the comments received from the LLFA, with the latest response from the LLFA (dated 11th February 2025) confirming they have no objection to the application subject to conditions.
- 1.6 This technical note, which should be read in conjunction with FRADN(N)-01_v5, provides a summary of the updates and amendments made to the proposals in relation to flood risk and drainage matters since the original planning application was submitted.

2.0 Flood Risk

2.1 Surface Water Flood Risk

- 2.1.1 Within the northern region of the site, two flow routes/ areas at potential risk of surface water flooding are shown crossing the northern field, with a third located within the southern field, as shown on the latest EA Risk of Surface Water Flooding maps. Two smaller, narrow flow paths are shown running either side of the existing ditch/ hedgerow which separates the two fields. Further north, a larger more significant flow path is shown running adjacent to the northern site boundary, in a west to east orientation.
- 2.1.2 The original development proposals showed built development extending to the southern and northern extents of the field with dwellings proposed to be located within the area of these flow paths.

- 2.1.3 Since the original application, the development proposals have been revised to accommodate the flow paths/ areas at risk of surface water flooding shown crossing the northern region of the site.
- 2.1.4 The northern flow path consists of two flows routes which are influenced by offsite flows which are conveyed in an easterly direction towards the site, following the natural topography and valleys. The flow paths continue into the site, with onsite runoff from the northern region of the site also directed towards these areas, with the two flow paths combining within the site before continuing to the east. The EA mapping shows this flow path continuing to the east and crossing the A10. However, the EA mapping does not account for any existing ditches or culvert features within the site and therefore the flow path is not accurately shown as it continues to the east.
- 2.1.5 In reality, the flow path will follow the topography across the northern region of the site, with flows conveyed in an easterly direction. However, as shown by the topographical survey, the onsite levels will direct flows to the existing ditch on the north-eastern site boundary, where flows are then culverted beneath the A10 and continue to the east.
- 2.1.6 The development proposals have been amended to bring the northern edge of the development parcel back to the south. Consequently, no built development, aside from the northern access road, is now proposed within the northern surface water flow path.
- 2.1.7 A plan (23161_SK-C-016) showing the surface water flow path overlaid on the revised development land use plan is included in **Appendix A**.
- 2.1.8 It is therefore proposed that this flow path/ area shown at risk of surface water flooding will remain as green open space, with the proposed accessed road specifically designed to ensure dry access/egress can be provided with levels of the access road set above that of the existing flow path/ areas shown at risk of flooding while ensuring the route of the flow path is maintained and not impeded by the proposals.
- 2.1.9 It is therefore proposed that the existing flow path will be maintained and will act as it does in the existing greenfield scenario, with no impact from the development proposals.
- 2.1.10 To further enhance/ assist with the conveyance of any flows through the site, it is proposed to incorporate a drainage ditch as part of the masterplan layout aligning with the route of the existing flow paths.
- 2.1.11 The development proposals will also provide an element of improvement/ mitigation to the areas shown at risk of surface water flooding in the northern region of the site, with the proposed drainage strategy intercepting flows from a large proportion of the onsite catchment. These flows will then be attenuated and discharged in a controlled manner at a restricted greenfield rate.
- 2.1.12 A plan (23161_SK-C-016) showing the flow path, revised development extents and proposed conveyance ditch in the northern region of the site is included in **Appendix A**.
- 2.1.13 Further investigation of the southern flow path (in the northern field) shows that this is generated by flows from onsite catchments being conveyed through the site by the existing topographical profile.
- 2.1.14 The southern flow path will be alleviated through the construction of the development proposals and the inclusion of positive drainage throughout the site. The existing onsite catchments which contribute to this flow path will form part of the development proposals and become positively drained. The proposed drainage strategy will intercept these flows, with flows conveyed to an attenuation basin and discharged directly to the existing drainage ditch.
- 2.1.15 It is therefore considered that this southern flow path will be alleviated through the construction of the development proposals and therefore locating dwellings within this area is considered appropriate.
- 2.1.16 Within the southern field a small band of surface water flood risk/ flow path is shown running adjacent to the existing hedgerow. This flow path is formed by solely onsite flows being conveyed to this location by the existing topography.

- 2.1.17 This flow path will be alleviated through the construction of the development proposals and site wide drainage strategy, which will cover the full catchment of this flow path. Consequently, flows will be intercepted and discharged in a controlled manner. It is therefore considered that this southern flow path will be alleviated through the construction of the development proposals and will therefore not impact the development proposals.
- 2.1.18 Further clarification on the contributing catchments in relation to the southern flow paths (northern & southern field) is shown on the plan (23161_SK-C-011) which is included in **Appendix A**.
- 2.1.19 It is therefore considered that the development has taken a suitable approach, with development directed away from the risk of flooding and mitigation measures such as setting finished floor levels a minimum of 150mm above existing ground levels and profiling of the site to direct potential flows away from buildings or vulnerable areas incorporated to further mitigate the risk posed to the development.

3.0 Proposed Drainage Strategy

3.1 Principals & Outfall Arrangements

- 3.1.1 The overall principals of the proposed surface water drainage strategy have not changed since the original application.
- 3.1.2 It is proposed that generated surface water runoff from the development will be discharged at a restricted pre-development greenfield rate to the existing drainage ditches within the site and existing public sewer network in close proximity to the site, with flows attenuated onsite via a range of SuDS features.
- 3.1.3 The proposed drainage strategy aims to mimic the existing drainage regime of the greenfield site, with the design reflecting the existing greenfield nature and catchments of the site.
- 3.1.4 The northern and central regions of the site drain to the north-east corner of the site, where existing drainage ditches convey flows offsite beneath the A10, with the ditches continuing to the east before converging with the River Rib. Further information on the downstream connectivity of these existing drainage features is provided within Section 3.2.
- 3.1.5 However, the topography of the southern region of the site is affected by an existing crest which runs through the site in a north-south orientation. The proposed development in the southern region of the site falls in a south-easterly direction towards the southeastern corner of the site.
- 3.1.6 Onsite investigation of the existing drainage features present in the south-east region of the site could not trace the downstream route or identify an existing outfall for these features. Consequently, it is considered that these existing features will not be a suitable outfall for the discharge of flows from this part of the site, with no suitable alternative options identified which reflect the natural greenfield catchments.
- 3.1.7 It is therefore proposed to discharge flows from this region to the existing public surface water sewer located to the east of the site within Baldock Road.
- 3.1.8 We have been in constant discussions with Thames Water from an early pre-planning stage regarding the development proposals. This has included the submission of a pre-development enquiry and further discussions to confirm the status of the public surface water sewer and where a suitable point of connection for the development proposals maybe possible.
- 3.1.9 Ahead of submitting a formal s106 application, Thames Water have confirmed that a future connection to the public sewer is acceptable in principle. A copy of the correspondence is included in **Appendix B**.

3.1.10 Discussions regarding the current capacity status of the existing network have also been ongoing with Thames Water from an early stage. Thames Water have confirmed that the existing surface water sewer network has sufficient capacity to accommodate the proposed greenfield discharge of 5.4 l/s, with a proposed point of connection to the existing sewer within Baldock Road to the south-east of the site. A copy of the Thames Water capacity confirmation letter is included in **Appendix B**.

3.1.11 The offsite connection from the development to the public sewer has been considered. The connection route avoids third party land and can be delivered within land either under the ownership of the landowner or the Highways Authority. A future s278 or s50 application will be submitted to obtain permission to lay the offsite connection within the Highways Authority land once planning permission has been obtained.

3.2 Downstream Connectivity

3.2.1 Within the site, a network of existing drainage ditches has been identified running along the existing field boundaries. In the northeastern region of the site, two existing predominant drainage ditches have been identified on the north-east site boundary and running through the centre of the site between the two existing fields.

3.2.2 A site walkover survey along with topographical and CCTV survey has been undertaken to identify existing drainage features and confirm their downstream connectivity within and east of the site. A plan and photos of the existing drainage ditches and culverts confirming their presence and demonstrating their downstream connectivity has been provided in **Appendix C**.

3.2.3 A ditch connectivity plan (SK-C-010) also provided in **Appendix C**, which provides further information and references the location of each photograph.

3.2.4 An additional tracing/ CCTV survey has also been undertaken on the existing culvert located on the north-east site boundary which confirms its downstream connectivity to the existing watercourse to the east of the A10.

3.2.5 The CCTV survey has also confirmed this existing culvert is in good condition. A copy of the CCTV report/ tracing plan is also included in **Appendix C**.

3.2.6 The proposed drainage strategy for the northern and central region of the site includes the attenuation and discharge of surface water flows at a restricted pre-development greenfield rate, with flows discharged to the existing drainage ditch before being culverted beneath the A10 and continuing to the existing ordinary watercourse immediately to the east of the A10.

3.2.7 The drainage strategy proposes to discharge flows from the development at a restricted greenfield Qbar rate for all storm events up to the 1 in 100-year plus climate change.

3.2.8 A comparison between the discharge rates for the existing greenfield scenario and the development proposals has been provided.

3.2.9 This shows that the development will be matching the existing greenfield rate for the Qbar event, however, during larger rainfall events the discharge from the development is significantly lower than the existing greenfield rate. Consequently, the proposed development provides a significant betterment compared to the existing greenfield scenario for a large number of storm events.

3.2.10 It is therefore considered that the existing downstream ordinary watercourse is able to accept the discharge from the development proposals, with the development restricting flows to match the existing greenfield rate and providing betterment during a large number of storm events.

3.2.11 Drainage calculations have also been provided which demonstrate that the existing culvert has sufficient capacity to accommodate its full catchment including the development discharge. A copy of the calculations is included in **Appendix D**.

3.2.12 It can be seen from the onsite photos that the existing culvert is in very good condition with no signs of any blockages being present.

3.3 Existing Land Drainage

3.3.1 The proposed site is split into two fields, existing land drains have been identified within the northern field and the neighbouring land to the north-west of the site. No land drainage is shown to be present within the southern field.

3.3.2 Where possible any existing land drainage within the site will be retained and accommodated as part of the development proposals.

3.3.3 Where the development impacts the existing land drains and the drains are no longer required they will be abandoned and removed.

3.3.4 Any land drains serving the neighbouring land which passes through the site will be maintained. Where the route of these drains is impacted by the development, they will be diverted to accommodate proposals.

3.3.5 The development proposals will ensure that the development proposals do not increase the risk of flood risk to the site or the surrounding area.

3.3.6 A plan of the existing land drainage is included in **Appendix E**. This shows the sections of the existing drainage which will be maintained, removed or diverted.

3.4 Calculations

3.4.1 It is proposed that flows will be discharged from the site at a restricted predevelopment greenfield rate, the FEH statistical method produces a Qbar greenfield rate of 71l/s for the total development. This rate will be split across the various catchments and will be used as the maximum offsite discharge rate for storm events up to the 1 in 100-year plus 40% climate change scenario.

3.4.2 The proposed greenfield runoff rates have been based on catchments informed by the onsite topographic survey. The catchments are based on the existing levels with each catchment considered to reflect the current catchments of the greenfield site, to ensure the drainage proposals mimic the existing drainage regime of the site. A drainage catchment plan has been produced and is included in **Appendix F**.

3.4.3 The catchments have also taken into account where areas of open green space have been identified which fall forwards the site. If this is the case, this has been accounted for within the drainage proposals, with 30% of this area considered as impermeable area and contributing the drainage proposals.

3.4.4 The existing levels of the proposed site are heavily influenced by a crest which runs through the southern region of the site and continues to the north-west towards the village of Throcking.

3.4.5 A review of the existing topography of the site and surrounding area shows that the majority of the open green space to the west of the site is conveyed away from the development proposals and will therefore not contribute to the proposed drainage strategy.

3.4.6 Further detailed information is provided below for each region of the site, with drainage calculations and plan included in **Appendix F**. A separate drainage catchment plan (SK-C-009) has also been included in **Appendix F** to highlight the revised catchments and the topographical considerations.

Southern Region
In the southern region of the site, large areas of open green space are proposed adjacent to the western site boundary. However, these areas fall on the western side of the crest with levels falling away from the development in a westerly direction. These areas have therefore not been included in the proposed drainage calculations.

A narrow band of open green space is also shown running between the western edge of the southern development parcel and the proposed woodland area. This area runs along the top of the crest with levels falling in an easterly direction towards the development. The proposed drainage calculations have therefore been amended to account for this area of open space.

Central Region

In the central region of the site, levels from a small area of offsite catchment and the remaining onsite green areas which are proposed to be used for sports pitches fall in an easterly direction towards the development. However, an existing drainage ditch is present on the western edge of the development which will intercept runoff and convey flows to the existing watercourse on the eastern site boundary.

The existing ditch has been incorporated as part of the development layout, runoff from the open space in this area will therefore be intercepted and conveyed through the development and will therefore not impact the development or contribute to the proposed drainage network.

Existing levels of an area of open space located to the west of the development, which is proposed to be used as sports pitches, does fall towards the development and will not be intercepted by the existing ditch. This area has therefore been included as part of the revised drainage calculations.

Northern Region

In the northern region of the site, existing levels fall from the west in an easterly/ north-easterly direction towards the eastern site boundary.

Two valleys are formed by the natural topography running through the northern extents of the site. Based on the latest masterplan layout, it is considered that the topography of the open green space to the west will convey runoff to these natural valleys which run to the north of the development proposals. This conveyance route is highlighted on the proposed drainage catchment plan in **Appendix F**.

It is therefore considered that runoff from the open green space to the north and west of the development proposals in the northern region of the site will be conveyed to the north, before heading to the east towards the existing ditch on the north-eastern site boundary.

Consequently, this runoff will be conveyed around the development proposals and not towards it and will therefore not contribute to the proposed development drainage strategy. This area has therefore not been taken into account as part of the drainage calculations.

3.4.7 In accordance with local guidance, a 10% increase in the impermeable area to account for urban creep has been included as part of the proposed attenuation calculations.

3.4.8 The proposed drainage calculations have been revised with CV values set equal to 1 for the summer and winter events. On this basis, restricting the offsite surface water discharge rate to Q_{bar} , an estimated storage volume of 13,055m³ is required to accommodate the 1 in 100-year plus 40% climate change scenario and the revised design parameters. A copy of the updated drainage calculations and drainage strategy plan have been included in **Appendix F**.

3.5 SuDS

3.5.1 It is proposed to incorporate a variety of SuDS features as part of the site wide drainage strategy, with additional features such as permeable paving, raingardens and swales etc to supplement the attenuation basins.

3.5.2 A separate drainage strategy plan has been produced to show indicative locations for these additional SuDS features, this includes:

- Highlighted green corridors which could be utilised for swales.

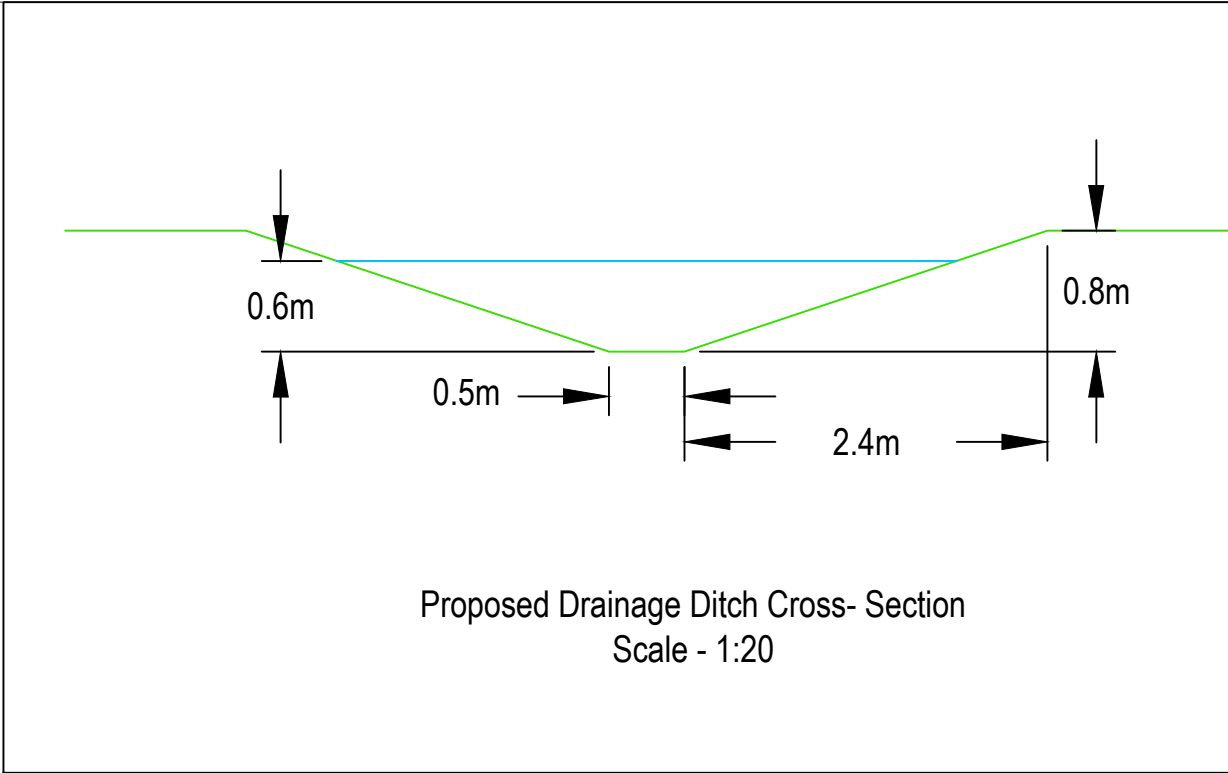
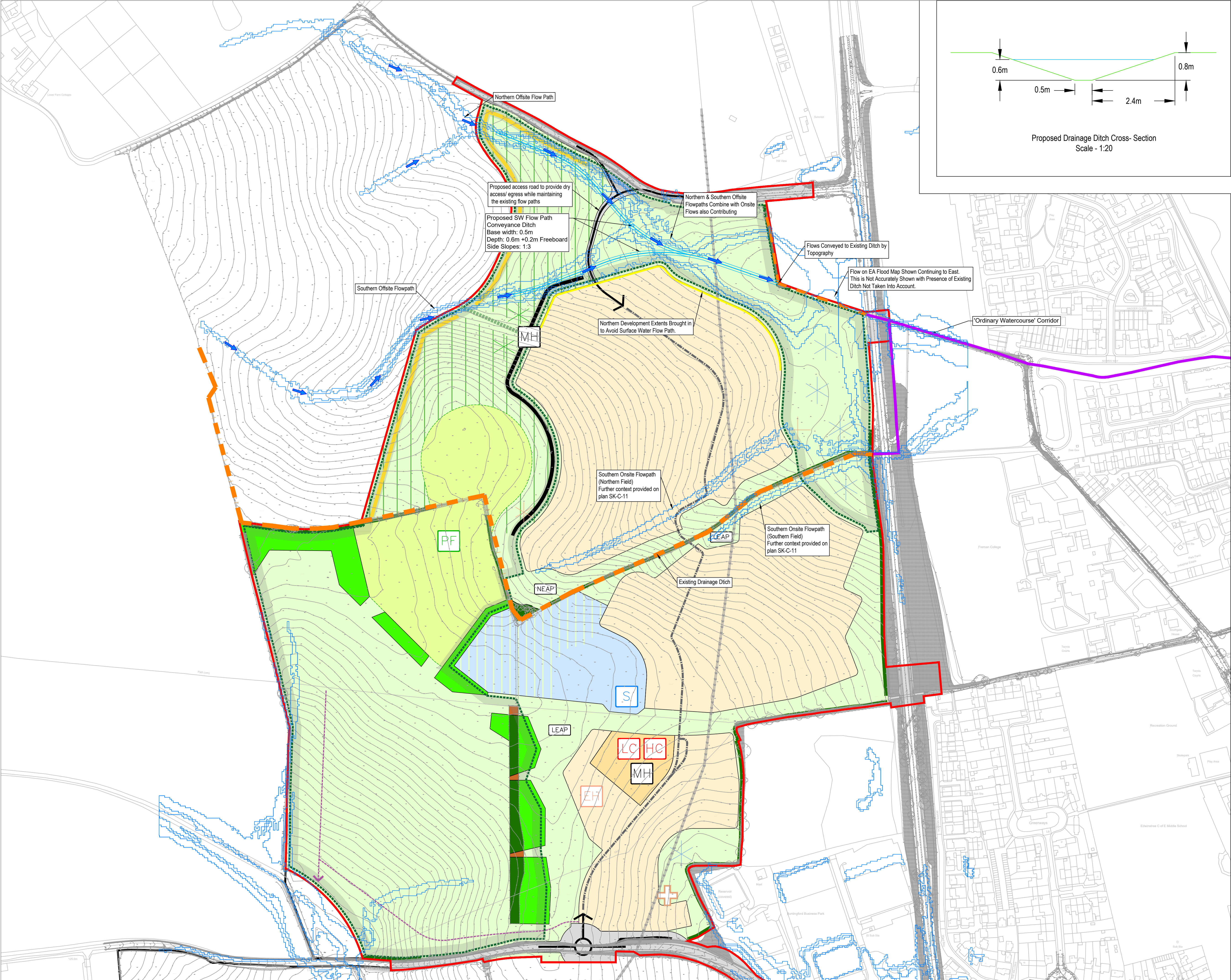
- Verges alongside main roads highlighted which could be utilised for raingardens or tree pits.
- Courtyard areas and driveways which could be constructed of permeable paving.

3.5.3 A SuDS overview plan is included in **Appendix G**.

3.5.4 Please note that at this outline planning stage the proposed masterplan is not fixed and is subject to change. The additional drainage features are shown indicatively to highlight the principals that will be applied to the development masterplan as this is taken forward to detailed design.

3.5.5 A 3m offset has been shown around the proposed attenuation basins to account for easement and maintenance requirements, notes have been added to the proposed drainage strategy drawing to highlight the easements shown.

Appendix A: Surface Water Flow Path Review Plans



- Legend
- Site Boundary
 - Ordinary Watercourse
 - Existing Drainage Ditch
 - Areas of Surface Water Flood Risk (Taken from EA Online Mapping)
 - Revised Development Parcel Extents

P2	22.05.25	Revised Land Use Plan	LE	LE
P1	22.01.54	Preliminary Issue	LE	LE
Rev	Date	Description	By	Apvd

PROJECT:
LAND NORTH OF BALDOCK ROAD,
BUNTINGFORD

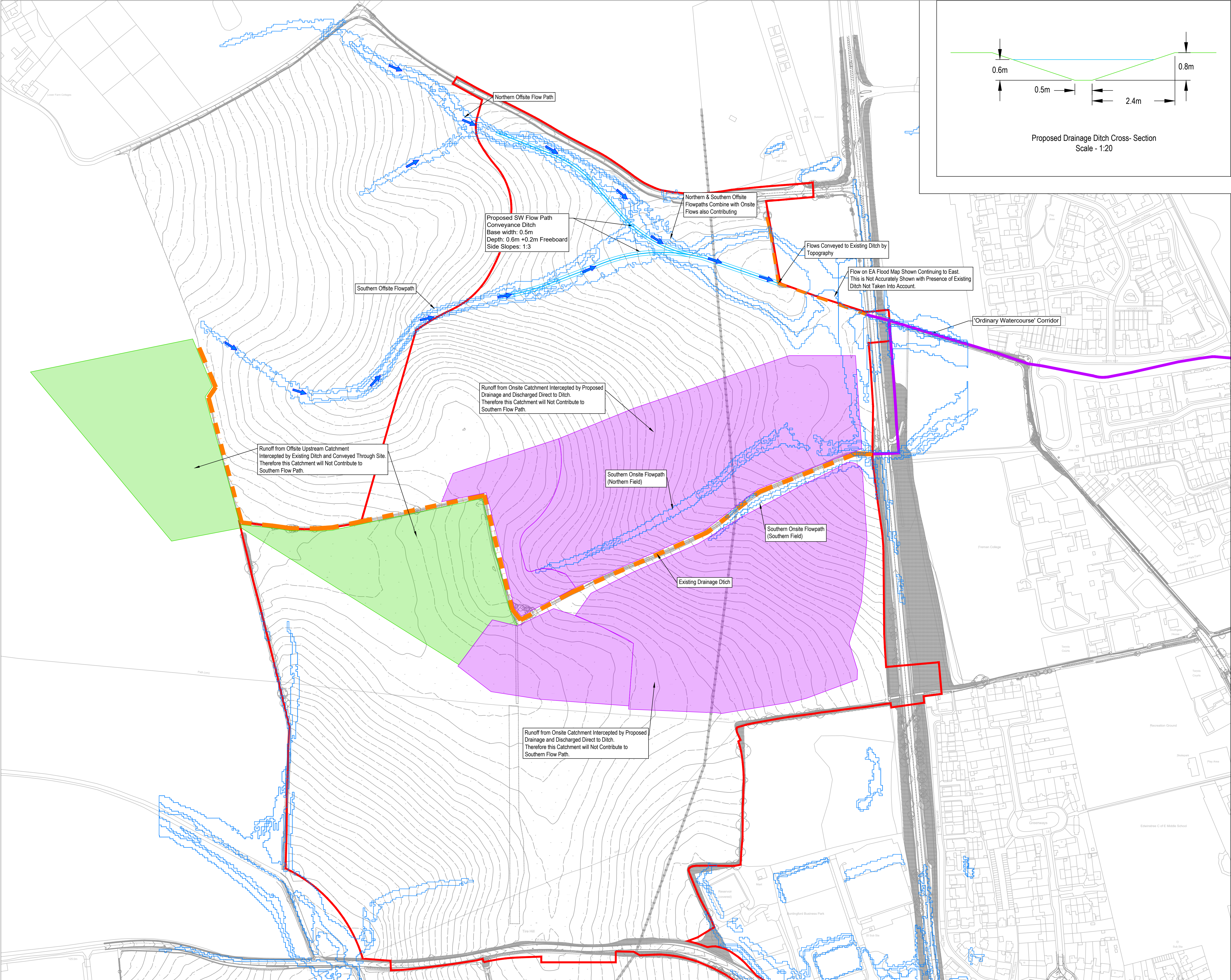
TITLE:
FLOW PATH REVIEW PLAN
(NORTHERN FLOW PATH)

CLIENT:
HALLAM LAND MANAGEMENT

SCALE@A1:
1:2000

PROJECT REF:
23161
DRAWING No:
SK-C-016
REV:
P2

Revision Referencing
P = Preliminary A = Approval T = Tender C = Construction



Legend

- Site Boundary
- Ordinary Watercourse
- Existing Drainage Ditch
- Areas of Surface Water Flood Risk (Taken from EA Online Mapping)
- Revised Development Parcel Extents

P2	18.12.24	Clarification of flow paths	LE	LE
P1	22.07.24	Preliminary Issue	LE	LE
Rev	Date	Description	By	Apvd

PROJECT:
LAND NORTH OF BALDOCK ROAD,
BUNTINGFORD

TITLE:
FLOW PATH REVIEW PLAN

CLIENT:
HALLAM LAND MANAGEMENT

SCALE@A1:
1:2000

PROJECT REF:
23161
DRAWING No:
SK-C-011
REV:
P2

Revision Referencing
P = Preliminary A = Approval T = Tender C = Construction

Appendix B: Thames Water Correspondence

From: DEVELOPER.SERVICES@THAMESWATER.CO.U
<DEVELOPER.SERVICES@THAMESWATER.CO.UK>
Sent: 27 November 2024 17:10
Subject: RE: RE: Development Enquiry

Hello,

Correct- Subject to the submission of a formal s106 and supporting information, a future connection from the development to the existing public surface water sewer network is acceptable in principal subject to the application meeting the necessary requirements.

I will however emphasise again that if this is a very large new development (100+ sites), the size of the development and the capacity of the receiving sewer will need to be considered to understand if it's feasible to take on the additional high discharge rate/flow.

Kind regards,

Jade Almeida- Waste connections - Developer Services



20 January 2025

Pre-planning enquiry: Confirmation of sufficient capacity (Surface Water Only)

Thank you for providing information on your development

Site Address: Land North of Baldock Road, Baldock Road, Buntingford, SG9 9ER

Proposed Surface Water to be discharged into either:

- SWMH TL35297454
- SWMH TL35297456

At a peak flow rate of 5.4 l/s via gravity as per Greenfield runoff rates of 2 l/s per hectare area of impermeable land.

Proposed impermeable area per connection is 26600 sqm.

We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Surface Water

In accordance with the Building Act 2000 Clause H3.3, positive connection of surface water to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. Before we can consider your surface water needs, you'll need written approval from the lead local flood authority that you have followed the sequential approach to the disposal of surface water and considered all practical means.

The disposal hierarchy being:

- 1) rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
- 2) rainwater infiltration to ground at or close to source
- 3) rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)
- 4) rainwater discharge direct to a watercourse (unless not appropriate)

- 5) controlled rainwater discharge to a surface water sewer or drain
- 6) controlled rainwater discharge to a combined sewer.

Where connection to the public sewerage network is required to manage surface water flows we will accept these flows at a discharge rate in line with CIRIA's best practice guide on SuDS or that stated within the sites planning approval.

If the above surface water hierarchy has been followed and if the flows are restricted to a total of 5.4 l/s then Thames Water would not have any objections to the proposal.

Please see our [FAQ's leaflet](#) for additional information.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you've any further questions, please contact me on 07747642636.

Yours sincerely

Nathanael Bryant Sanjaya

Developer Services – Adoptions Engineer

Office: 0800 009 3921

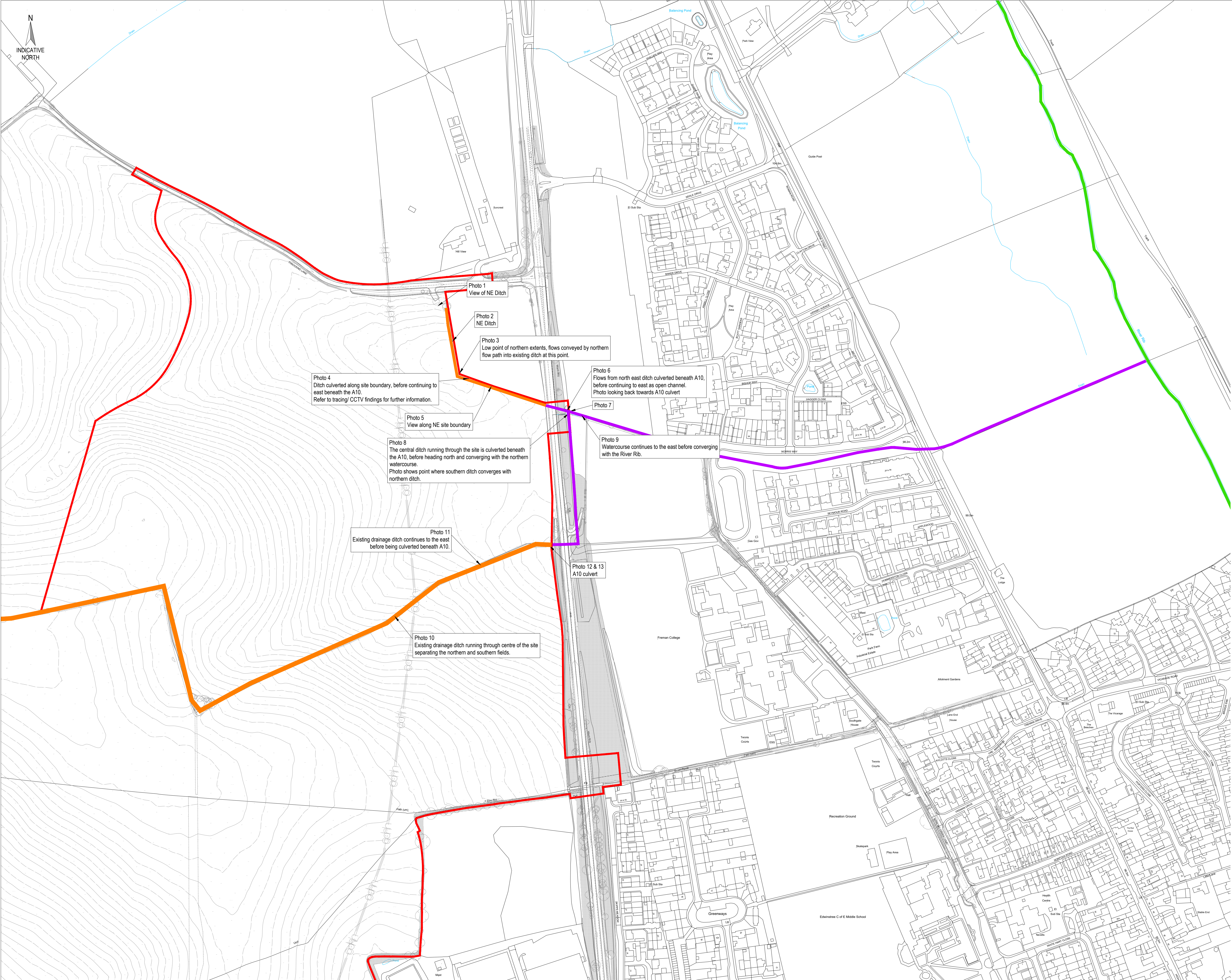
Mobile: 07747642636

Nathanaelbryant.sanjaya@thameswater.co.uk

Clearwater Court, Vastern Road, Reading, RG1 8DB



Appendix C: Downstream Connectivity Plan & Photographs



Legend

- On Site Ordinary Watercourse
- Off Site Ordinary Watercourse
- Environment Agency Main River

P2	18.12.24	Photo Refs & further information added	LE	LE
P1	22.07.24	Preliminary Issue	RJ	LE
Rev	Date	Description	By	Apvd

PROJECT:
LAND NORTH OF BALDOCK ROAD,
BUNTINGFORD

TITLE:
DRAINAGE DITCH CONNECTIVITY PLAN

CLIENT:
HALLAM LAND MANAGEMENT

SCALE@A1:
1:2000

PROJECT REF:
23161
DRAWING No:
SK-C-010

STATUS:

REV:
P2

Revision Referencing
P = Preliminary A = Approval T = Tender C = Construction

Photo 1 – Existing North-East Drainage Ditch



Photo 2 – Existing North-East Drainage Ditch



Photo 3 – Existing North-East Drainage Ditch at Site Low Point



Photo 4 – Existing North-East Drainage Ditch Culvert



Photo 5 – Existing North-East Drainage Looking Easterly



Photo 6 – Culvert Beneath A10



Photo 7 – A10 Culvert/ Ordinary Watercourse to East of A10



Photo 8 – Connection of Central Ditch to Ordinary Watercourse



Photo 9 – Downstream Ordinary Watercourse



Photo 10 – Central Drainage Ditch



Photo 11 – Central Ditch/ A10 Culvert



Photo 12 – Central Ditch A10 Culvert



Photo 13 – Central Ditch A10 Culvert



CCTV Drainage Survey

Baldock
Buntingford
SG9 9ER

CCTV DRAINAGE SURVEY REPORT





Project Information

Project Name
baldock road**Project Number****Project Date**
09/12/2024

Client

Company: Greenhatch Group
Contact: Adam Sneddon
Department: Associate Director
Street: Rowan House, Duffield Road
Town or City: Little Eaton, Derby
Post Code: DE21 5DR
Phone: 01332 830044
Email: utilities@greenhatch-group.co.uk

Site

Street: Baldock Road
Town or City: Buntingford
Post Code: SG9 9ER

Contractor

Company: Sewer Surveys UK Ltd
Contact: Simon Bennett
Department: Directors
Street: 14B Orgreave Close
Town or City: Sheffield
Post Code: S13 9NP
Phone: 0114 251 3481
Mobile: 07808 220160
Email: info@sewersurveysuk.co.uk



Section Inspection - 09/12/2024 - INLET 1X

Item No. 1	Insp. No. 1	Date 09/12/24	Time 10:14	Client's Job Ref greenhatch	Weather No Rain Or Snow	Pre Cleaned No	PLR INLET 1X
Operator KB		Vehicle OU20 FCP		Camera Forward View	Preset Length Not Specified	Criticality Grade Category C	Alternative ID Not Specified

Town or Village:	Buntingford	Inspection Direction:	Downstream	Upstream Node:	INLET 1
Road:	Baldock Road	Inspected Length:	84.93 m	Upstream Pipe Depth:	
Location:	Fields	Total Length:	84.93 m	Downstream Node:	CP 1
Surface Type:		Joint Length:	1.00 m	Downstream Pipe Depth:	
Use:	Surface water	Pipe Shape:	Circular		
Type of Pipe:	Gravity drain/sewer	Dia/Height:	600 mm		
Flow Control:	No flow control	Pipe Material:	Concrete		
Year Constructed:	Not Specified	Lining Type:	No Lining		
Inspection Purpose:	Sample survey to determine asset condition	Lining Material:	No Lining		

Comments:**Recommendations:**

Scale:	1:736	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m INLET 1							
	0.00	OF	Start node, outfall, reference: INLET 1		00:00:00		
	0.00	WL	Water level, 30% of the vertical dimension		00:00:02		
	10.88	GP	General photograph taken at this point: 1.48		00:01:12	INLET 1X_9df0df 4b-7972-4	
	21.05	GP	General photograph taken at this point: 2.25		00:02:29	INLET 1X_2d35a 7fd-a5d7-4	
	33.07	GP	General photograph taken at this point: 3.07		00:03:55	INLET 1X_19730 57a-541d-	
	55.32	GP	General photograph taken at this point		00:05:25	INLET 1X_d8d53 a9a-0a87-	
	84.93	CPF	Finish node, catchpit, reference: OUTLET 1		00:07:19		
CP 1 Depth: m							

Construction Features**Miscellaneous Features****Structural Defects****Service & Operational Observations**

STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0



Section Pictures - 09/12/2024 - INLET 1X

Item No.	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
1	Downstream	INLET 1X	greenhatch	24/130



INLET
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16_843.jpg, 00:01:12, 10.88 m
General photograph taken at this point, 1.48



INLET
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General photograph taken at this point, 2.25



INLET
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General photograph taken at this point, 3.07



INLET
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3645_099.jpg, 00:05:25, 55.32 m
General photograph taken at this point

Badlock Road
Buntingford
SG 9ER

Photo 1-OULET 1 UPSTREAM (1)



Photo2-OULET 1 UPSTREAM (2)

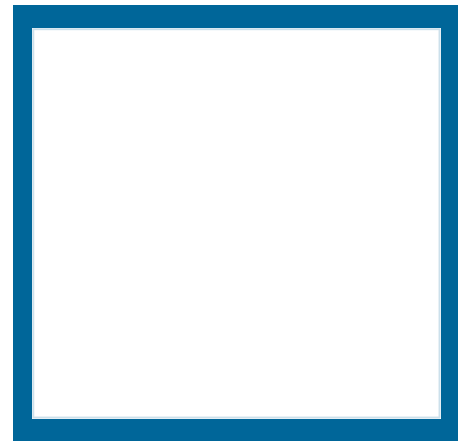
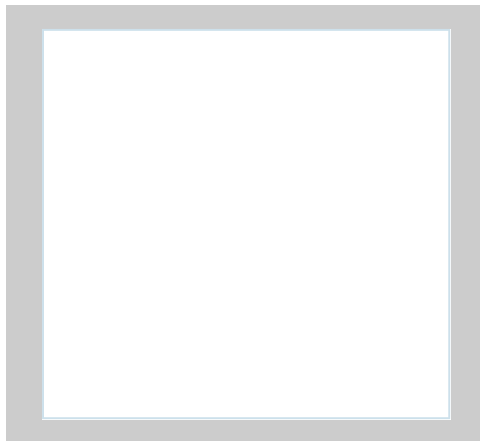


Badlock Road
Buntingford
SG 9ER
Photo 3-OUTLET 1 LOCATION



Photo 4-OUTLET 2 LOCATION





Appendix D: Capacity Calculations

Greenfield Comparison Calculations

	Catchment				
Discharge Rate (L/s)	Ex Greenfield Catchment	Development Parcel Only	Remaining Greenfield Area of Ex. Ditch Catchment	Development Parcel + Remaining Greenfield Catchment	Difference
Qbar	110.43	65.6	44.83	110.43	0.00
Q30	254	65.6	103.12	168.72	-85.28
Q100	352.29	65.6	143.02	208.62	-143.67
Q100+40%cc	493.21	65.6	200.23	265.83	-227.38
Q200	413.03	65.6	167.68	233.28	-179.75

Conclusions: This comparison shows that flows from the development do not exceed the existing greenfield Qbar rate, with significant betterment provided in the Q30, Q100, Q100 + CC and the Q200 event. It is therefore considered that the downstream ordinary watercourse is able to accept the discharge from the proposed development.

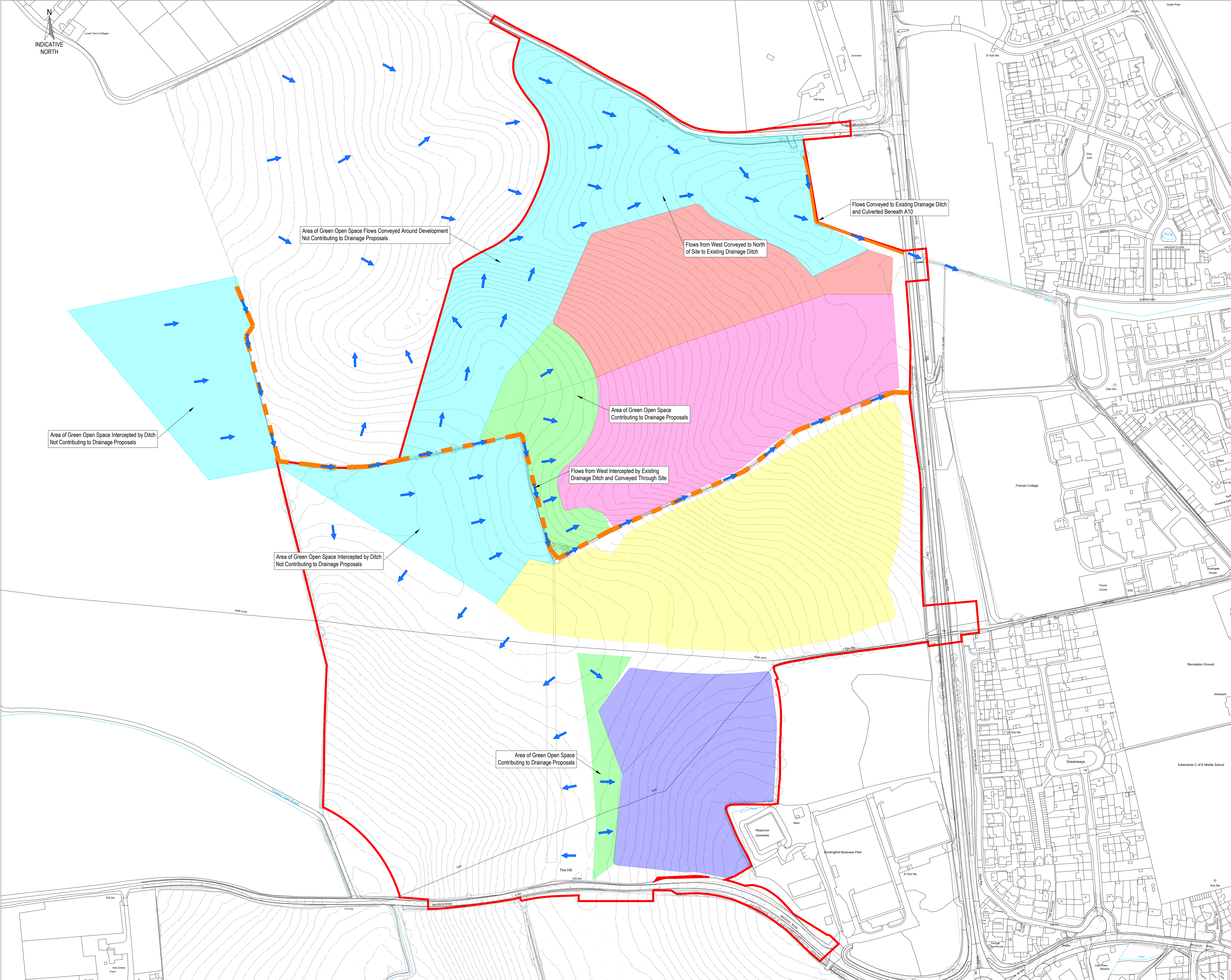
A10 Culvert Capacity Calculations Central Ditch/ Culvert

	Discharge Rate (l/s)				
Catchment Description	Qbar	Q30	Q100	Q100+40%cc	Q200
Offsite greenfield catchment	10.96	25.21	34.97	48.958	41
Remaining onsite greenfield catchment	15.8	36.33	50.39	70.546	59.08
Development discharge	65.6	65.6	65.6	65.6	65.6
A10 Catchment	9.84	23.30	29.63	41.49	33.58
Total	102.20	150.44	180.59	226.59	199.26
Culvert capacity (Based on 1000mm Dia. Pipe @1:30 Gradient)	4706	4706	4706	4706	4706
Capacity Check	ok	ok	ok	ok	ok

Conclusions: It can be seen from the table above that the existing culvert has sufficient capacity to accommodate the flows from the greenfield catchment and development parcel.

Appendix E: Land Drainage Plan

Appendix F: Proposed Drainage Strategy Plan, Calculations & Drainage Catchment Plan



Legend

- Catchment 1
- Catchment 2
- Catchment 3
- Catchment 4
- Open Green Space Contributing to Drainage Proposals
- Open Green Space Not Contributing to Drainage Proposals

P3	23.01.25	Updated catchments	LE	LE
P2	18.12.24	Updated Catchments	LE	LE
P1	22.07.24	Preliminary Issue	RJ	LE
Rev	Date	Description	By	Apvd

PROJECT:
LAND NORTH OF BALDOCK ROAD,
BUNTINGFORD

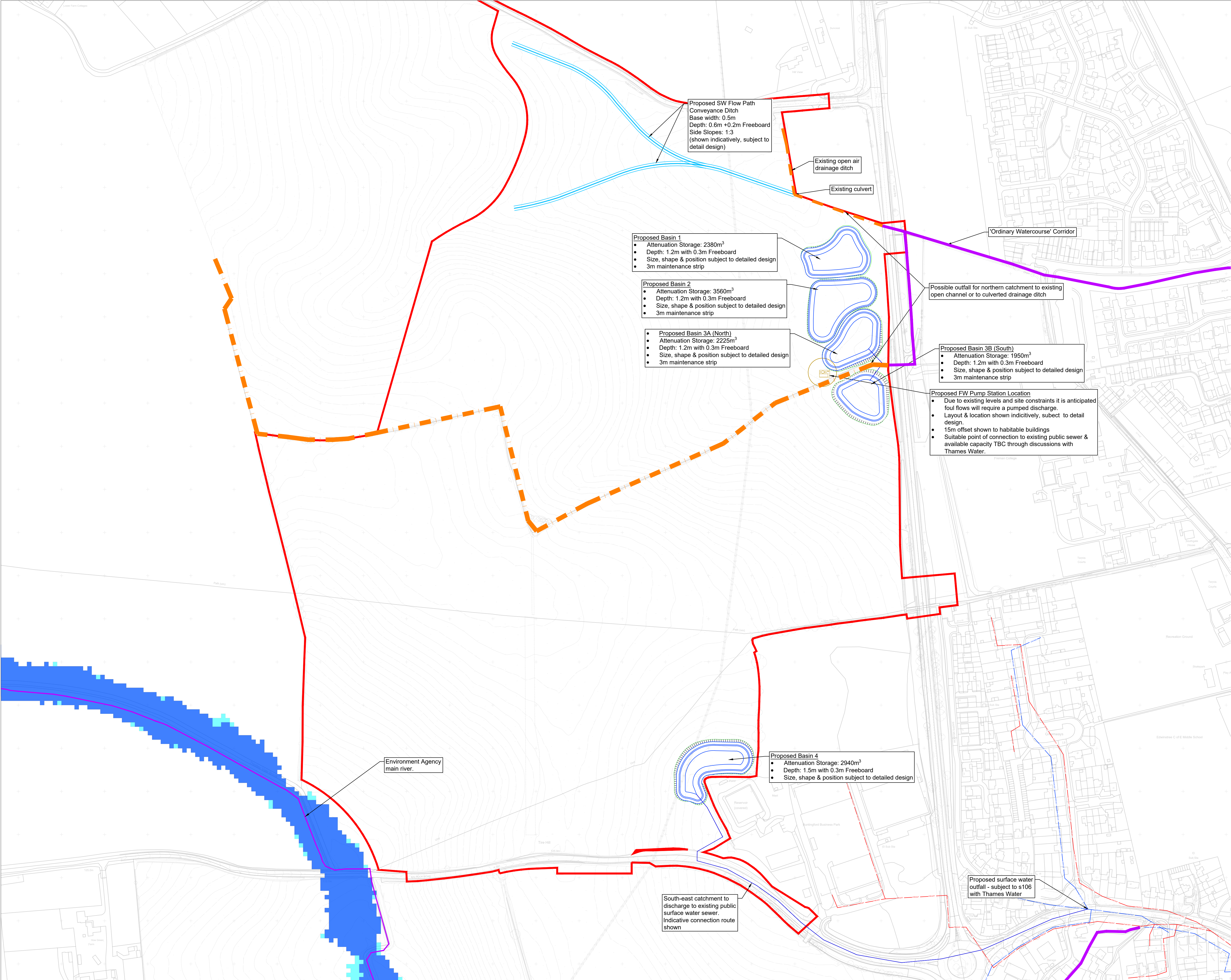
TITLE:
DRAINAGE CATCHMENT PLAN

CLIENT:
HALLAM LAND MANAGEMENT

SCALE@A1:
1:2000

PROJECT REF: 23161	STATUS: P3
DRAWING No: SK-C-009	REV: P3

Revision Referencing
P = Preliminary A = Approval T = Tender C = Construction



Legend

Proposed Attenuation Basin
with Associated Grading
(1 in 100yr + 40% climate change)

Proposed Foul Pumping Station

Existing Ordinary Watercourse Corridor

Flood Zone 2

Flood Zone 3

Existing SW Sewer

Existing Foul Water Sewer

Indicative Proposed SW Sewer

Existing Drainage Ditch

Notes:

- Do not scale from this drawing.
- The location of existing sewers and other features are shown indicatively based on utility companies asset plans. The location and details of any existing apparatus/features should be further investigated prior to commencement of works onsite.
- Fluvial flood zones and surface water flood risk zones shown based on EA flood maps. These zones are subject to change following further investigation of EA flood data.
- No detailed ground investigation information data is available for the site.
- BGS data shows the site is underlain with Chalk of the Lewes Nodular Chalk Formation and Seaford Chalk Formation, which may be suitable for infiltration. Full infiltration testing in accordance with BRE Digest 365 guidance is required onsite to check infiltration feasibility.
- If infiltration is found not to be a viable option, the preferred drainage strategy for the development is to discharge to the existing watercourses/ public sewer within the site and surrounding area, subject to approval from the LLFA, with surface water run-off from the development restricted to a pre-development greenfield Qbar rate.
- Indicative attenuation basins shown have been sized to contain the 1 in 100 year including 40% CC allowance event.
- The proposed basins are shown indicatively with grading shown tying into existing levels. The size, shape and position is subject to detail design.
- An indicative overview of the drainage strategy is shown based on currently available information. This is subject to change and further assessment as the site is taken forward and more detailed information becomes available.
- There is a considerable level difference in parts of the site, proposed basins have been shown to try to reflect the existing topography. However, significant earthworks may be required in the construction of the basins.
- Due to the existing topography of the site, it is anticipated that foul flows from northern parcel of the site will require a pumped connection to the proposed point of connection on the public sewer.
- For the attenuation option, it is anticipated that surface flows from the development will be conveyed to a suitable point of connection to the existing public sewer network or a local watercourse located within close proximity to the site. This is subject to approval with Thames Water/ LLFA.

P9	16.01.25	2Is SE Basin	LE	LE
P8	18.12.24	Updated LLFA response v2	LE	LE
P7	12.11.24	Updated SE basin/ North Ditch	LE	LE
P6	06.11.24	Updated basins per LLFA coms	LE	LE
P5	24.09.24	Updated Basin 4	RJ	LE
P4	22.07.24	Updated to LLFA comments	RJ	LE
P3	14.05.24	Updated Redline Plan	LE	LE
P2	22.03.24	Updated redline plan	LE	LE
P1	15.02.24	Preliminary Issue	MD	LE

Rev

Date

Description

By

Apvd

PROJECT:
LAND NORTH OF BALDOCK ROAD,
BUNTINGFORD

TITLE:
PRELIMINARY DRAINAGE LAYOUT

CLIENT:
HALLAM LAND MANAGEMENT

SCALE@A1:
1:2000

PROJECT REF:
23161

DRAWING No:
SK-C-007

REV:
P9

Revision Referencing
P = Preliminary A = Approval T = Tender C = Construction

Bristol, Cardiff, Plymouth, Winchester
St James Court, St James Parade, Bristol BS1 3LH

jubb.uk.com
+44(0)117 922 6266

Project:	Date: 18/07/2024			
	Designed by:	Checked by:	Approved By:	
Report Details:	Company Address:			
Type: Inflows Storm Phase: Phase				



Pond - TAD 1

Type : Catchment Area

Area (ha)	2.93
-----------	------

Dynamic Sizing

Runoff Method	Time Area Diagram
Summer Volumetric Runoff Coefficient	1.000
Winter Volumetric Runoff Coefficient	1.000
Percentage Impervious (%)	100
Time (mins)	Area (ha)
4	1.00
8	1.00
12	0.93

Project:	Date: 18/07/2024		
	Designed by:	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		





Pond

Type : Pond

Dimensions

Exceedance Level (m)	1.500
Depth (m)	1.500
Base Level (m)	0.000
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	0.00
Total Volume (m³)	3570.000

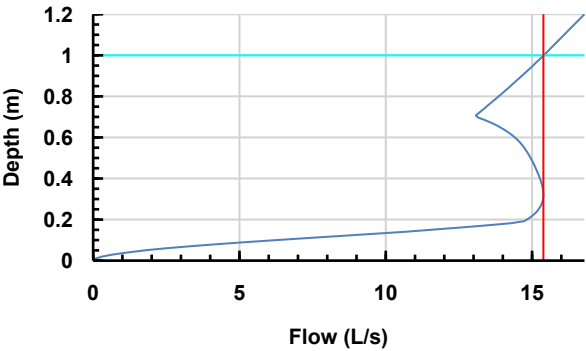
Depth (m)	Area (m²)	Volume (m³)
0.000	2380.00	0.000
1.000	2380.00	2380.000

Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Hydro-Brake®
Invert Level (m)	0.000
Design Depth (m)	1.000
Design Flow (L/s)	15.4
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☒

Unit Reference	SHE-0177-1540-1000-1540
----------------	-------------------------



Project:	Date: 18/07/2024			
	Designed by:	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 (%)	0
Junction Flood Risk Margin (mm)	0
Perform No Discharge Analysis	☐

Rainfall	
Rainfall Details FEH	Type: FEH
Site Location	GB 536400 228400 TL 36400 28400
Rainfall Version	2013
Data Type	Catchment
Summer	☒
Winter	☒

Return Period

Return Period (years)	Increase Rainfall (%)
2.0	0.000
30.0	0.000
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

Project:	Date: 18/07/2024			
	Designed by:	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. Residant Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	Rainfall Details FEH: 100 years: +40 %: 720 mins: Winter	1.000	1.000	1.000	1.000	167.2	2379.771	0.000	0.000	15.4	1101.914	33.340	OK

Project: Land North of Baldock Road Catchment 2	Date: 18/07/2024			
	Designed by:	Checked by:	Approved By:	
Report Details: Type: Inflows Storm Phase: Phase	Company Address:			



Pond - TAD 1

Type : Catchment Area

Area (ha)	4.39
-----------	------

Dynamic Sizing

Runoff Method	Time Area Diagram
Summer Volumetric Runoff Coefficient	1.000
Winter Volumetric Runoff Coefficient	1.000
Percentage Impervious (%)	100
Time (mins)	Area (ha)
4	1.00
8	1.50
12	1.89

Project: Land North of Baldock Road Catchment 2	Date: 18/07/2024		
	Designed by:	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		





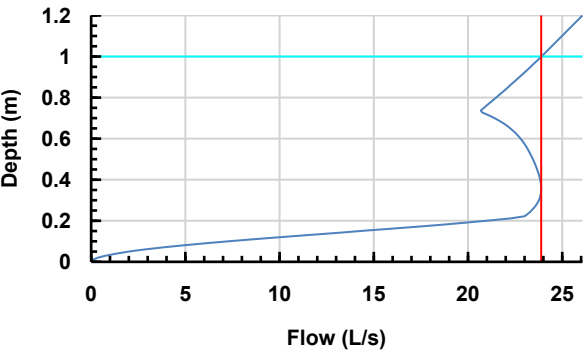
Pond

Type : Pond

Dimensions		
Exceedance Level (m)	1.500	
Depth (m)	1.500	
Base Level (m)	0.000	
Freeboard (mm)	0	
Initial Depth (m)	0.000	
Porosity (%)	100	
Average Slope (1:X)	0.00	
Total Volume (m³)	5340.000	
Depth (m)	Area (m²)	Volume (m³)
0.000	3560.00	0.000
1.000	3560.00	3560.000

Inlets	
Inlet	
Inlet Type	Point Inflow
Incoming Item(s)	Pond - TAD 1
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets	
Outlet	
Outgoing Connection	(None)
Outlet Type	Hydro-Brake®
Invert Level (m)	0.000
Design Depth (m)	1.000
Design Flow (L/s)	23.9
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☒
Unit Reference	SHE-0215-2390-1000-2390



Project:	Land North of Baldock Road Catchment 2			Date:	18/07/2024			
Report Title:	Rainfall Analysis Criteria			Designed by:	Checked by:	Approved By:		
			Company Address:					

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	0
Perform No Discharge Analysis	☐

Rainfall	
Rainfall Details FEH	Type: FEH
Site Location	GB 536400 228400 TL 36400 28400
Rainfall Version	2013
Data Type	Catchment
Summer	☒
Winter	☒

Return Period

Return Period (years)	Increase Rainfall (%)
2.0	0.000
30.0	0.000
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

Project: Land North of Baldock Road Catchment 2		Date: 18/07/2024			
		Designed by:	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	Rainfall Details FEH: 100 years: +40 %: 720 mins: Winter	0.999	0.999	0.999	0.999	250.4	3558.179	0.000	0.000	23.9	1688.181	33.367	OK

Project: Land North of Baldock Road Catchment 3	Date: 18/07/2024			
	Designed by:	Checked by:	Approved By:	
Report Details: Type: Inflows Storm Phase: Phase	Company Address:			



Pond - TAD 1

Type : Catchment Area

Area (ha)	5.09
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Dynamic Sizing

Runoff Method	Time Area Diagram
Summer Volumetric Runoff Coefficient	1.000
Winter Volumetric Runoff Coefficient	1.000
Percentage Impervious (%)	100
Time (mins)	Area (ha)
4	1.00
8	1.80
12	2.29

Project: Land North of Baldock Road Catchment 3	Date: 18/07/2024		
	Designed by:	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		



Pond

Type : Pond

Dimensions

Exceedance Level (m)	1.500
Depth (m)	1.500
Base Level (m)	0.000
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	0.00
Total Volume (m³)	6262.500

Depth (m)	Area (m²)	Volume (m³)
0.000	4175.00	0.000
1.000	4175.00	4175.000

Inlets

Inlet

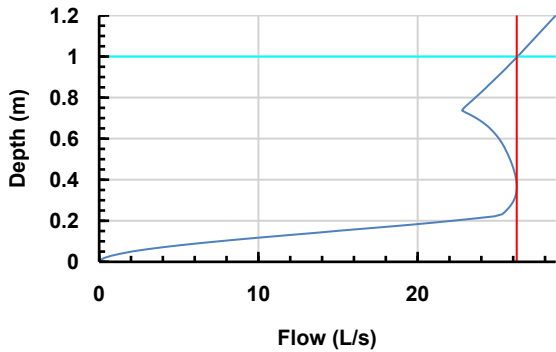
Inlet Type	Point Inflow
Incoming Item(s)	Pond - TAD 1
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Hydro-Brake®
Invert Level (m)	0.000
Design Depth (m)	1.000
Design Flow (L/s)	26.3
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☒

Unit Reference	SHE-0224-2630-1000-2630
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Project:	Land North of Baldock Road Catchment 3			Date:	18/07/2024			
Report Title:	Rainfall Analysis Criteria			Designed by:	Checked by:	Approved By:		
			Company Address:					

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	0
Perform No Discharge Analysis	☐

Rainfall		
Rainfall Details FEH		Type: FEH
Site Location	GB 536400 228400 TL 36400 28400	
Rainfall Version	2013	
Data Type	Catchment	
Summer	☒	
Winter	☒	

Return Period

Return Period (years)	Increase Rainfall (%)
2.0	0.000
30.0	0.000
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

Project: Land North of Baldock Road Catchment 3		Date: 18/07/2024			
		Designed by:	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	Rainfall Details FEH: 100 years: +40 %: 720 mins: Winter	1.000	1.000	1.000	1.000	290.3	4174.085	0.000	0.000	26.3	1854.878	33.348	OK

Project: Land North of Baldock Road Catchment 4	Date: 18/07/2024			
	Designed by:	Checked by:	Approved By:	
Report Details: Type: Inflows Storm Phase: Phase	Company Address:			



Pond - TAD 1

Type : Catchment Area

Area (ha)	3.04
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Dynamic Sizing

Runoff Method	Time Area Diagram
Summer Volumetric Runoff Coefficient	1.000
Winter Volumetric Runoff Coefficient	1.000
Percentage Impervious (%)	100
Time (mins)	Area (ha)
4	1.00
8	1.00
12	1.04

Project: Land North of Baldock Road Catchment 4		Date: 18/07/2024			
Report Details: Type: Stormwater Controls Storm Phase: Phase		Designed by:	Checked by:		Approved By:
		Company Address:			



Pond

Type : Pond

Dimensions

Exceedance Level (m)	1.500
Depth (m)	1.500
Base Level (m)	0.000
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	0.00
Total Volume (m³)	4425.000

Depth (m)	Area (m²)	Volume (m³)
0.000	2950.00	0.000
1.000	2950.00	2950.000

Inlets

Inlet

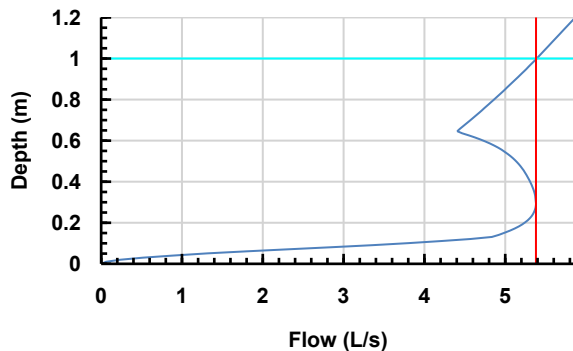
Inlet Type	Point Inflow
Incoming Item(s)	Pond - TAD 1
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Hydro-Brake®
Invert Level (m)	0.000
Design Depth (m)	1.000
Design Flow (L/s)	5.4
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☒

Unit Reference SHE-0109-5400-1000-5400



Project:	Land North of Baldock Road Catchment 4			Date:	18/07/2024			
Report Title:	Rainfall Analysis Criteria			Designed by:	Checked by:	Approved By:		
			Company Address:					

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	0
Perform No Discharge Analysis	☐

Rainfall	
Rainfall Details FEH	Type: FEH
Site Location	GB 536400 228400 TL 36400 28400
Rainfall Version	2013
Data Type	Catchment
Summer	☒
Winter	☒

Return Period

Return Period (years)	Increase Rainfall (%)
2.0	0.000
30.0	0.000
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

Project: Land North of Baldock Road Catchment 4		Date: 18/07/2024			
		Designed by:	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	Rainfall Details FEH: 100 years: +40 %: 2160 mins: Winter	0.997	0.997	0.997	0.997	67.8	2939.922	0.000	0.000	5.4	1195.984	33.561	OK

Appendix G: SuDS Overview Plan

