FORTEM
Civil Engineering Consultants Ltd

Proposed Residential Development Land off Malting Lane, Donington Phase 2

Flood Risk Assessment

October 2020

Minster Property Group

Report

This report consists of a Flood Risk Assessment and Drainage Strategy, produced to support the proposed Phase 2 residential development of the site located off Malting Lane, Donington. It has been produced by FORTEM Civil Engineering Consultants Ltd for Minster Property Group.

Revision History

Rev Ref	Date	Amendments	By	Chk'd
1	20.10.2020	First Issue	BS	ADC

Contract

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Executive Summary

Site Description

The proposed development is located off Malting Lane, Donington. The Phase 2 site area is 1.24ha and is located to the west of and accessed through Phase 1 (1.32ha, Reserved Matters Application H04-0268-20). The current use of the land is grassland paddock.

There is a 150mm foul sewer located in Malting Lane to the east of Phase 1 and a 225mm rising main located south of Phase 2. Unnamed watercourses are located on the northern and western boundaries and to the south of Phase 2.

Proposed Development

It is proposed to construct 32 residential dwellings within Phase 2.

Flood Risk

Environment Agency Flood Mapping confirms the site is located in Flood Zone 3. However a more detailed assessment of flood risk undertaken as part of the South Holland Strategic Flood Risk Assessment confirms the risk of fluvial or tidal flooding as low.

The following mitigation measures are required:

- Finished floor levels to be set 300mm above the surrounding ground levels;
- Blockage/exceedance events should be considered ensuring the proposed development and surrounding areas are not put at risk from overland flows.

Drainage

The foul and surface water drainage principles for Phase 2 have been established as part of the Phase 1 scheme (H04-0268-20).

The surface water discharge from Phase 2 is to discharge to the Phase 1 drainage system (Phase 1/2 restricted discharge, 18l/s). The attenuation basin for Phase 1 is to be increased by 333m^3 to accommodate the storage for the 1in100 year + climate change event (for Phase 1&2).

It is proposed to discharge the foul water flows from Phase 2 to the Phase 1 foul water pumping station. Flows from Phase 1&2 are to be restricted to 3.8l/s.

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	South Holland Flood Risk for Fluvial and Tidal (Extract)

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1. Introduction

1.1. Report Background

1.1.1. This report has been produced to support the Reserved Matters Planning Application by Minster Property Group for the proposed Phase 2 residential development off Malting Lane, Donington. It has been produced in accordance with the National Planning Policy Framework (NPPF) and guidance documents produced by Lincolnshire County Council and South Holland District Council.

1.1.2. As part of the Outline Planning Approval (H04-0244-16) a Flood Risk Assessment produced by Fisher German was submitted and approved. The drainage principles established within the report have been developed to provide detailed foul and surface water drainage solutions.

1.1.3. As part of the Phase 1 Reserved Matters Application the FORTEM Flood Risk Assessment was produced (1087-R001-V1). The Phase 2 development is based upon the principles developed within the Phase 1 report.

1.1.4. The study consists of data collection, consultation and review with regulatory bodies and third parties in relation to flood risk and drainage. FORTEM cannot guarantee the reliability of third party information and/or changes in consultee conclusions/responses.

1.2. Site Description

1.2.1. The site is located off Malting Lane, Donington, OS grid reference TF 20193 35214, see Appendix A for Location Plan. Details of the site are tabled below:

Site Area		1.24ha (Phase 2).
Topography		There is minimal level change across the site with typical levels of 2.23m AOD, see appendix A for topographical survey.
Land Use		The proposed development site is currently grassland paddock.
Boundaries	**North:**	Watercourse extending to existing dwellings.
	South:	Commercial building and associated hardstanding.
	East:	Land proposed for phase 1 residential development (currently grassland paddock).
	West:	A watercourse extending to a commercial haulage yard.
Watercourses		Existing unnamed open watercourses are located on the northern and western boundary. There is a further unnamed watercourse located south of the Phase 2 boundary. The watercourses fall under the maintenance of Black Sluice Internal Drainage Board (IDB). See Appendix A for drawing 1087-101 - Existing Drainage Networks.
Public Sewers		Anglian Water confirm the existence of a 150mm foul water sewer located in Malting Lane at the Phase 1 development access and a 225mm rising main to the south of the Phase 2 boundary. Anglian Water record drawings confirm the nearest surface water sewer is located in Arnhem Way approximately 100m south-east of the proposed Phase 2 development boundary. See Appendix A for drawing 1087-101 - Existing Drainage Networks.
Other Drainage		Other than the watercourse covered above, there are no other known systems on or serving the site. It is anticipated that parts of the site could be served by land drains.

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Ground	The Hydrock Desk Study and Ground Investigation Report MLD-HYD-XX-GI-RP-GE-1001 Rev P2 dated August 2017 confirms Made Ground overlaying natural Tidal Deposits (silty CLAY) overlaying Glacial Till (silty CLAY). Infiltration testing was undertaken in four trial pit locations with insufficient infiltration to allow a rate to be calculated indicating that infiltration drainage is not suitable for the proposed development.

1.3. Proposed Development

1.3.1. It is proposed to construct 32 No residential dwellings within Phase 2, see Appendix B for the JGA Architecture & Planning Feasibility Site Layout drawing 20017 001 P01. It is proposed to submit a Reserved Matters Application for Phase 2 in accordance with the previously granted Outline approval in 2017, H04-0244-16 (covering Phase 1&2).

1.3.2. The Phase 2 development is to be accessed through Phase 1 (H04-0268-20).

1.4. Consultation

1.4.1. Consultation with the relevant consultees has been undertaken, see summary below:

Consultee	Response Summary
South Holland District Council	SHDC were consulted as part of the Outline Planning (H04-0244-16), where the principles proposed as part of the Reserved Matters application were established.
Environment Agency (EA)	The EA were consulted as part of the Outline Planning (H04-0244-16) and confirmed no objection to the development (Phase 1 and 2) and no at risk of flooding.
Lincolnshire County Council (LCC)	LCC were consulted as part of the Outline Planning (H04-0244-16) and raised no objection to the development.
Black Sluice Internal Drainage Board (IDB)	The IDB were consulted as part of the Outline Planning (H04-0244-16). The IDB raised no objections to the Outline Planning Application and confirmed: • Surface water can discharge from the development to the watercourses located on the northern boundary of the development; • Discharge rate is to restricted in accordance with their charging schedule, but can be varied in accordance with the schedule. A development contribution is payable to the Board based on the final discharge rate and the development impermeable area.

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Anglian Water	Anglian Water were consulted as part of the Outline Application (H04-0244-16) and Reserved Matters Application for Phase 1 (H04-0268-20). Anglian Water have confirmed: • There is capacity in the foul network for the development (Phase 1 & Phase 2). The development has been granted a pumped discharge rate of 3.8l/s to the existing public foul sewer in Malting Lane. • Re-consultation with Anglian Water will be required should a surface water discharge to the public sewer be required; • There must be a 3m easement either side of the existing 225mm rising main to the south of the Phase 2 development. Anglian Water Records have been received for the site and are included in Appendix A.

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2. Sources of Flood Risk

2.1. Summary

2.1.1. Below is a summary of the sources of flood risk and the potential risk associated to the proposed development:

Source	Risk Level	Notes
Fluvial/Tidal	High (see Section 2.2)	Environment Agency Flood Maps indicated that the site is located within Flood Zone 3, high probability (1 in 100 year, 1% AEP) or greater annual probability of flooding from rivers.
Surface Water/Pluvial	Low	Environmental Agency maps confirm low risk of surface water flooding for the Phase 2 development along the northern and western boundaries and in a section on the southern boundary. See Section 2.3.
Groundwater	Low	There are no known records of any historic groundwater flooding or risk.
Sewers	Low	Based upon searches undertaken, no historic incidents have been recorded within the vicinity of the proposed development.
Other Man-Made Sources	Low	The site is not in an area at risk from a major failure of a reservoir and there are no other known artificial sources of flood risk in the area.

Copies of the Environment Agency flood maps are included in Appendix C.

2.2. Fluvial/Tidal

2.2.1. A more detailed assessment of Fluvial and Tidal flood risk has been undertaken as part of the South Holland SFRA (2017). This considers a number of scenarios:

- Flooding from the sea;
- Flooding from main rivers;
- Flooding from IDB watercourses;
- Flood Risk Management measures, including flood defences;
- Overtopping and breach of flood defences.

The published South Holland SFRA mapping is included in Appendix C. The predicted flood mapping is based upon merged flooding events/sources (Fluvial (1% AEP), Tidal (0.5% AEP) plus allowance for climate change and overtopping). An enlarged extract of the mapping for the area of the proposed development is included in Appendix C, confirming no predicted inundation for the proposed development.

2.2.2. The Environment Agency were consulted as part of the Outline Approval (H04-0244-16) and confirmed the site will be unaffected if a breach of the flood defences were to occur and as such the fluvial/tidal flood risk to the site is low.

2.2.3. As a result of the supplementary assessment work undertaken by the South Holland SFRA and the Outline consultation with the Environment Agency, Fluvial/Tidal flood risk for the proposed development can be considered as low.

2.3. Surface Water/ Pluvial

2.3.1. Environment Agency maps confirm low levels of surface water flood risk on the northern and western boundaries and in a section on the southern boundary of the site. The flood risk coincides with the watercourses along the northern and western boundaries and depressions within the existing site levels, see topographical survey in Appendix A.

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2.3.2. The redevelopment of the site will mitigate the potential surface water flood risk by reprofiling the site and providing a new foul and surface water drainage systems to current local and national design standards.

2.4. Development Mitigation

2.4.1. In accordance with the Outline Approval and this assessment the following mitigation measures are recommended:

2.4.2. Finished floor levels to be set 300mm above existing (EA Outline);

2.4.3. Within the detailed drainage design blockage/exceedance events should be considered ensuring the proposed development and surrounding areas are not put at risk from overland flows;

2.4.4. The proposed development surface water drainage is to be designed such that there is no external flooding for the 1 in 30 year event and all flows retained on site for up to the 1 in 100 year plus climate change (30%) event.

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3. Development Drainage

3.1. Existing Site Drainage

3.1.1. As covered in section 1.2 Anglian Water record drawings confirm there is an existing 150mm diameter foul water sewer located in Malting Lane at the Phase 1 development access and an existing 225mm diameter rising main to the south of the Phase 2 boundary.

3.1.2. Existing unnamed open watercourses are located on the northern and western boundaries and to the south of the Phase 2 boundary, see drawing 1087-101, Appendix A.

3.1.3. Based upon the topography of the site the existing surface water runoff discharges to unnamed watercourses on the development boundaries. In accordance with the Phase 1 development assessment, the existing greenfield runoff is 5l/s/ha.

3.2. Development Surface Water Drainage

3.2.1. The principles of the surface water drainage for the proposed development were considered as part of the Outline Planning approved Fisher German Flood Risk Assessment. The principles have been progressed as part of the report and are summarised below:

Outfall/Discharge Option **(Ranked in order of Preference)**	✓/×	**Notes**
1. Infiltration	×	Infiltration testing undertaken as part of the Hydrock Desk Study and Ground Investigation Report MLD-HYD-XX-GI-RP-GE-1001 Rev P2 confirms infiltration drainage is not suitable for the development.
2. Discharge to Watercourse	✓	Existing open watercourses are located along the northern and western boundary of the site. Consultation with Black & Sluice IDB confirms surface water discharge to the open watercourses is acceptable (in accordance with the payment schedule).
3. Discharge to Public Surface Water Sewer	×	There is a surface water sewer located in Arnhem Way, approximately 100m south-east from the Phase 2 development boundary. There is no known historic connectivity to the system and the developer has no access rights to cross third-party land. Discharge to public sewer is not considered suitable for the development.
4. Discharge to Public Combined Sewer	×	No combined sewers within the vicinity of the site.

3.2.2. In accordance with the findings above and the Phase 1 development, the surface water runoff for the Phase 2 development is to discharge to the unnamed watercourse on the northern boundary (via Phase 1 network).

3.2.3. The runoff from Phase 2 is to be collected in a new adoptable sewer system, before discharging to the Phase 1 surface water sewer system, with the discharge for the combined Phase 1/2 development restricted to 18l/s (discharge in accordance with Phase 1 FRA). For details of the proposed surface water drainage arrangement, see drawing 1087-102 – Proposed Drainage Strategy.

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3.2.4. The Phase 1 attenuation pond is to be extended to accommodate the inclusion of the Phase 2 runoff. Based upon a discharge rate of 18l/s, the Phase 1 attenuation (242m^3) needs to be increased by 334m^3 (total Phase 1/2 attenuation 576m^3). Attenuation is sized such that there is no external flooding for the 1 in 30 year event and all flows retained on site for up to the 1 in 100 year + climate change event, see Appendix B for attenuation calculations and drawing 1087-102.

3.3. Development Foul Water Drainage

3.3.1. It is proposed to discharge the foul water flows from Phase 2 to the Phase 1 pumping station.

3.3.2. The foul water flows from the Phase 1 pumping station are to discharge to the 150mm foul drainage system in Malting Lane. The peak foul flows for Phase 1/2 is to be 3.8l/s (based upon Anglian Water approval).

3.4. Maintenance

3.4.1. It is proposed for both the foul and surface water drainage networks to be adopted by Anglian Water under a Section 104 agreement. Therefore the long term maintenance of the adoptable drainage system will be the responsibility of Anglian Water.

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4. Conclusion

4.1. Flood Risk

4.1.1. Environment Agency Flood Mapping confirms the site is located in Flood Zone 3. However a more detailed assessment of flood risk undertaken as part of the South Holland Strategic Flood Risk Assessment confirms the risk of fluvial or tidal flooding as low.

4.1.2. All other forms of flood risk are low.

4.1.3. The following mitigation measures are required:

- Finished floor levels to be set 300mm above the surrounding ground levels;
- Blockage/exceedance events should be considered ensuring the proposed development and surrounding areas are not put at risk from overland flows.

4.2. Drainage

4.2.1. The surface water discharge from Phase 2 is to discharge to the Phase 1 drainage system (Phase 1/2 restricted discharge of 18l/s).

4.2.2. The attenuation basin for Phase 1 is to be increased by 333m^3 to accommodate the storage for the 1in100 year + climate change event (Phase 1&2 total storage 576m^3).

4.2.3. It is proposed to discharge the foul water flows from Phase 2 to the Phase 1 pumping station. Flows from Phase 1&2 are to be restricted to 3.8l/s.

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Appendix A **Existing Site**

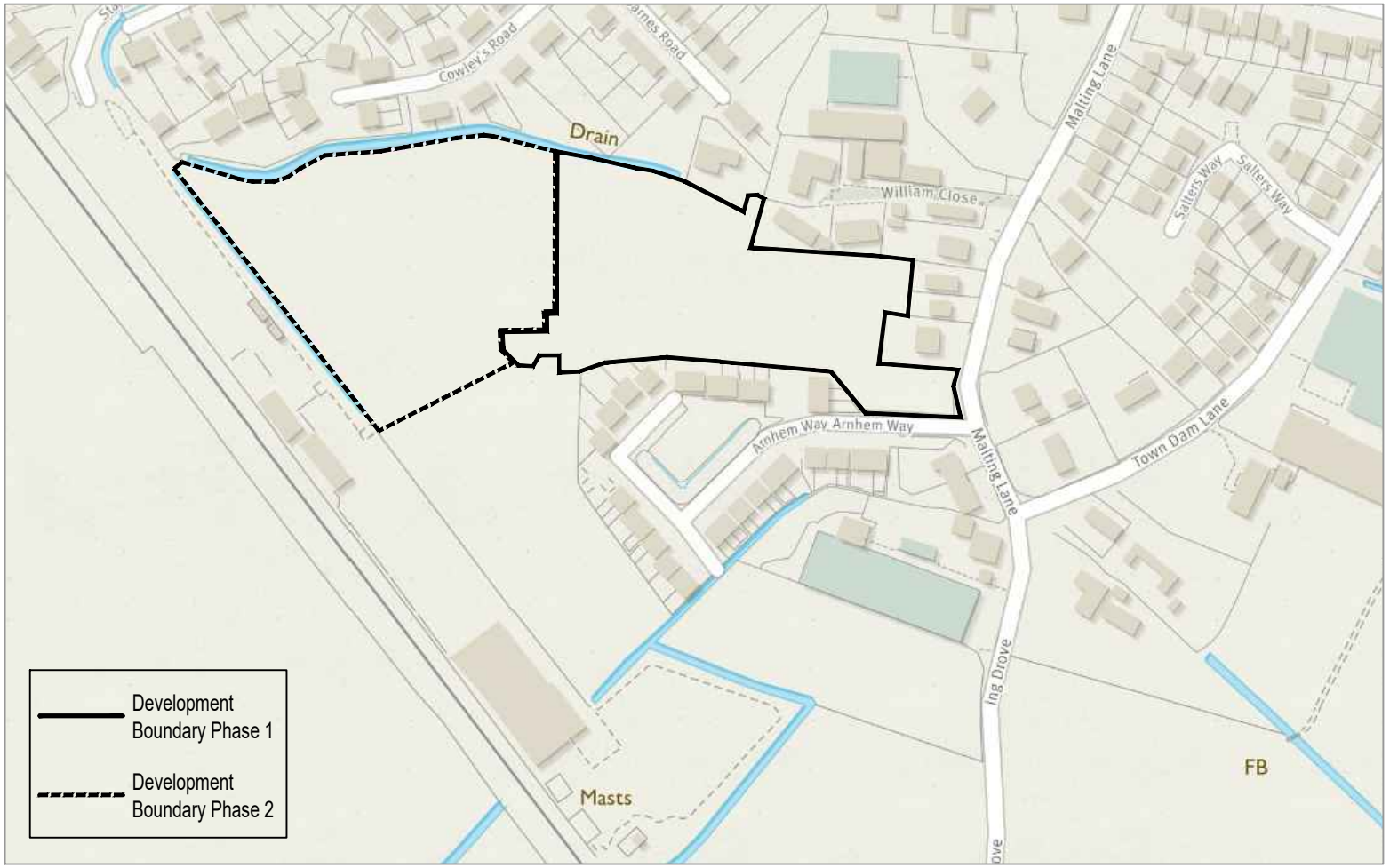
Site Location Plan

GP Surveying drawing S219 579 - Site Survey

Anglian Water Sewer Records

Drawing 1087-101 – Existing Drainage Networks

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MALTING LANE, DONINGTON
DEVELOPMENT LOCATION PLAN
EXTRACT TAKEN 22.01.2020 : NTS

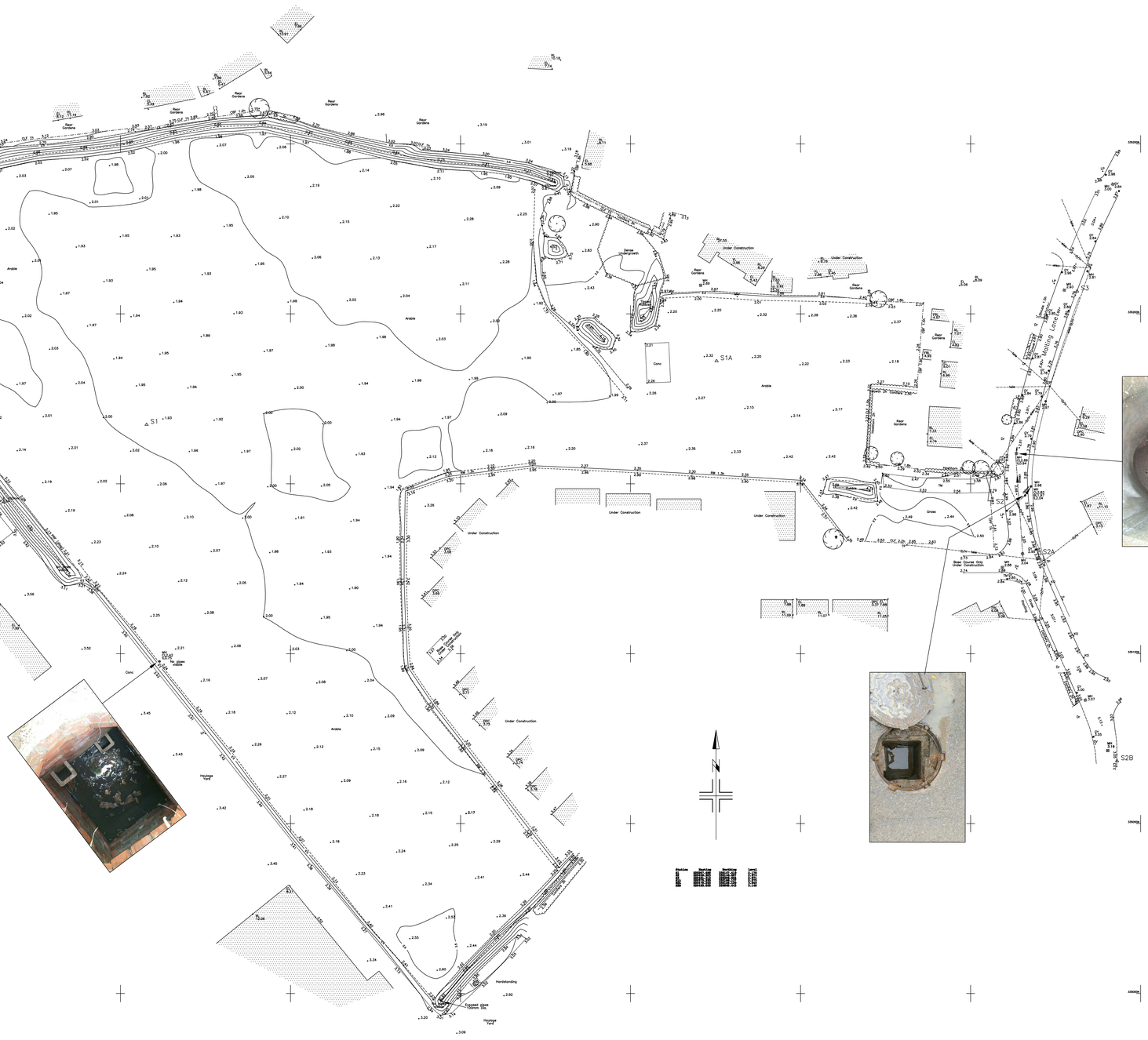
A0

STANDARD ABBREVIATIONS

AV	AIR VALVE	PSP	PERIMETRIC SPOILING MARKER
BOL	BOLLARD	PWF	POST & WIRE FENCE
BS	BRITISH STANDARD	RF	RAILWAY FENCE
BTM	BRITISH TELECOM 'A'	RSF	POST & RAIL FENCE
BWF	BARBED WIRE FENCE	RL	REDUCED LEVEL
CAP	CAPSTAN	RP	RODDING POINT
CBF	CLOSE BOARDED FENCE	RSJ	ROLLED STEEL JOIST
CCF	CONCRETE CRIB FENCE	RSJ	ROLLED STEEL JOIST
CL	CABLE MARKER	SCH	SCHEDULE
CP	CONCRETE POST	SCW	SCREW PILE
CP	CATCH PIT	SL	SLOPE LEVEL
CPF	CLOSE BOARD PANEL FENCE	SP	SOIL PIPE
CTL	CENTRE TOP LEVEL	SPP	SURFACE PIPE
DPMH	DRAINAGE MANHOLE	SPP	SURFACE WATER PLATE
DW	DRAIN WELL	SW	SIDE WALL
EB	ELECTRIC BOX	TB	TRIAL BOX
EC	EARTH EDGE COURSE	TCH	TRENCHING
EW	EARTH RETAINING WALL	TP	TELEGRAPH POLE
EX	EXCAVATION	TV	TELE. & T.V. DUCT PIPE
FC	FENCE	TW	TELEPHONE
FP	FLOWING WELL	TWC	TELEPHONE CALL BOX
FPL	FLOWING WELL LEVEL	TWP	TELEPHONE POLE
FW	FOUL WATER	UL	UNDERGROUND LIGHTS
FWM	FOUL WATER MANHOLE	UP	UTILITY POLE
FWP	FOUL WATER POLE	VA	VENTILATING SHAFT
GV	GAS VALVE	VA	TRANSFORMER
HH	HAND HOLE	WB	WATER BOARD
HW	HEDGE WOOD	WC	WATER CO. LPT
IC	INSPECTION CHAMBER	WM	WATER MAIN
IL	INVERT LEVEL	WM	WATER METER
KP	KERB PAD FENCE	WO	WATER OUT
LP	LAMP POST	WT	WATER TUP
MH	MANHOLE	WV	WATER VALVE
NH	NEW HOLE	WVC	WATER VALVE CHAMBER
OH	OVERHEAD	WVH	WATER VALVE HEADSTONE
PC	PIPE CRADLE	WW	WATER WELL
PF	POST & RAIL FENCE	WWF	WIRE NETTING FENCE
PL	PIPE LINE	YC	YARD GULLY
PO	PIPE OUTLET	YD	YARD DRAIN
PP	POWER POLE		
CPS	CONCRETE PANEL SLABS		

POS/MARKER — STN 2 SURVEY STATION

12.34 SPOT LEVEL — 11.50 CONTOUR VALUE





The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work starts. The Contractor is to comply in all respects with current Building Legislation, British Standard Specifications , Building Regulations, Construction (Design & Management) Regulations, Party Wall Act, etc. whether or not specifically stated on this drawing. This drawing must be read with and checked against any structural, geotechnical or other specialist documentation provided. This drawing is not intended to show details of foundations, ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor. A suitable method of foundation should be provided allowing for existing ground conditions. Any suspect or fluid ground, contaminates on or within the ground, should be further investigated by a suitable expert. Any earthwork constructions shown indicate typical slopes for guidance only & should be further investigated by a suitable expert.
Where existing trees are to be retained they should be subject to a full Arboricultural inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services. A suitable method of foundation is to be provided to accommodate the proposed tree planting.
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This survey has been orientated to the Ordnance Survey (O.S) National Grid (OSGB36) via a Global Position System (GPS) and the O.S. Active Network (OS Net).
A true OSGB36 coordinate has been established near to the site centre via a transformation using the OSTN02 & OSGM02 transformation models. The survey has been correlated to this point and a further one or more OSGB36 points established to create a true O.S. bearing for angle orientation.
No scale factor has been applied to the survey therefore the coordinates shown are arbitrary & not true O.S. Coordinates which have a scale factor applied.
Please refer to Survey Station Table to enable establishment of the on-site grid.
3D Information frozen on layer TRIANGLES.

Scale Check:

1:50 - 0 50mm 100mm 150mm 200mm 250mm 300mm 350mm 400mm 450mm 500mm
1:500 - 0 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m
1:50 - 0 100mm 200mm 300mm 400mm 500mm

Revisions:

Client:
Fisher German LLP

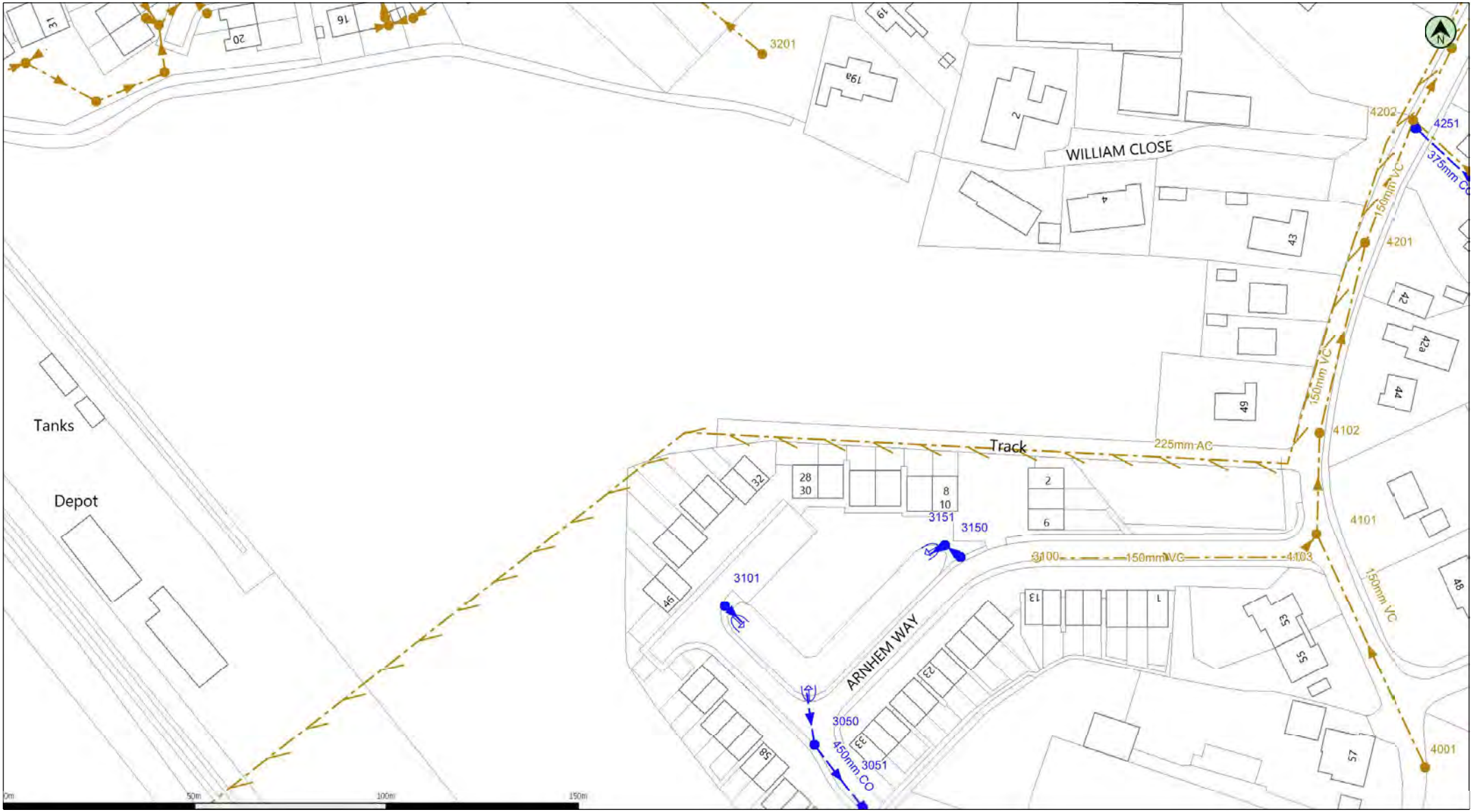
Project:
Malting Lane
Donington

Title:
Site Survey

Date: Oct 2015 **Scale:** 1:500 @ A0
Drawn by: DW **Checked by:** ICP

Job No.	Drwg No.	Rev.
S 219	579	

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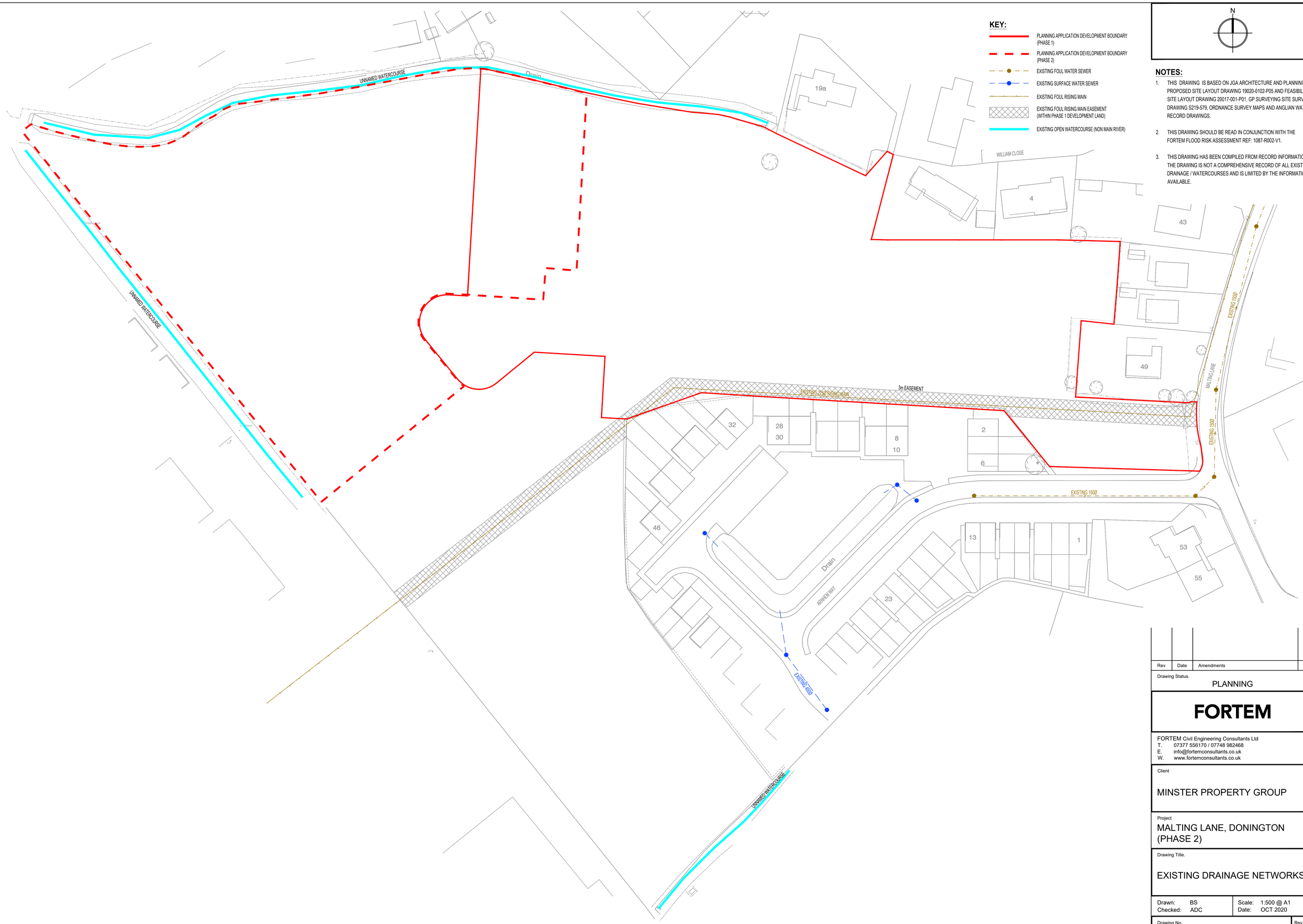
This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2019 Ordnance Survey 100022432.This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

- Foul Sewer
- Surface Sewer
- Combined Sewer
- Final Effluent
- Rising Main*
- Private Sewer*
- Decommissioned Sewer*
- Outfall*
- Inlet*
- Manhole*
- Sewage Treatment Works
- Public Pumping Station
- Decommissioned Pumping Station

*(Colour denotes effluent type)

hayley@harlaxton.com
MPG

love every drop anglianwater



NOTES:

1. THIS DRAWING IS BASED ON JGA ARCHITECTURE AND PLANNING PROPOSED SITE LAYOUT DRAWING 19020-0102-P05 AND FEASIBILITY SITE LAYOUT DRAWING 20017-001-P01, GP SURVEYING SITE SURVEY DRAWING S219-579, ORDNANCE SURVEY MAPS AND ANGLIAN WATER RECORD DRAWINGS.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE FORTEM FLOOD RISK ASSESSMENT REF: 1087-R002-V1.
3. THIS DRAWING HAS BEEN COMPILED FROM RECORD INFORMATION. THE DRAWING IS NOT A COMPREHENSIVE RECORD OF ALL EXISTING DRAINAGE / WATERCOURSES AND IS LIMITED BY THE INFORMATION AVAILABLE.

Rev	Date	Amendments	By

Drawing Status.
PLANNING

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Client
MINSTER PROPERTY GROUP

Project
MALTING LANE, DONINGTON (PHASE 2)

Drawing Title.
EXISTING DRAINAGE NETWORKS

Drawn: BS
Checked: ADC
Scale: 1:500 @ A1
Date: OCT 2020

Drawing No.
1087 - 101

Rev.
-

C:\Users\peter\FORTEM Civil Engineering Consultants Ltd\Andrew Calvert - FORTEM Projects\1087 - Malting Lane, Donington\2. Drawings\1. FORTEM\2. Drawings\1. Current\1087 - 101 Existing Drainage Networks (Phase 2).dwg 20 Oct, 2020 - 4:35pm

Appendix B **Proposed Development**

JGA drawing 20017-001-P01 - Feasibility Site Layout

Drawing 1087-102 – Proposed Drainage Strategy

Attenuation Calculations Phase 1/2 Combined

Proposed Site Layout

Scale: 1:500



Key

- Application site boundary
- Proposed Housing
- Existing Surrounding Buildings
- Private Rear Garden Area
- Public Open / Green Space
- Principal Highway / Road
- Private Drive
- Car Parking Spaces
- Pedestrian Footpaths
- Existing Tree Planting (approximate locations)
- Proposed Tree Planting (for illustrative purposes only - subject to detailed design / planting scheme by Landscape Architect)
- Proposed Hedge / Shrub Planting (for illustrative purposes only - subject to detailed design / planting scheme by Landscape Architect)
- Housetypes - Primary Point of Access
- Primary Site Access

Scale (m)

0 10 20 30 40 50

N

schedule of accommodation

housetype	code	area	quantity
2B4P House	A	70m²	12 no. units
3B5P House	B	82m²	11 no. units
4B6P House	E	96m²	02 no. units
2B3P Bungalow	C	61m²	03 no. units
1B2P Maisonette	D	46m²	04 no. units
Total Number of Units			**32 no. units**

approximate site area :	1.32Ha / 3.26 acres
density :	24.2 dwellings per hectare
parking provision :	200% / 100%

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Source File:
20017 Site Model.pln

Rev	Date	Drawn	Note

Note: This drawing is for feasibility purposes only. This information must not be used for setting out and is subject to a full site/topographical survey being undertaken, and full engagement with the LPA.

Pasted Image #4 74B11614.jpg

JGA
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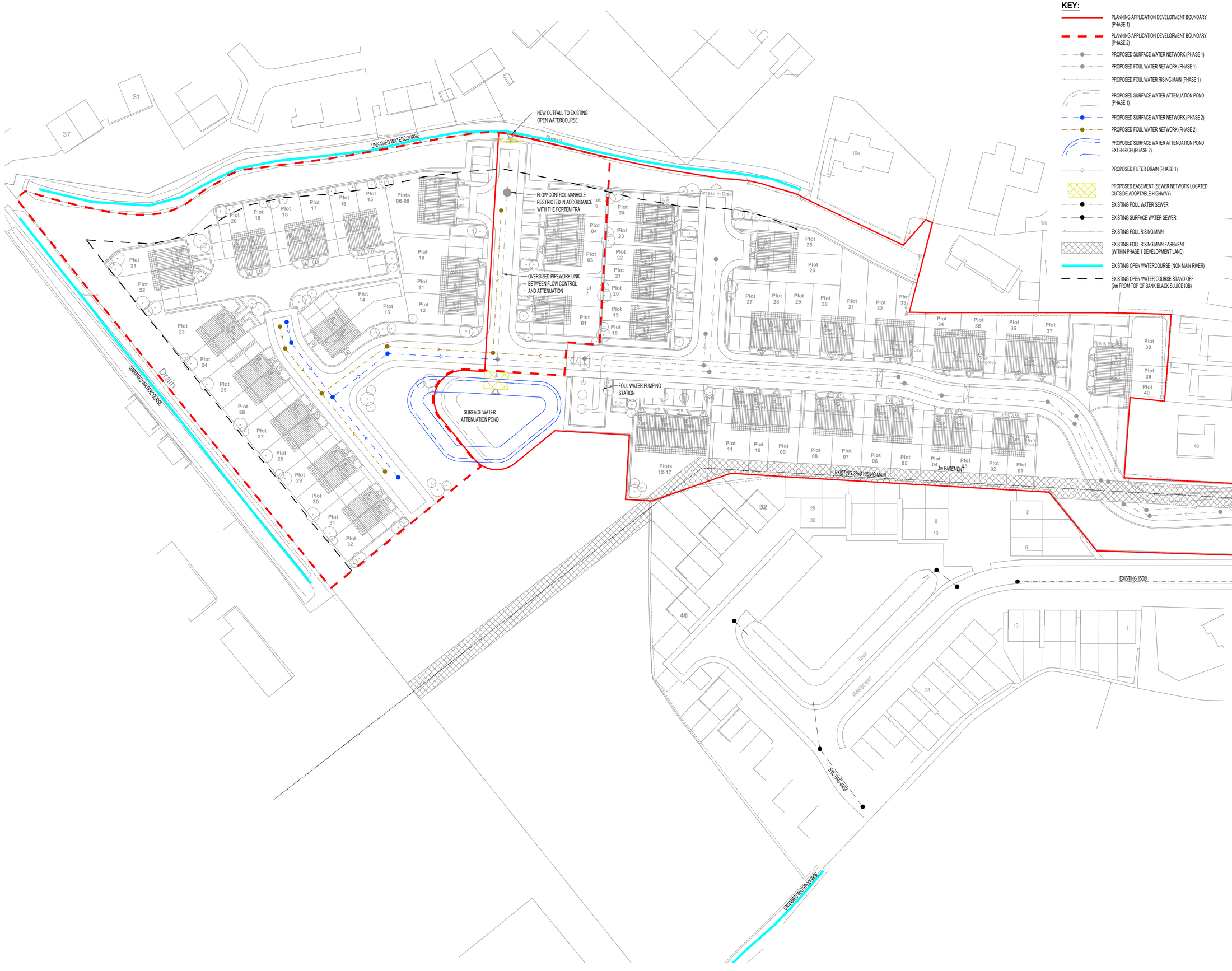
Client
Minster Property Group Ltd.

Project Title
Proposed residential development
Phase 2,
Land off Malting Lane, Donington

Drawing Title
Feasibility Site Layout

Drawing Status
Preliminary

Scale(s):	Original Paper Size:
1:500	A2
Drawn:	**Date:**
JKG	23.09.20
Project Number:	**Drawing Number:** / **Revision:**
20017	**001** / **P01**



KEY:

- PLANNING APPLICATION DEVELOPMENT BOUNDARY (PHASE 1)
- PLANNING APPLICATION DEVELOPMENT BOUNDARY (PHASE 2)
- PROPOSED SURFACE WATER NETWORK (PHASE 1)
- PROPOSED FOUL WATER NETWORK (PHASE 1)
- PROPOSED FOUL WATER RISING MAIN (PHASE 1)
- PROPOSED SURFACE WATER ATTENUATION POND (PHASE 1)
- PROPOSED SURFACE WATER NETWORK (PHASE 2)
- PROPOSED FOUL WATER NETWORK (PHASE 2)
- PROPOSED SURFACE WATER ATTENUATION POND EXTENSION (PHASE 2)
- PROPOSED FILTER DRAIN (PHASE 1)
- PROPOSED EASEMENT (SEWER NETWORK LOCATED OUTSIDE ADOPTABLE HIGHWAY)
- EXISTING FOUL WATER SEWER
- EXISTING SURFACE WATER SEWER
- EXISTING FOUL RISING MAIN
- EXISTING FOUL RISING MAIN EASEMENT (WITHIN PHASE 1 DEVELOPMENT LAND)
- EXISTING OPEN WATERCOURSE (NON MAIN RIVER)
- EXISTING OPEN WATER COURSE STAND-OFF (9m FROM TOP OF BANK BLACK SLUICE IDB)

N

NOTES:

1. THIS DRAWING IS BASED ON JGA ARCHITECTURE AND PLANNING PROPOSED SITE LAYOUT DRAWING 19020-0102-P05 AND FEASIBILITY SITE LAYOUT DRAWING 20017-001-P01, GP SURVEYING SITE SURVEY DRAWING S219-579, ORDNANCE SURVEY MAPS AND ANGLIAN WATER RECORD DRAWINGS.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE FORTEM FLOOD RISK ASSESSMENT REF: 1087-R002-V1.

Rev	Date	Amendments	By

Drawing Status.

PLANNING

FORTEM

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Client

MINSTER PROPERTY GROUP

Project

MALTING LANE, DONINGTON (PHASE 2)

Drawing Title.

PROPOSED DRAINAGE STRATEGY

Drawn: BS
Checked: ADC
Scale: 1:500 @ A1
Date: OCT 2020

Drawing No. 1087 - 102

Rev. -

C:\Users\peter\FORTEM Civil Engineering Consultants Ltd\Andrew Calvert - FORTEM Projects\1087 - Malting Lane, Donington\2. Drawings\1. FORTEM\2. Drawings\1. Current\1087 - 102 Proposed Drainage Strategy (Phase 2).dwg 20 Oct, 2020 - 4.37pm

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	1.669	0.569	17.9	273.3	O K
30 min Summer	1.840	0.740	17.9	355.2	O K
60 min Summer	2.000	0.900	17.9	432.1	O K
120 min Summer	2.117	1.017	17.9	488.4	O K
180 min Summer	2.148	1.048	17.9	503.0	O K
240 min Summer	2.143	1.043	17.9	500.9	O K
360 min Summer	2.112	1.012	17.9	486.0	O K
480 min Summer	2.079	0.979	17.9	469.8	O K
600 min Summer	2.042	0.942	17.9	452.2	O K
720 min Summer	2.004	0.904	17.9	433.8	O K
960 min Summer	1.923	0.823	17.9	394.8	O K
1440 min Summer	1.756	0.656	17.9	314.8	O K
2160 min Summer	1.564	0.464	17.9	222.7	O K
2880 min Summer	1.432	0.332	17.9	159.5	O K
4320 min Summer	1.303	0.203	16.9	97.5	O K
5760 min Summer	1.267	0.167	14.1	80.4	O K
7200 min Summer	1.247	0.147	12.0	70.6	O K
8640 min Summer	1.233	0.133	10.4	64.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	121.269	0.0	287.2	25
30 min Summer	79.695	0.0	378.4	39
60 min Summer	49.937	0.0	477.5	68
120 min Summer	30.267	0.0	579.1	124
180 min Summer	22.297	0.0	640.1	182
240 min Summer	17.851	0.0	683.3	230
360 min Summer	12.957	0.0	744.1	288
480 min Summer	10.330	0.0	791.0	352
600 min Summer	8.659	0.0	828.8	420
720 min Summer	7.492	0.0	860.6	492
960 min Summer	5.959	0.0	912.6	630
1440 min Summer	4.309	0.0	989.6	882
2160 min Summer	3.110	0.0	1073.7	1240
2880 min Summer	2.466	0.0	1134.7	1584
4320 min Summer	1.775	0.0	1224.0	2244
5760 min Summer	1.405	0.0	1293.7	2944
7200 min Summer	1.171	0.0	1347.5	3672
8640 min Summer	1.008	0.0	1392.4	4408

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	1.223	0.123	9.2	59.1	O K
15 min Winter	1.742	0.642	17.9	308.0	O K
30 min Winter	1.936	0.836	17.9	401.5	O K
60 min Winter	2.116	1.016	17.9	487.8	O K
120 min Winter	2.255	1.155	17.9	554.4	O K
180 min Winter	2.297	1.197	18.0	574.7	O K
240 min Winter	2.299	1.199	18.0	575.7	O K
360 min Winter	2.256	1.156	17.9	555.0	O K
480 min Winter	2.214	1.114	17.9	534.6	O K
600 min Winter	2.164	1.064	17.9	510.6	O K
720 min Winter	2.110	1.010	17.9	484.7	O K
960 min Winter	1.996	0.896	17.9	430.1	O K
1440 min Winter	1.739	0.639	17.9	306.8	O K
2160 min Winter	1.465	0.365	17.9	175.2	O K
2880 min Winter	1.323	0.223	17.1	106.9	O K
4320 min Winter	1.258	0.158	13.2	75.9	O K
5760 min Winter	1.234	0.134	10.5	64.5	O K
7200 min Winter	1.220	0.120	8.8	57.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.889	0.0	1430.4	5136
15 min Winter	121.269	0.0	322.0	25
30 min Winter	79.695	0.0	424.1	39
60 min Winter	49.937	0.0	534.9	68
120 min Winter	30.267	0.0	648.8	122
180 min Winter	22.297	0.0	717.1	178
240 min Winter	17.851	0.0	765.5	234
360 min Winter	12.957	0.0	833.6	302
480 min Winter	10.330	0.0	886.1	374
600 min Winter	8.659	0.0	928.5	452
720 min Winter	7.492	0.0	964.1	530
960 min Winter	5.959	0.0	1022.3	682
1440 min Winter	4.309	0.0	1108.7	942
2160 min Winter	3.110	0.0	1202.7	1280
2880 min Winter	2.466	0.0	1271.1	1568
4320 min Winter	1.775	0.0	1371.4	2216
5760 min Winter	1.405	0.0	1449.0	2944
7200 min Winter	1.171	0.0	1509.4	3672

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
8640 min Winter	1.209	0.109	7.6	52.5	O K
10080 min Winter	1.202	0.102	6.7	48.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.008	0.0	1559.8	4408
10080 min Winter	0.889	0.0	1602.6	5128

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 1.280

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.427	4	8	0.427	8	12	0.427

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Model Details

Storage is Online Cover Level (m) 2.700

Tank or Pond Structure

Invert Level (m) 1.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	480.0	1.200	480.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0187-1800-1200-1800
Design Head (m)	1.200
Design Flow (l/s)	18.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	187
Invert Level (m)	1.100
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	18.0	Kick-Flo®	0.818	15.0
Flush-Flo™	0.374	17.9	Mean Flow over Head Range	-	15.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.5	1.200	18.0	3.000	27.9	7.000	42.0
0.200	16.8	1.400	19.4	3.500	30.0	7.500	43.4
0.300	17.8	1.600	20.6	4.000	32.0	8.000	44.8
0.400	17.9	1.800	21.8	4.500	33.9	8.500	46.1
0.500	17.7	2.000	23.0	5.000	35.7	9.000	47.4
0.600	17.3	2.200	24.0	5.500	37.3	9.500	48.6
0.800	15.4	2.400	25.1	6.000	38.9		
1.000	16.5	2.600	26.0	6.500	40.5		

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Appendix C Flood Risk Mapping

EA Map Risk from Rivers or Sea

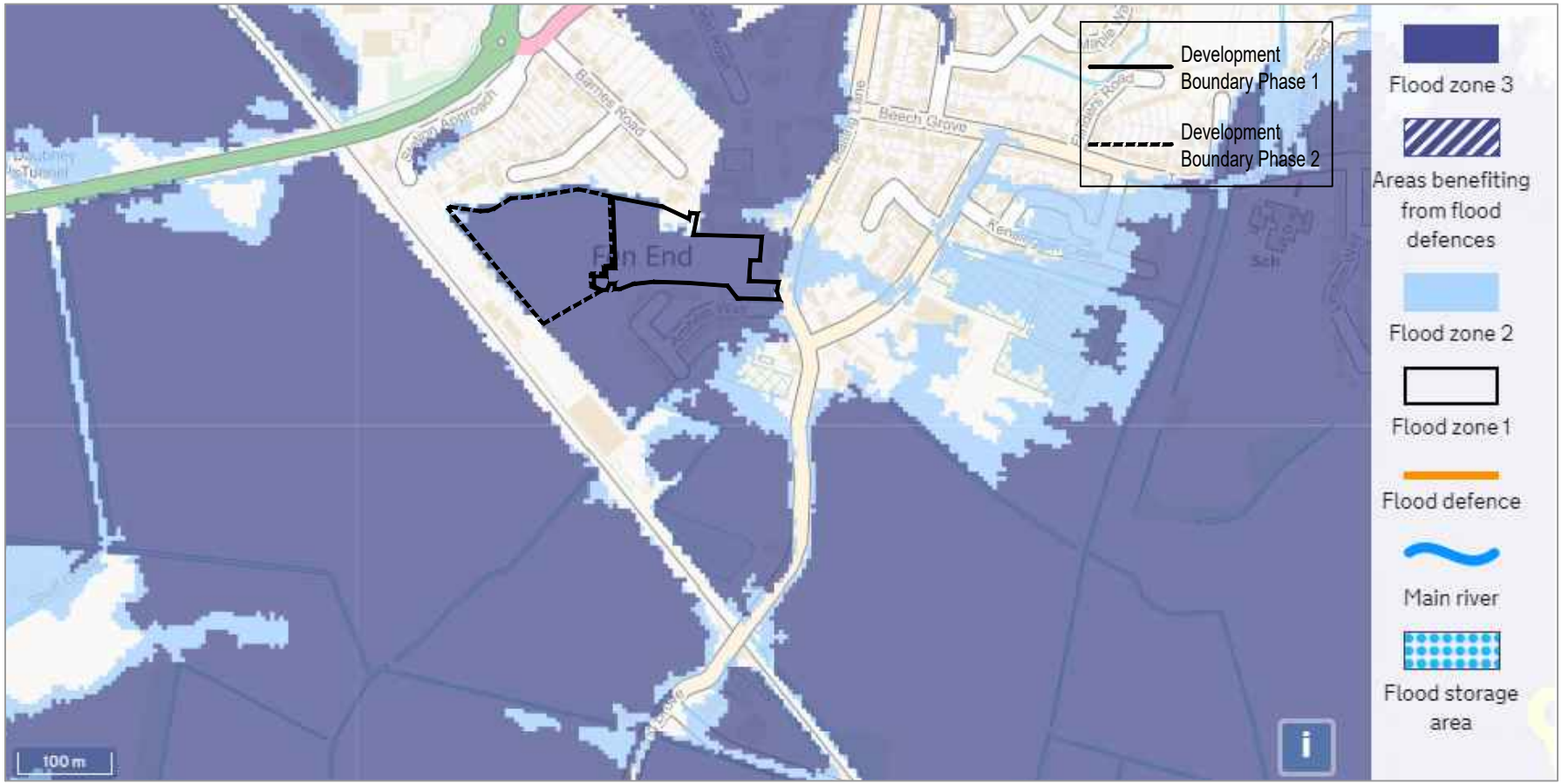
EA Map Risk from Surface Water

EA Map Risk from Reservoir

South Holland Residual Flood Risk for the Fluvial (1% AEP) and Tidal (0.5% AEP) Flood Event plus an allowance for climate change Flood Map

South Holland Flood Risk for Fluvial and Tidal (Extract)

FORTEM



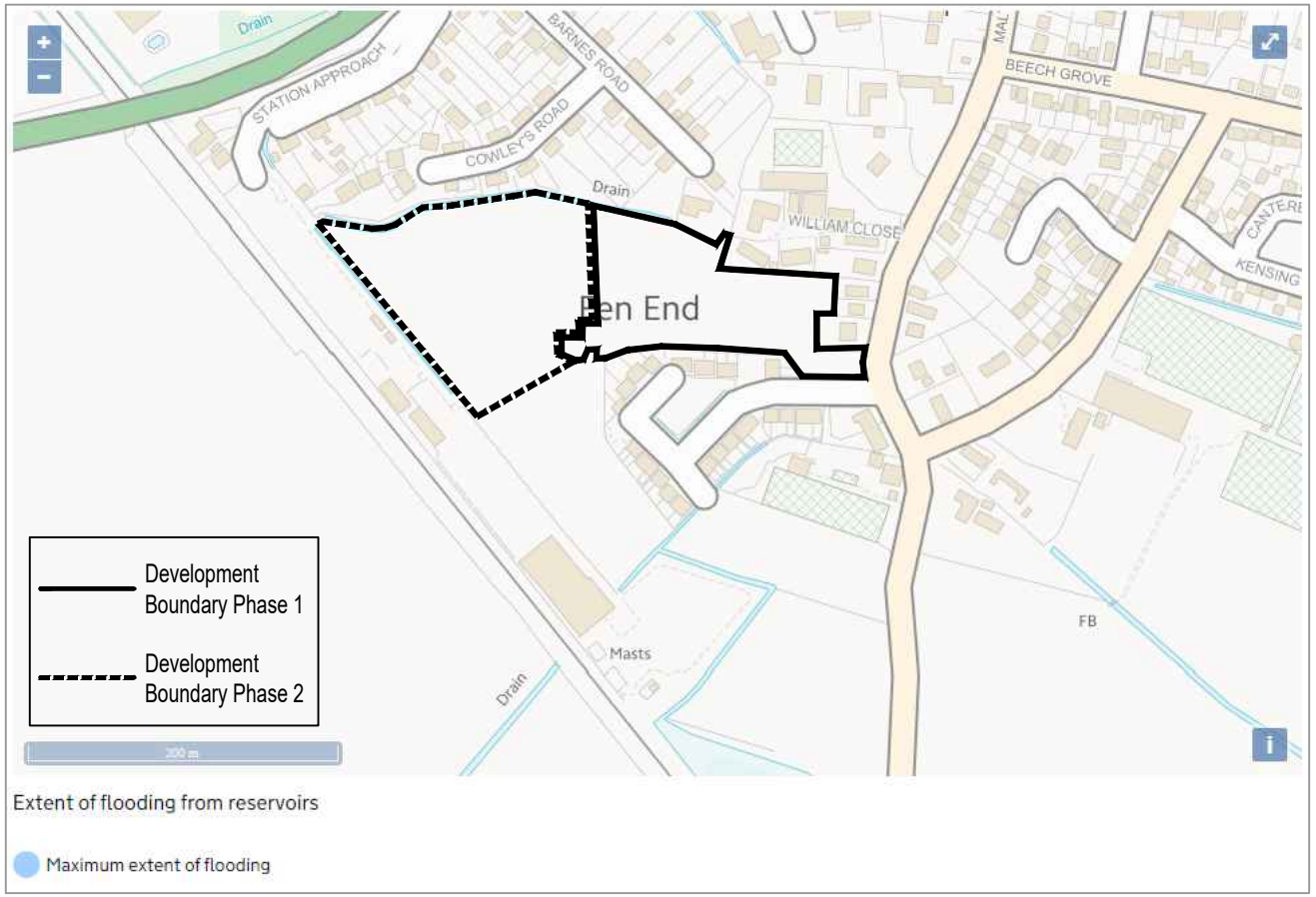
MALTING LANE, DONINGTON
EXTRACT FROM ENVIRONMENT AGENCY MAPPING (GOV.UK)
FLOOD ZONE MAP
EXTRACT TAKEN 16.10.2020 : NTS

FORTEM



MALTING LANE, DONINGTON
EXTRACT FROM ENVIRONMENT AGENCY MAPPING (GOV.UK)
RISK FROM FLOODING FROM SURFACE WATER
EXTRACT TAKEN 16.10.2020 : NTS

FORTEM



MALTING LANE, DONINGTON
EXTRACT FROM ENVIRONMENT AGENCY MAPPING (GOV.UK)
RISK FROM FLOODING FROM RESERVOIR
EXTRACT TAKEN 16.10.2020 : NTS

N

NOTES

1. The potential flooding consequences shown on this map primarily relate to flooding from the sea and main rivers taking into account the presence of current flood risk management measures such as flood defences.

2. This update only included new flood risk information from River Welland (Fluvial), River Glen (Fluvial) and Tidal hazard mapping (River Welland, River Nene and the Wash sea defences). No new information from the Internal Drainage Boards and associated systems was used for this update.

3. In addition to the potential flood extents shown on this map, there may be shallow flooding in low-lying rural areas

4. The consequences designated as being a Residual Risk arise from direct overtopping of defences, where this would occur, together with breach failure which is assumed could occur at any point along the defences.

5. Functional Floodplain encompasses areas where water is intended to flow or be stored in times of flood.

6. Land outside South Holland District is not considered.

7. This map shows the extents only of the flooding probability bands relevant to the map Title

Map Legend

Peak Depth

- 0m - 0.25m
- 0.25m - 0.5m
- 0.5m - 1m
- 1m - 2m
- 2m +
- Functional Floodplain
- South Holland District Boundary

REV	DATE	REMARKS
2	Feb 17	Modelling and Mapping Update
1	Dec 16	Modelling and Mapping Update

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UPDATE OF STRATEGIC FLOOD RISK ASSESSMENT

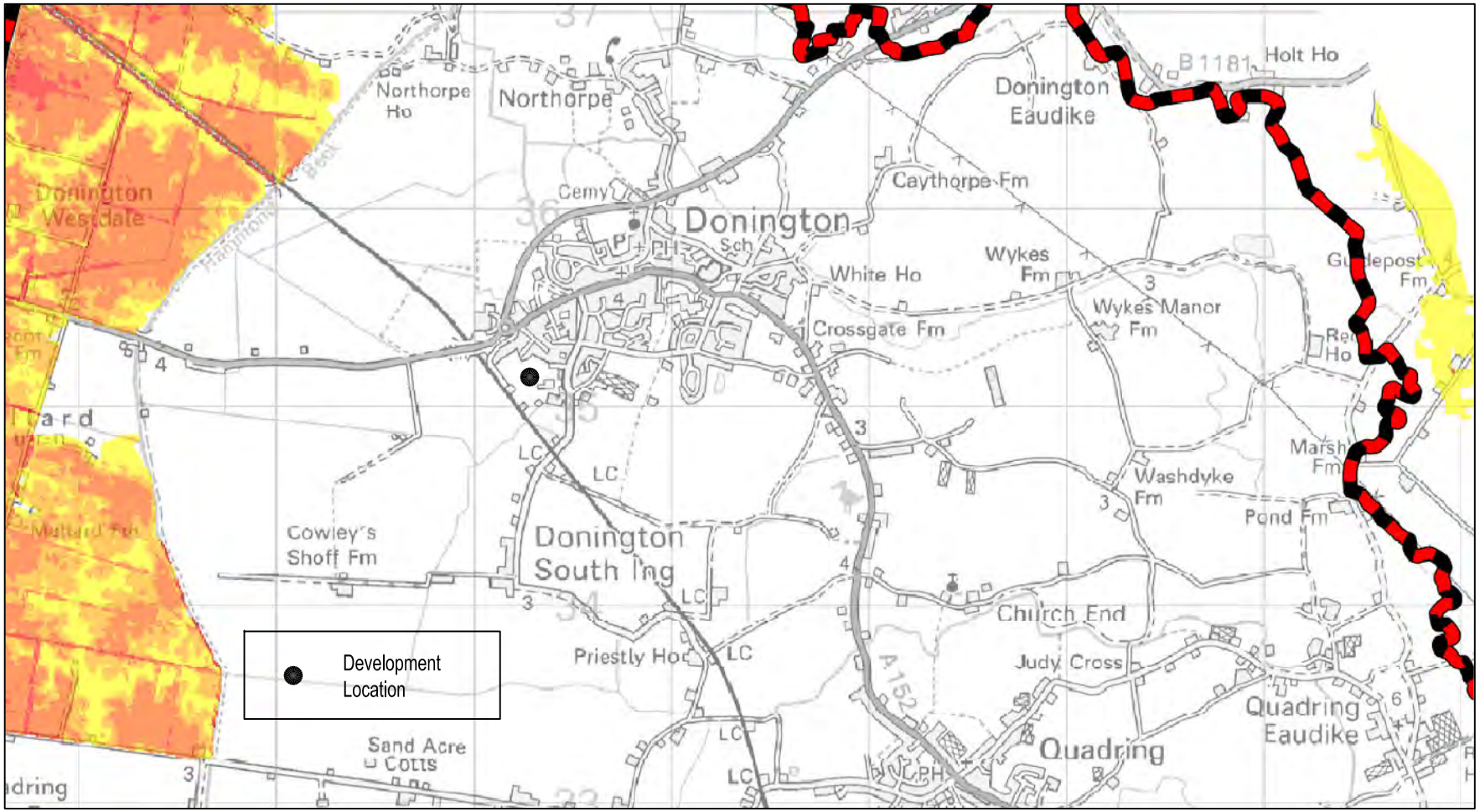
Residual Peak Depth
District - Year 2115
1% Fluvial / 0.5% Tidal Event Probability

DATE OF ISSUE: Feb 2017 **REV NO:** 2

SCALE: 1 : 60,000 @ A1

MAP NO:

FORTEM



MALTING LANE, DONNINGTON

SOUTH HOLLAND SFRA RESIDUAL FLOOD RISK MAP (EXTRACT)

EXTRACT TAKEN 22.01.2020 : NTS

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