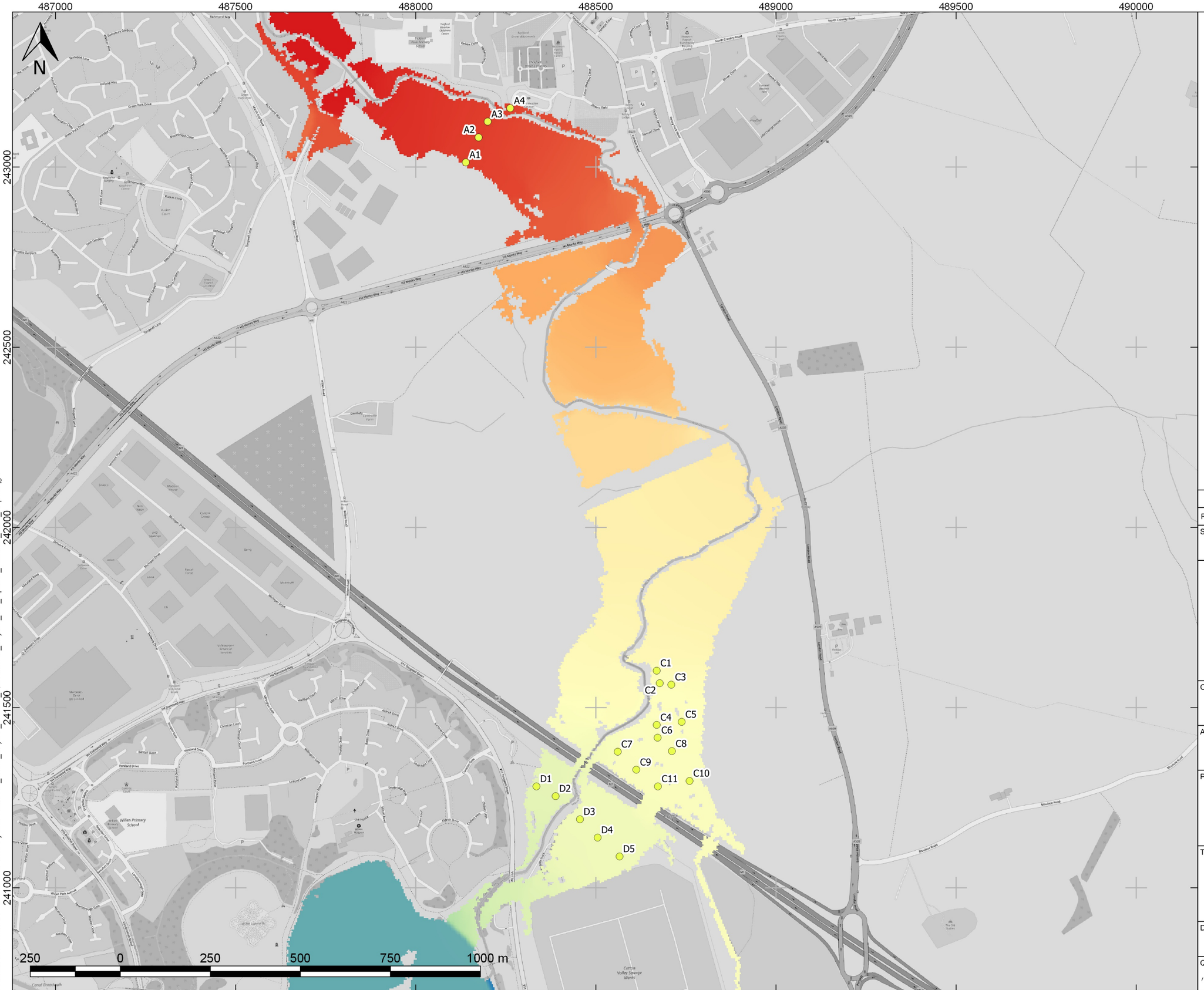

KEY:

- Point Location

Flood Elevation (mODN)

- 55
- 56.25
- 57.5
- 58.75
- 60

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	15/02/19	EHC	FIRST ISSUE	AS	AS

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ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: Flood Elevation
Option 3
Q1000

DRAWN:	CHECKED:	APPROVED:
EHC	AS	AS

QGIS FILE:	SCALE @A3:	DATE:
/12_Options_12Feb19_E	1:10,000	19/02/19

PROJECT No:	DRAWING No:	REV:
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Appendix E

FLOOD DIFFERENCE PLANS

487000 487500 488000 488500 489000 489500 490000

243000 242500 242000 241500 241000

N

A1 A2 A3 A4

C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11

D1 D2 D3 D4 D5

250 0 250 500 750 1000 m

KEY:

- Point Location
- Was Wet Now Dry
- Was Dry Now Wet

Water Level Difference (m)

- -0.5
- -0.37
- -0.25
- -0.12
- -0.05
- 0
- 0.05
- 0.12
- 0.25
- 0.37
- 0.5

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	15/02/19	EHC	FIRST ISSUE	AS	AS

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CLIENT: St James

ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: DIFFERENCE MAP BASE VS POST OPT1 Q0100

DRAWN:	CHECKED:	APPROVED:
EHC	AS	AS

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487000 487500 488000 488500 489000 489500 490000

243000 242500 242000 241500 241000

N

A4 A3 A2 A1

C1 C3 C2 C4 C5 C6 C7 C8 C9 C10 C11

D1 D2 D3 D4 D5

250 0 250 500 750 1000 m

KEY:

- Point Location
- Was Wet Now Dry
- Was Dry Now Wet

Water Level Difference (m)

- -0.5
- -0.37
- -0.25
- -0.12
- -0.05
- 0
- 0.05
- 0.12
- 0.25
- 0.37
- 0.5

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	15/02/19	EHC	FIRST ISSUE	AS	AS

STATUS: FOR INFORMATION ONLY

wsp
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Exeter, Devon EX1 1NT
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CLIENT: St James

ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: DIFFERENCE MAP
BASE VS POST
OPT1 Q0100 + 35% CC

DRAWN:	CHECKED:	APPROVED:
EHC	AS	AS

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487000 487500 488000 488500 489000 489500 490000

243000 242500 242000 241500 241000

N

A1 A2 A3 A4

C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11

D1 D2 D3 D4 D5

250 0 250 500 750 1000 m

KEY:

- Point Location
- Was Wet Now Dry
- Was Dry Now Wet

Water Level Difference (m)

- -0.5
- -0.37
- -0.25
- -0.12
- -0.05
- 0
- 0.05
- 0.12
- 0.25
- 0.37
- 0.5

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	15/02/19	EHC	FIRST ISSUE	AS	AS

STATUS: FOR INFORMATION ONLY

wsp
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ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: DIFFERENCE MAP
BASE VS POST
OPT1 Q0100 + 65% CC

DRAWN:	CHECKED:	APPROVED:
EHC	AS	AS

QGIS FILE:	SCALE @A3:	DATE:
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PROJECT No:	DRAWING No:	REV:
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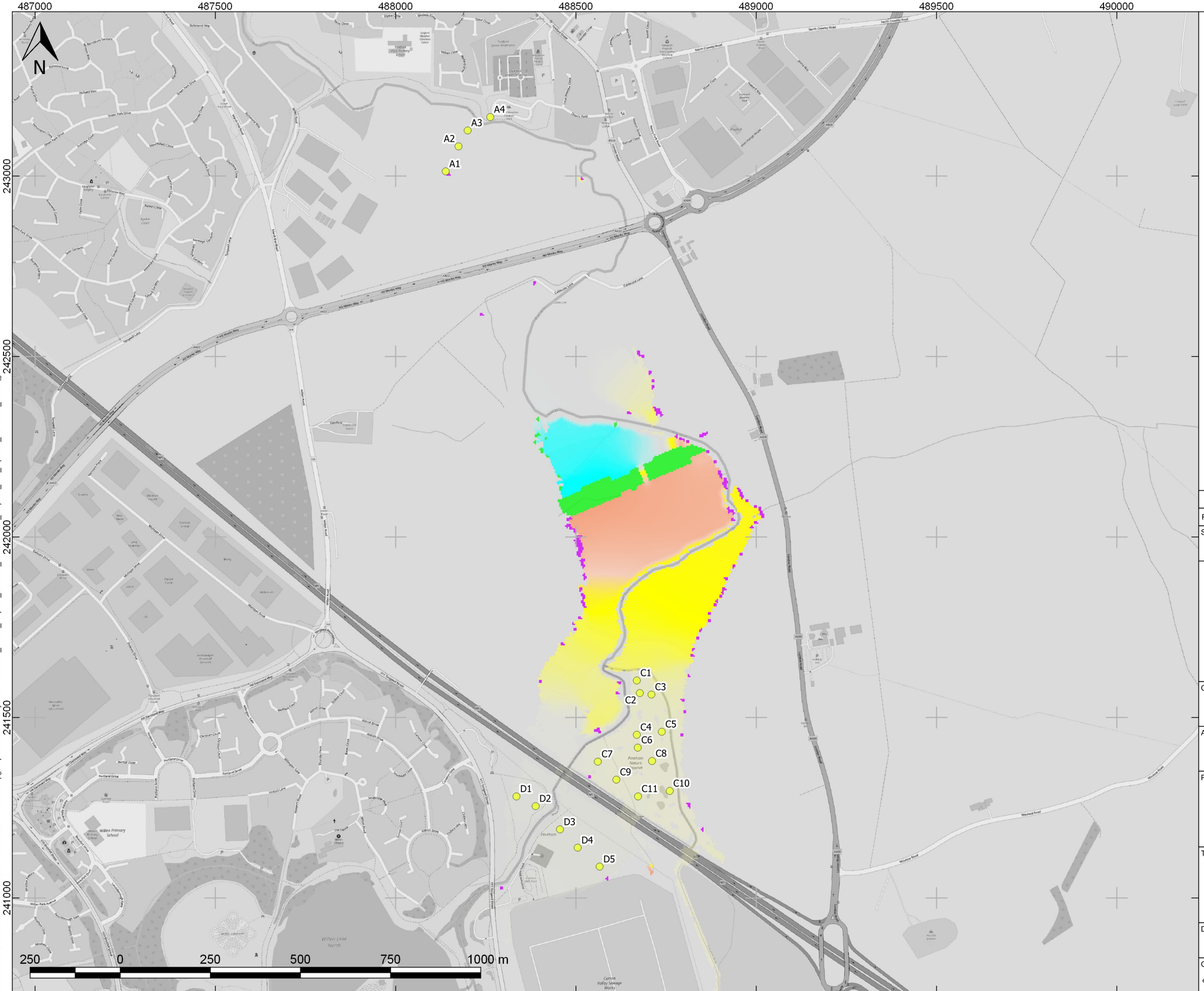

KEY:

- Point Location
- Was Wet Now Dry
- Was Dry Now Wet

Water Level Difference (m)

- -0.5
- -0.37
- -0.25
- -0.12
- -0.05
- 0
- 0.05
- 0.12
- 0.25
- 0.37
- 0.5

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	15/02/19	EHC	FIRST ISSUE	AS	AS

STATUS: FOR INFORMATION ONLY

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ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: DIFFERENCE MAP BASE VS POST OPT1 Q1000

DRAWN:	CHECKED:	APPROVED:
EHC	AS	AS
QGIS FILE: es_v12_Options_12Feb	SCALE @A3: 1:10,000	DATE: 15/02/19
PROJECT No: 70014859	DRAWING No: ıes_v12_Options_12I	REV: A

487000 487500 488000 488500 489000 489500 490000

243000 242500 242000 241500 241000

N

A1 A2 A3 A4

C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11

D1 D2 D3 D4 D5

250 0 250 500 750 1000 m

KEY:

- Point Location
- Was Wet Now Dry
- Was Dry Now Wet

Water Level Difference (m)

- -0.5
- -0.37
- -0.25
- -0.12
- -0.05
- 0
- 0.05
- 0.12
- 0.25
- 0.37
- 0.5

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	15/02/19	EHC	FIRST ISSUE	AS	AS

STATUS: FOR INFORMATION ONLY

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ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: DIFFERENCE MAP
BASE VS POST
OPT2 Q0100

DRAWN:	CHECKED:	APPROVED:
EHC	AS	AS

QGIS FILE:	SCALE @A3:	DATE:
es_v12_Options_12Feb	1:10,000	15/02/19

PROJECT No:	DRAWING No:	REV:
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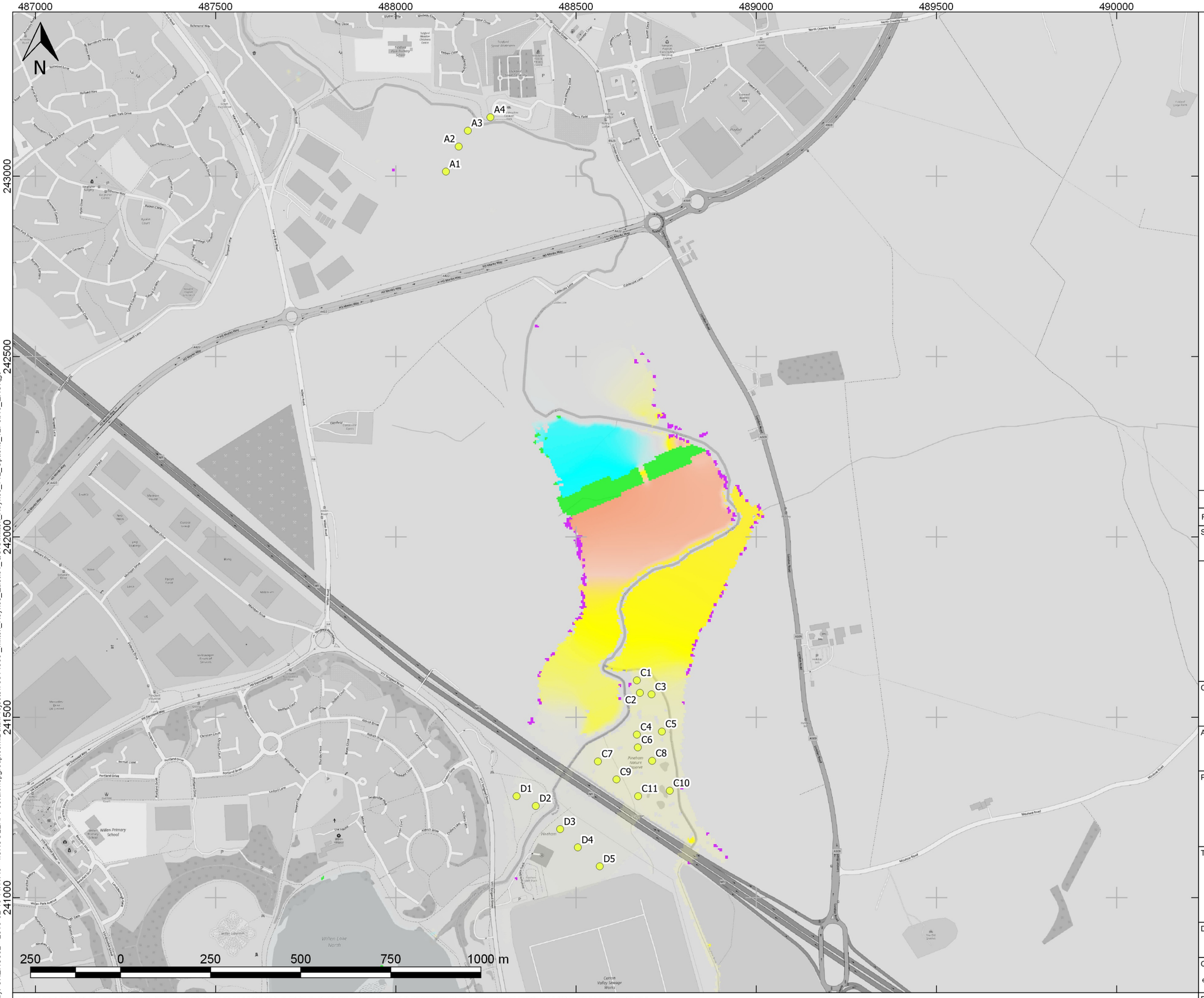

KEY:

- Point Location
- Was Wet Now Dry
- Was Dry Now Wet

Water Level Difference (m)

- -0.5
- -0.37
- -0.25
- -0.12
- -0.05
- 0
- 0.05
- 0.12
- 0.25
- 0.37
- 0.5

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	15/02/19	EHC	FIRST ISSUE	AS	AS

STATUS: FOR INFORMATION ONLY

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CLIENT: St James

ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: DIFFERENCE MAP
BASE VS POST
OPT2 Q0100 + 35% CC

DRAWN:	CHECKED:	APPROVED:
EHC	AS	AS

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PROJECT No:	DRAWING No:	REV:
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487000 487500 488000 488500 489000 489500 490000

243000 242500 242000 241500 241000

N

A1 A2 A3 A4

C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11

D1 D2 D3 D4 D5

250 0 250 500 750 1000 m

KEY:

- Point Location
- Was Wet Now Dry
- Was Dry Now Wet

Water Level Difference (m)

- -0.5
- -0.37
- -0.25
- -0.12
- -0.05
- 0
- 0.05
- 0.12
- 0.25
- 0.37
- 0.5

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	15/02/19	EHC	FIRST ISSUE	AS	AS

STATUS: FOR INFORMATION ONLY

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ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: DIFFERENCE MAP
BASE VS POST
OPT2 Q0100 + 65% CC

DRAWN:	CHECKED:	APPROVED:
EHC	AS	AS

QGIS FILE:	SCALE @A3:	DATE:
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PROJECT No:	DRAWING No:	REV:
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487000 487500 488000 488500 489000 489500 490000

243000 242500 242000 241500 241000

N

A1 A2 A3 A4

C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11

D1 D2 D3 D4 D5

250 0 250 500 750 1000 m

KEY:

- Point Location
- Was Wet Now Dry
- Was Dry Now Wet

Water Level Difference (m)

- -0.5
- -0.37
- -0.25
- -0.12
- -0.05
- 0
- 0.05
- 0.12
- 0.25
- 0.37
- 0.5

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	15/02/19	EHC	FIRST ISSUE	AS	AS

STATUS: FOR INFORMATION ONLY

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PROJECT: MILTON KEYNES EAST

TITLE: DIFFERENCE MAP
BASE VS POST
OPT2 Q1000

DRAWN:	CHECKED:	APPROVED:
EHC	AS	AS

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487000 487500 488000 488500 489000 489500 490000

243000 242500 242000 241500 241000

N

A1 A2 A3 A4

C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11

D1 D2 D3 D4 D5

250 0 250 500 750 1000 m

KEY:

- Point Location
- Was Wet Now Dry
- Was Dry Now Wet

Water Level Difference (m)

- -0.5
- -0.37
- -0.25
- -0.12
- -0.05
- 0
- 0.05
- 0.12
- 0.25
- 0.37
- 0.5

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	15/02/19	EHC	FIRST ISSUE	AS	AS

STATUS: FOR INFORMATION ONLY

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CLIENT: St James

ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: DIFFERENCE MAP
BASE VS POST
OPT3 Q0100

DRAWN:	CHECKED:	APPROVED:
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487000 487500 488000 488500 489000 489500 490000

243000 242500 242000 241500 241000

N

A1 A2 A3 A4

C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11

D1 D2 D3 D4 D5

250 0 250 500 750 1000 m

KEY:

- Point Location
- Was Wet Now Dry
- Was Dry Now Wet

Water Level Difference (m)

- -0.5
- -0.37
- -0.25
- -0.12
- -0.05
- 0
- 0.05
- 0.12
- 0.25
- 0.37
- 0.5

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	15/02/19	EHC	FIRST ISSUE	AS	AS

STATUS: FOR INFORMATION ONLY

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CLIENT: St James

ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: DIFFERENCE MAP
BASE VS POST
OPT3 Q0100 + 35% CC

DRAWN:	CHECKED:	APPROVED:
EHC	AS	AS

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243000 242500 242000 241500 241000

N

A1 A2 A3 A4

C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11

D1 D2 D3 D4 D5

250 0 250 500 750 1000 m

KEY:

- Point Location
- Was Wet Now Dry
- Was Dry Now Wet

Water Level Difference (m)

- -0.5
- -0.37
- -0.25
- -0.12
- -0.05
- 0
- 0.05
- 0.12
- 0.25
- 0.37
- 0.5

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	15/02/19	EHC	FIRST ISSUE	AS	AS

STATUS: FOR INFORMATION ONLY

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ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: DIFFERENCE MAP
BASE VS POST
OPT3 Q0100 + 65% CC

DRAWN:	CHECKED:	APPROVED:
EHC	AS	AS

QGIS FILE:	SCALE @A3:	DATE:
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243000 242500 242000 241500 241000

N

A1 A2 A3 A4

C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11

D1 D2 D3 D4 D5

250 0 250 500 750 1000 m

KEY:

- Point Location
- Was Wet Now Dry
- Was Dry Now Wet

Water Level Difference (m)

- -0.5
- -0.37
- -0.25
- -0.12
- -0.05
- 0
- 0.05
- 0.12
- 0.25
- 0.37
- 0.5

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	15/02/19	EHC	FIRST ISSUE	AS	AS

STATUS: FOR INFORMATION ONLY

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ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: DIFFERENCE MAP BASE VS POST OPT2 Q1000

DRAWN:	CHECKED:	APPROVED:
EHC	AS	AS

QGIS FILE:	SCALE @A3:	DATE:
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PROJECT No:	DRAWING No:	REV:
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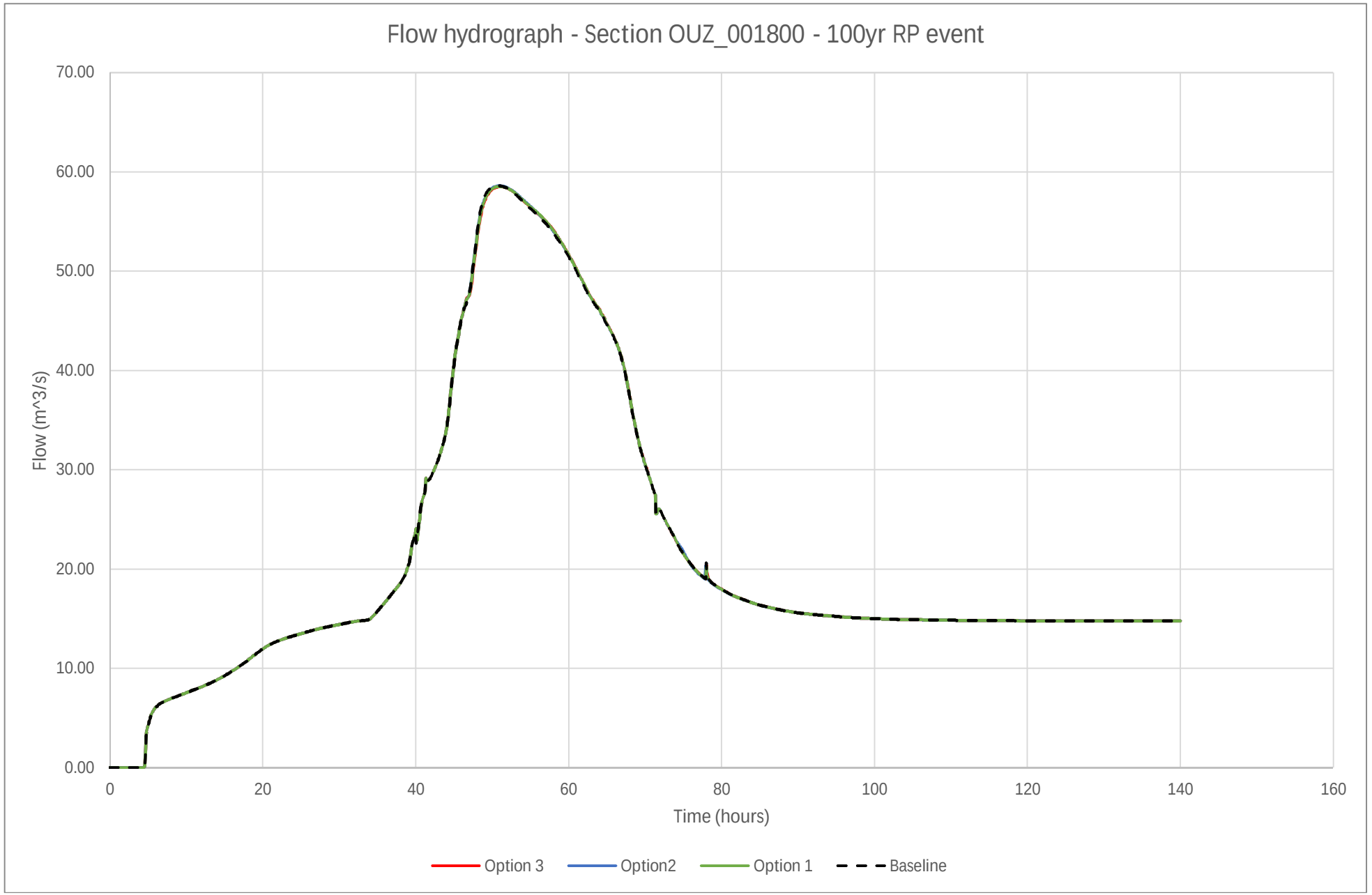
Appendix F

HYDROGRAPHS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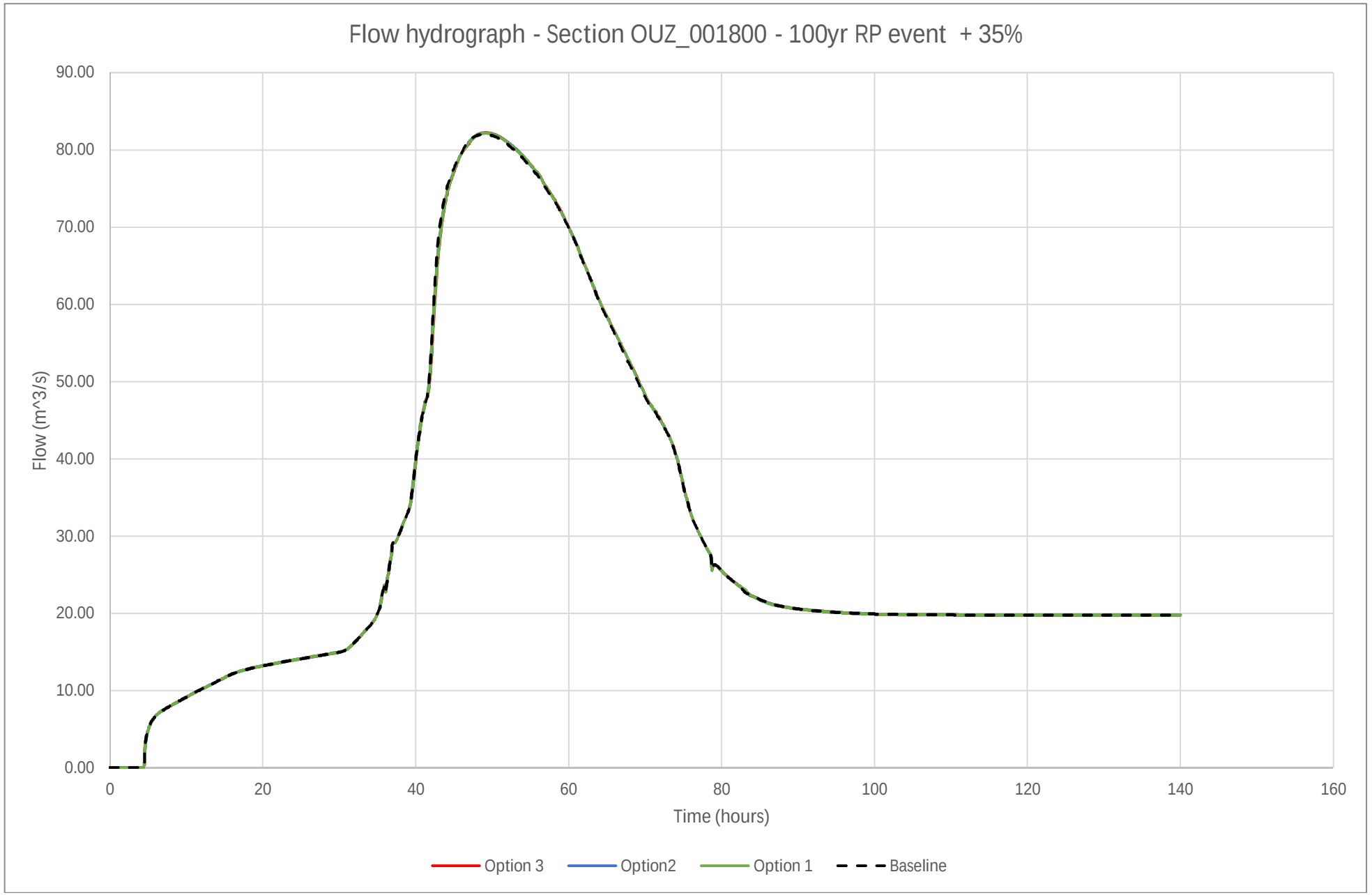
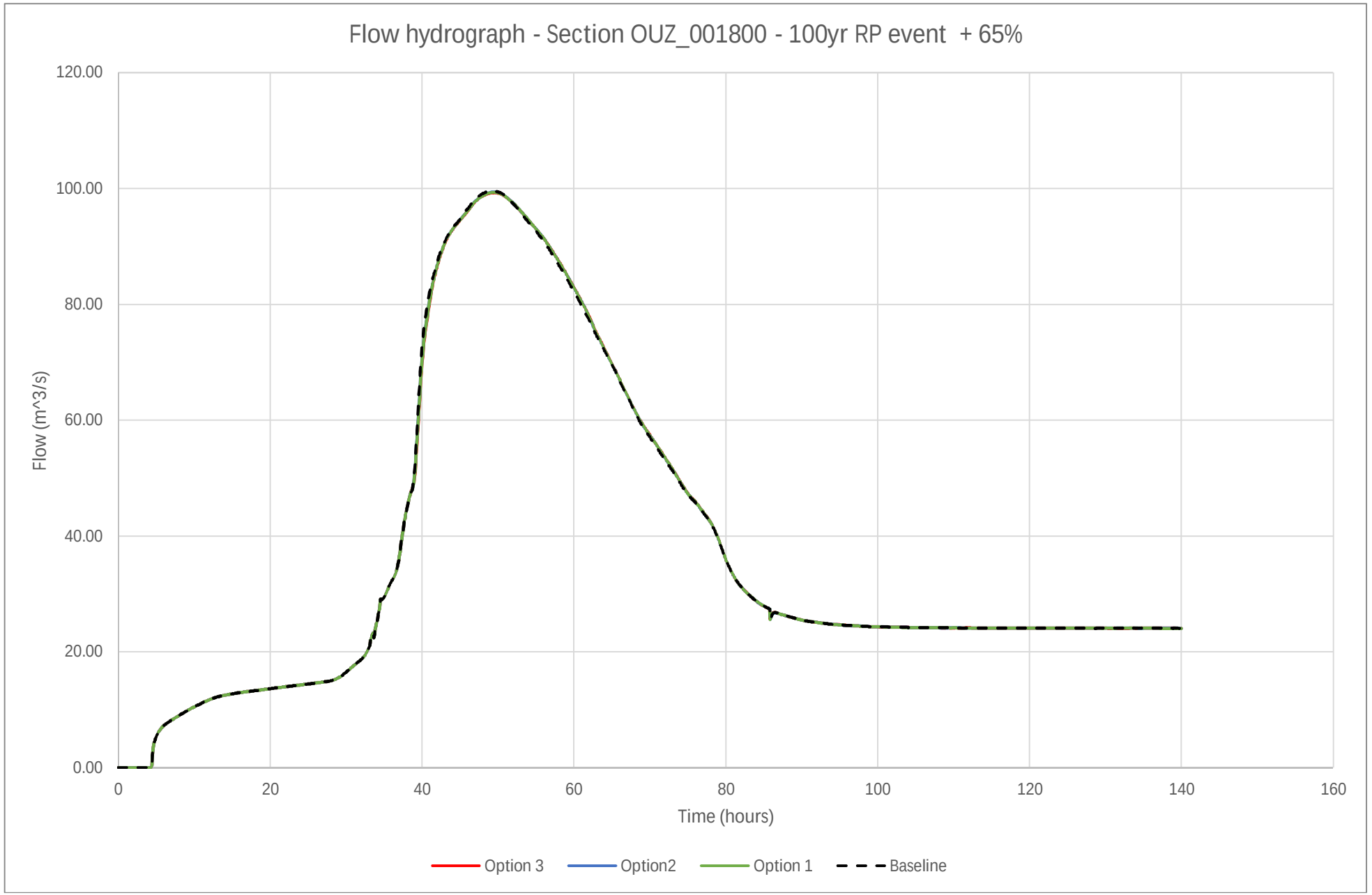
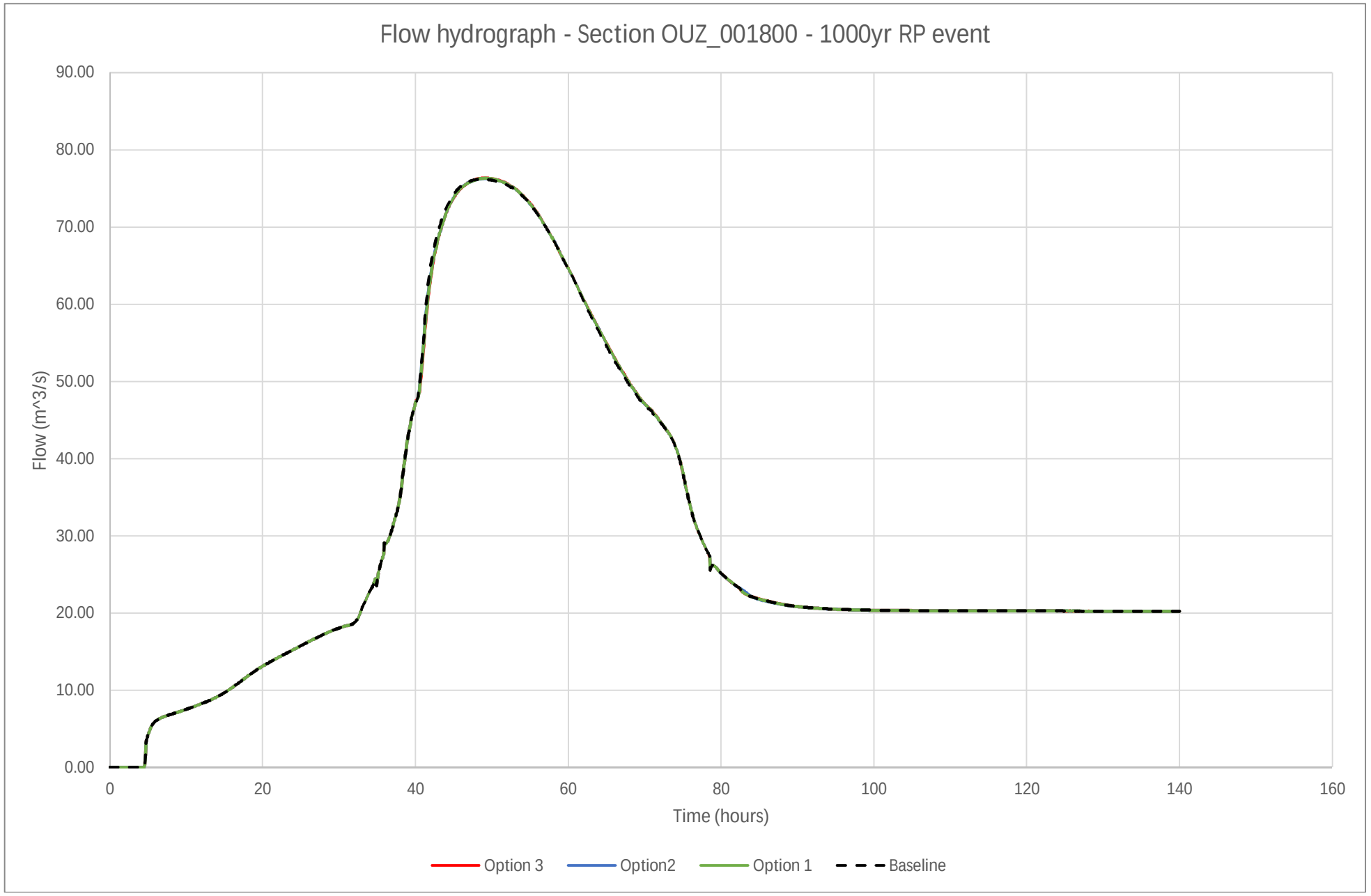
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Flow (m^3/s)
0
20
40
60
80
100
120
140
160
Time (hours)
Option 3
Option2
Option 1
Baseline


Flow hydrograph - Section OUZ_001800 - 100yr RP event + 35%
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Flow (m^3/s)
0
20
40
60
80
100
120
140
160
Time (hours)
Option 3
Option2
Option 1
Baseline


Flow hydrograph - Section OUZ_001800 - 100yr RP event + 65%
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Flow (m^3/s)
0
20
40
60
80
100
120
140
160
Time (hours)
Option 3
Option2
Option 1
Baseline


Flow hydrograph - Section OUZ_001800 - 1000yr RP event
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Flow (m^3/s)
0
20
40
60
80
100
120
140
160
Time (hours)
Option 3
Option2
Option 1
Baseline

Mountbatten House
Basing View
Basingstoke, Hampshire
RG21 4HJ

wsp.com

Appendix C

APPROACH TO FLOOD MANAGEMENT REPORT

Berkeley St James Group Limited

MILTON KEYNES EAST

Approach to Flood Management- Developed Scenario

70051078-AFRA-V2
DECEMBER 2020

PUBLIC

Berkeley St James Group Limited

MILTON KEYNES EAST

Approach to Flood Management- Developed Scenario

TYPE OF DOCUMENT (VERSION) PUBLIC

PROJECT NO. 70051078

OUR REF. NO. 70051078-AFRA-V2

DATE: DECEMBER 2020

WSP

Kings Orchard
1 Queen Street
Bristol
BS2 0HQ

Phone: +44 117 930 6200

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QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks				
Date	23/09/20	14/12/20		
Prepared by	Charlotte Dunleavy	Charlotte Dunleavy		
Signature				
Checked by	Doug Barker	Andy Smith		
Signature				
Authorised by	Andy Smith	Simon Purcell		
Signature				
Project number	70051078	70051078		
Report number	70051078-AFRA	70051078-AFRA-V2		
File reference	70051078-AFRA	70051078-AFRA-V2		

CONTENTS

TABLES

FIGURES

APPENDICES

1 INTRODUCTION

1.1 SCOPE

1.1.1. This report has been prepared by WSP UK Ltd (WSP) on behalf of St James Group Ltd (St James) to provide details to the Environment Agency as to how the flood risk constraints will be managed and designed into the Scheme. The report is prepared in order to gain approval in principle prior to the finalisation of the Flood Risk Assessment and the finalisation of the design of Highway Link 107 (the River Ouzel Crossing).

1.2 THE PROPOSED SCHEME

1.2.1. 'Milton Keynes East' (MKE) has been identified as an allocation for a strategic urban extension within Plan:MK and Milton Keynes Council's (MKC) aspirations for the allocation is set out within Policy SD12 of Plan:MK. The flood risk requirements are set out in policies FR1, FR2 and FR3, in addition to the general flood risk policies. Policy SD1 outlines that new development needs to take a strategic, integrated and sustainable approach to water resource management (including SUDS and flood risk mitigation). The FRA will demonstrate how the Scheme is compliant with these policies.

1.2.2. The masterplan for the Scheme is shown in Figure 1-1 and provided in Appendix A and is expected to include:

- Approximately 4,000 homes;
- Approximately 85 hectares of employment land (including B2 and B8);
- A community hub including a range of shops and services;
- Other facilities within the site such as allotments and burial space;
- A 10FE secondary school;
- 3 x 2/3FE primary schools;
- A linear park along the River Ouzel corridor;
- Access roads, pedestrian and cycle routes (along with the diversion and stopping up of existing routes within the site);
- A new bridge over the M1 motorway, access route and other transport infrastructure connecting into Milton Keynes;
- A new bridge across the River Ouzel floodplain; and
- Associated infrastructure, drainage and other works.

1.2.3. It is intended that a planning application will be submitted for the Scheme in Spring 2021.

1.2.4. The construction of Highway Link 107 (the River Ouzel Crossing) is funded by the Housing Infrastructure Fund (HIF), these works need to be constructed before the end of March 2023.

Source: JTP

Figure 1-1 – Indicative Parameter Plan

1.3 LOCATION

1.3.1. The site is located between the M1 which largely forms the southern boundary of the site and the A422 which forms the northern boundary, with the River Ouzel flowing through the site. The River Ouzel flows generally to the north-west, through the town of Newport Pagnell before joining the River Ouse. The grid reference for the site is 488630, 241770 and the location of the site is shown in Figure 1-2.

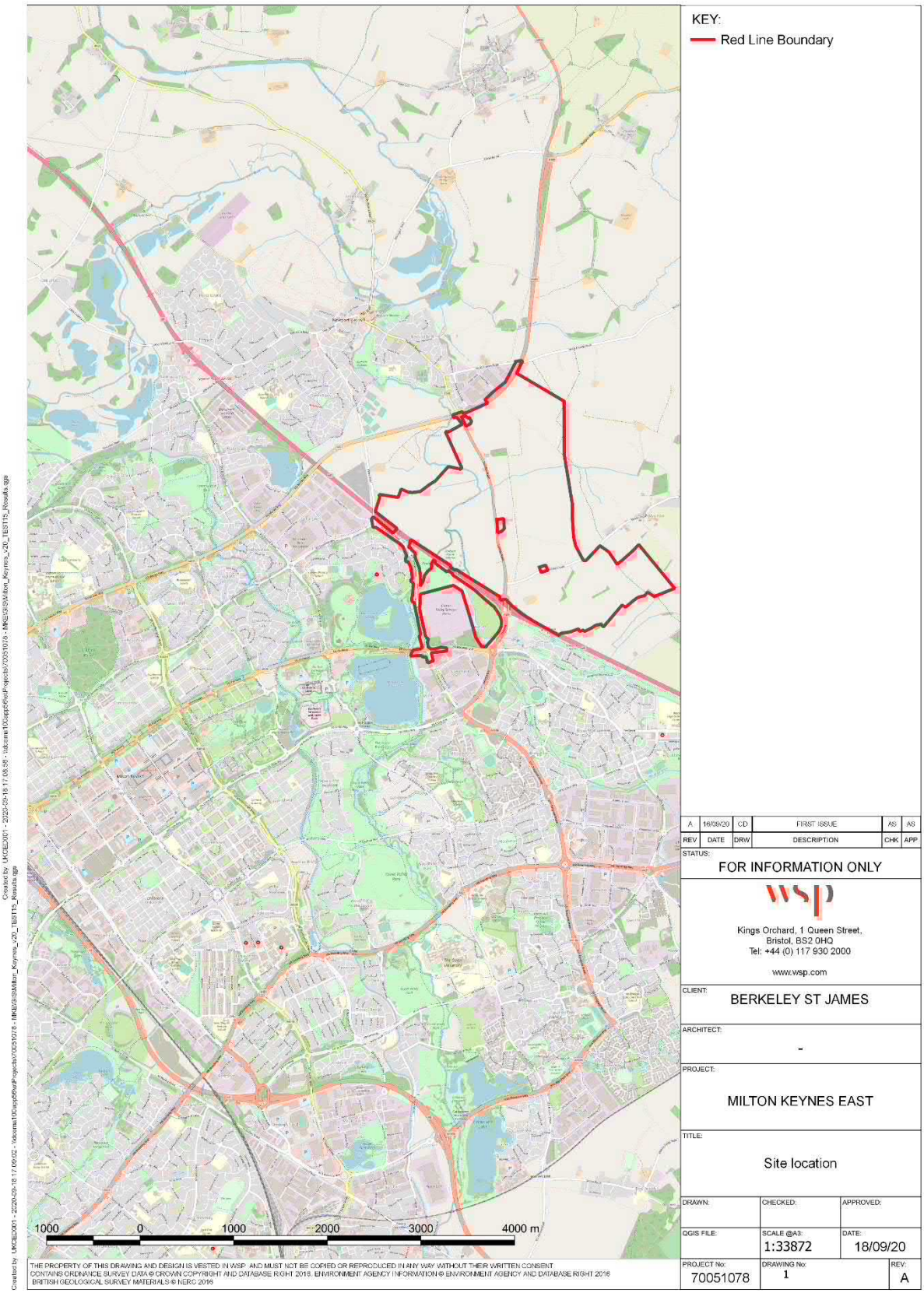

Figure 1-2 - Site Location

1.4 WATERBODIES

1.4.1. There are a number of unnamed watercourses which flow across the site towards the River Ouzel. The management of these watercourses is the responsibility of a range of organisations, including the Environment Agency (which is responsible for the River Ouzel as a main river), the Bedfordshire Group of Internal Drainage Boards (the vast majority of the watercourses) and Milton Keynes Council as Lead Local Flood Authority (which is responsible for the ordinary watercourses, which are those without other designations). The landowners also have riparian responsibilities for management and maintenance of these watercourses. The location of these watercourses are shown on Figure 1-3 along with their designations. All watercourses have been assigned names for the purposes of this assessment to provide ease of reference.

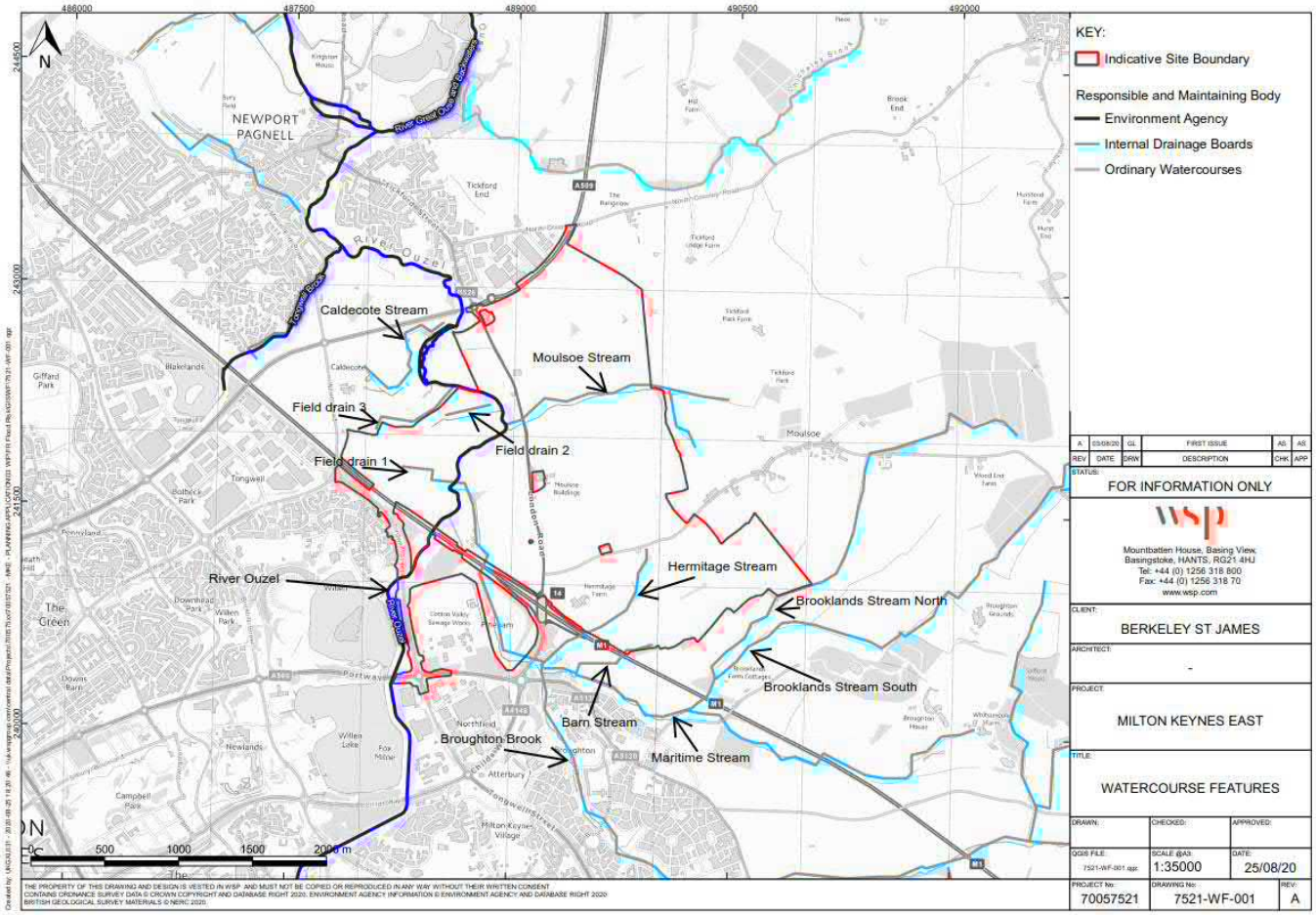

Figure 1-3 - Watercourse location, designation and names

2 CONSULTATION

2.1.1. The Scheme has been developed in line with the on-going consultation with the Environment Agency The key consultations are summarised below

- Letter of in principle agreement for the Scheme dated 28 February 2019 – The Environment Agency provided the In Principle in Agreement to support the HIF application following the submission of a Hydraulic Modelling Report dated February 2019 on 20 February 2019.
- Meeting on 16 January 2020 (minutes in Appendix B);
- Submission of the updated Baseline Model on 11 May 2020;
- Meeting on 30 July 2020;
- Environment Agency's comments on the Baseline Model received on 5 October 2020; and
- Submission of the responses to the Environment Agency's baseline model comments on 30 October 2020.

2.1.2. The key agreements are:

- **Baseline Flood Model** - The baseline flood model (as developed from the existing Environment Agency model) was deemed suitable for use in developing the Scheme on 16 January 2020. However, since this agreement, WSP have further refined the model to include the inflows on the Broughton Brook, the Moulsoe Brook and improved channel representation of the watercourses as they flow under and in close proximity to the M1. The responses to address the Environment Agency's comments on the baseline model was formally submitted to the Environment Agency on 30 October 2020. The Environment Agency are currently undertaking a review of this iteration of the baseline hydraulic model. These changes are documented in a Technical Note dated 30 October 2020;
- **Willen Lake Weirs** – The modelling has been developed based on the Environment Agency assumption that the weirs associated with the overflow lakes are in the lifted flood position (agreed January 2020);
- **Hydrology** - The timing of the River Ouzel and the Broughton Brook over the period February 2019 to February 2020 do not indicate any substantial differences in time to peak with these peaks being sufficiently close to be considered co-incident, although no large magnitude storms were observed. The approach within the hydraulic model has been to align the peaks of the hydrographs. The approach to the hydrology is summarised in the baseline flood model submission (submitted on 30 October 2020) which the Environment Agency are currently reviewing;
- **Climate Change** – It was agreed in the January 2020 meeting (Appendix B) that the 1 in 100 year plus 35% climate change allowance is to be the design scenario with sensitivity undertaken on the 65% climate change allowance . There is no requirement to consider the H++ scenario (agreed in July 2020).
- **Freeboard** – the Finished Floor Level (FFL) to consider the model uncertainty with 250-300mm freeboard being discussed, this would be set above the 1 in 100 year plus 35% climate change flood level (agreed January 2020);
  Compensation –It was agreed in the January 2020 meeting (Appendix B) in relation to Highway Link 107 (the River Ouzel Crossing), that flood plain compensation for this is not required in level for level volume for volume terms. This will instead need to be achieved by demonstrating that

there is no increase in flows at the peak of the hydrograph at the downstream boundary of the site.

3 POTENTIAL FLOODPLAIN IMPACTS

3.1 SCHEME PROPOSALS

3.1.1. Although the masterplan is still being refined, the proposed works that have the potential to impact the fluvial flood regime associated with the River Ouzel and the Broughton Brook are outlined below (as shown in Figure 1-1 and Appendix A):

Highway Link 107 (the River Ouzel Crossing), with a 30m bridge opening centred on the River Ouzel. The bridge opening will include a share footpath / cycle way on each bank along with the 20m wide river channel. Additionally, two flood relief culverts (each 3m high by 5m wide), which outside of times of flooding will act as pedestrian routes, are proposed beneath the highway connecting the floodplain. These flood relief culverts are also intended to provide vehicular access for maintenance purposes (including that undertaken by the Environment Agency). The proposed cross section showing the bridge and pedestrian routes is contained in Appendix C.

- **Widening of V11 (Tongwell Street)**, this is to be a new bridge structure and will be constructed largely mirroring the existing piers and embankments. The general arrangement for this is in Appendix D;
- **Managing future flood risk to the development platforms.** The changes to the floodplain by Highway Link 107 (the River Ouzel Crossing) introduce an element of risk to some of the proposed development parcels adjacent to the floodplain, to counter this they have been raised, a minimum of 600mm;
- **Recreational uses to be located within the floodplain, including three formal playgrounds**. These three formal play areas are located within the linear park to ensure the sustainability and amenity value of the Scheme (as shown on Figure 5-1). To ensure that they do not flood too frequently, which would impact their usability, safety and viability they are to be set at 150mm above the 1 in 20 year flood level; and
- **Raising of land adjacent to the upstream face of Highway Link 107 (the River Ouzel Crossing).** A small parcel of land on the right bank on the upstream face of the Highway Link has been raised by 400mm, to a minimum level of 58.2mAOD. This is required to ensure that the flow through the bridge structure are suitably throttled to prevent an increase in flood flows conveyed downstream. This approach ensures that all impacts are contained within the redline boundary (i.e. land which is under the applicants control to prevent third party impacts). This is inline with the approach discussed with the Environment Agency in January 2020.

3.1.2. The post development hydraulic model is the baseline hydraulic model modified to include all these aspects, as detailed in Section 5.

3.2 SURFACE WATER DRAINAGE STRATEGY

3.2.1. The surface water drainage strategy will be developed separately but will restrict the peak flows from the impermeable areas to the equivalent greenfield flow (QBAR) or 4 l/s/impermeable hectare, which ever is less. For all catchments which do not discharge into the Moulsoe Stream, this will provide a degree of betterment in the peak flows discharged from the site into the upper tributaries (as requested by the Environment Agency). This approach is precautionary and will improve the current standard of protection offered by the flood defences at Newport Pagnell and elsewhere further

downstream on the River Ouse, into which the River Ouzel discharges, in light of the increases in peak river flows expected due to climate change.

3.2.2. The post development surface water drainage regime for the catchments which discharge into the Moulsoe Stream has been represented within the current model, as detailed in Section5.

3.2.3. The surface water attenuation ponds will be located outside the 1 in 100 year plus 35% climate change flood extents.

3.3 DETAILED DESIGN CONSIDERATIONS

3.3.1. The masterplan includes some aspects which are not possible to assess at the current stage, due to the outline nature of the planning application. These include:

- A series of pedestrian bridges will be required over the River Ouzel and IDB managed watercourses, within the River Ouzel floodplain. These will be determined and assessed during reserved matters, with the current design considered to be free spanning, relatively low impact, wooden features which should have no to negligible impact on the flood regime;
- Wetland areas within the floodplain, to provide Water Framework Directive benefits along with biodiversity and amenity value;
- Community growing spaces and allotments will be located within / at the edge of the floodplain, these are water compatible uses and thus sequentially acceptable.

4 BASELINE FLOOD MODELLING

4.1.1. The baseline model remains as detailed in Section 2.1.1 as no further changes to the baseline model have been made since the last submission to the Environment Agency on 30 October 2020, A summary of the baseline model is provided below.

4.1.2. The baseline flood model represents the flood risk to the Scheme area prior to development. The modelling has been based on the existing ESTRY-TUFLOW model of the River Ouzel and tributaries provided by the Environment Agency. The full Environment Agency model was run with output locations included to capture out of bank flows for input into a cut down version. The Environment Agency model was trimmed between the Ouzel Valley Park and Newport Pagnell and the 1D and 2D results from the full model used as inputs to the site specific trimmed model.

4.1.3. During the development of options of Highway Link 107 (the River Ouzel Crossing), some improvements were identified and included within the model. These are listed below and shown in Figure 4-1:

- Inclusion of the Broughton Brook as a 1D ESTRY channel element (green line in Figure 4-1;
- Inclusion of a small channel flowing adjacent to the Cotton Valley Sewage Treatment Works (STW), under the M1 through Pineham Nature Reserve (red line in Figure 4-1);
- Inclusion of an additional ordinary watercourse on the right bank of the River Ouzel upstream of the proposed highway crossing location as a point input (green triangle in Figure 4-1);
- Revised hydrology for the Broughton Brook and additional watercourses.

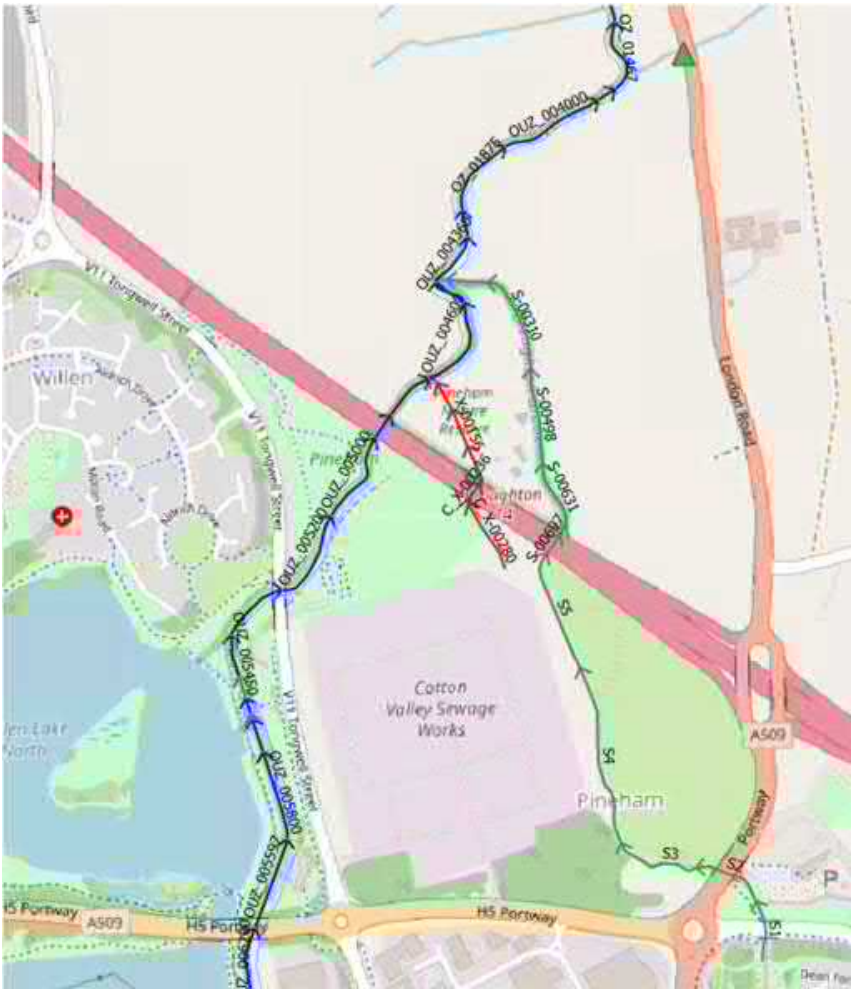

Figure 4-1 - Revised baseline model elements

5 POST DEVELOPMENT FLOOD MODELLING

5.1 MODEL SCHEMATISATION

5.1.1. The baseline model has been modified in the following ways to incorporate the post development aspects of the Scheme (as described in Section 3):

Hydraulics

- The Highway Link 107 (the River Ouzel Crossing) has been added to the model. This has been achieved by applying a new raster grid overlain on the baseline floodplain topography to represent the highway link. The grid ties the Highway Link 107 (the River Ouzel Crossing) into the existing levels to the east and west;
- To represent the bridge crossing of the River Ouzel, a z-shape file has been schematised to the edge of the 1d channel representation of the watercourse, resulting in a 30m gap in the Highway Link 107 (the River Ouzel Crossing) representing the proposed bridge opening;
- The 1D channel representation of the channel through the bridge has been altered to facilitate the pathways either side of the channel;
- The two flood relief culverts which outside of times of flood will act as pedestrian routes measuring 5m by 3m have been added through Highway Link 107 (the River Ouzel Crossing) using ESTRY floodplain features (these are located on the western side and the centre of the Highway Link 107 to facilitate continuation of pedestrian desire lines). These are 1D structures linking the 2D domains either side of the highway link;
- To ensure that the development parcels are safe from the risk of flooding, as a result of Highway Link 107 (the River Ouzel Crossing), the development parcels adjacent to the floodplain (R11, R12, R02, R03a, R03b, and R04) have been raised using z-shape files. The new ground level for the parcels has been set 600mm above the design event flood level (1 in 100 year plus 35% climate change);
- The piers of the Tongwell bridge are increased in size following the construction of the Scheme. This is represented by modifying the width of the flow constriction shapes used to represent the bridge piers in the baseline model to reflect the increased post-development pier size
- The land to the immediate south of Highway Link 107 (the River Ouzel Crossing) has been raised by 400mm, to a minimum level of 58.2mAOD, through the use of a z-shape file to throttle the flows through the bridge opening and help replicate the baseline scenario further downstream; and
- The three playground areas have been raised above the 1 in 20 year flood level plus 150mm freeboard using z-shape files.

5.1.2. Figure 5-1 shows a schematic map indicating the post-development scheme features as described above.

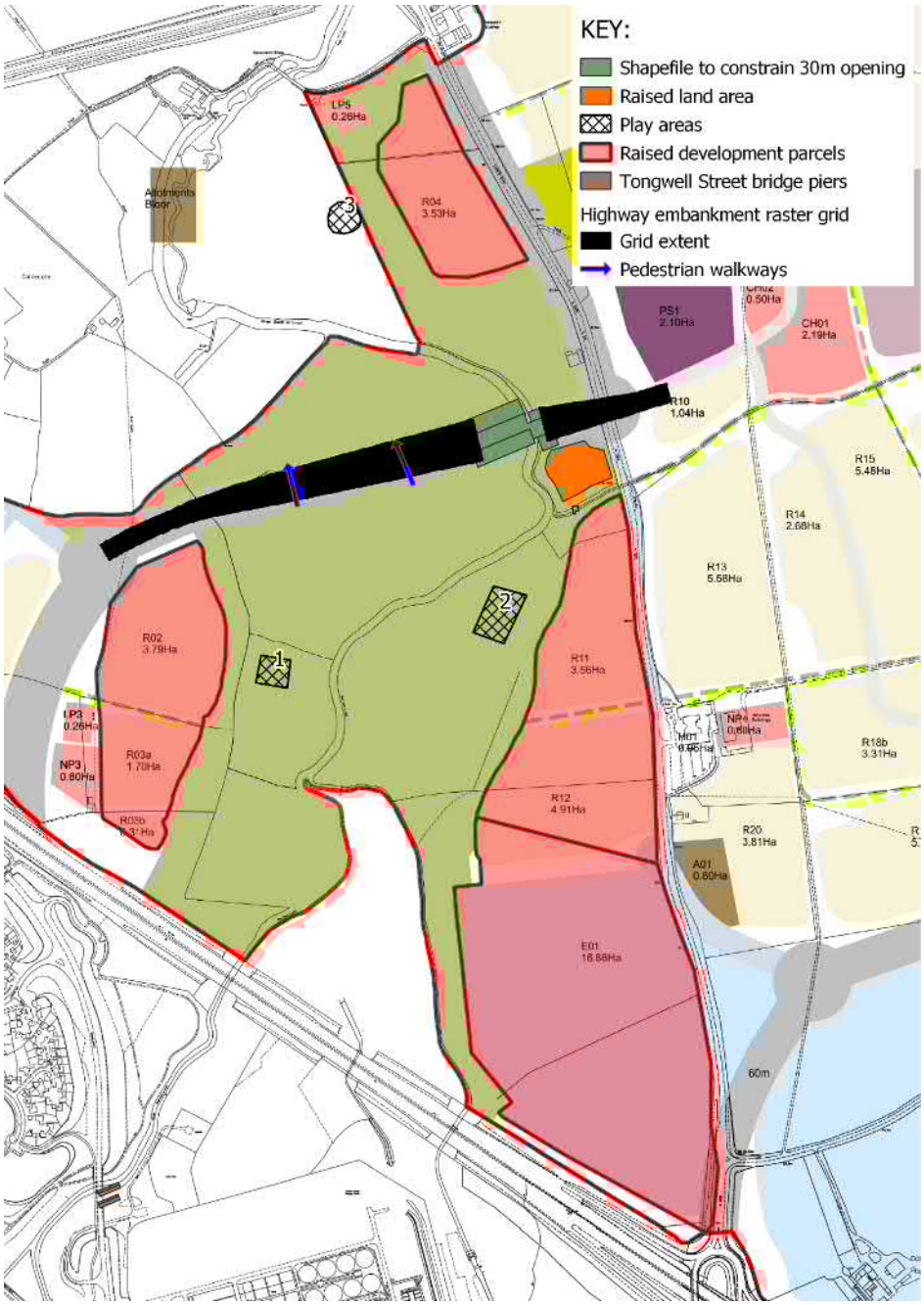

Figure 5-1 - Map showing location of changes made to the baseline model to incorporate the post-development scheme

Hydrology

5.1.3. The post development hydrograph for the Moulsoe Stream has been constructed by combining the baseline flows for the Moulsoe stream with the outputs from the surface water drainage strategy. The catchment draining to the Moulsoe stream was approximately 1.93km^2 and of this area, approximately 0.66km^2 will become impermeable areas served by a surface water drainage system once the Scheme is complete. The remaining 1.27km^2 (65%) of the catchment will continue to drain to the Moulsoe stream in the same manner as it does in baseline conditions. The baseline

hydrographs for the Moulsoe Stream were reduced by a factor of 0.65 to account for this loss of area.

5.1.4. For the impermeable areas, the maximum proposed discharge rate has been set at 4/l/s/ha. Based on a total impermeable area of 0.66km^2 (66ha) the maximum discharge from the impermeable areas will be 26l/s, equivalent to 0.26 m^3/s. This peak impermeable flow was then added to the adjusted baseline hydrographs at timesteps where the flow exceeded 0.26 m^3/s to replicate the conditions were water would be discharged from the surface water drainage system into the Moulsoe Stream.

5.1.5. The difference between the baseline and post-development hydrographs for the 1 in 100 year +35% climate change event are shown in Figure 5-2. The peak is attenuated from 1.06m^3/s down to 0.96m^3/s.

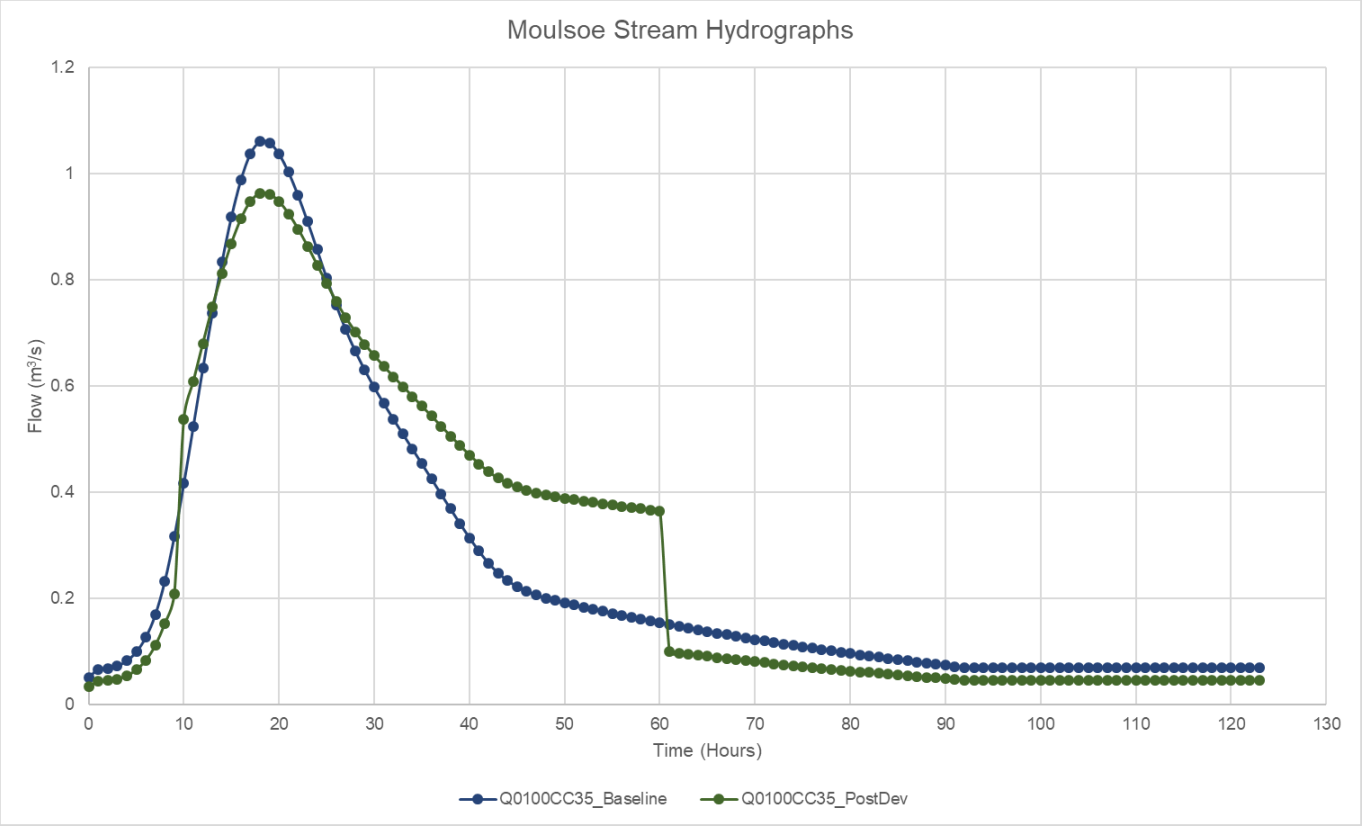

Figure 5-2 Comparison of baseline and post-development hydrographs on the Moulsoe stream for the 1 in 100 year + 35% climate change event

5.2 MODEL STABILITY

5.2.1. The post-development model has been assessed to determine whether the changes to the model relating to the post-development scheme result in a change to model stability. The graph shown in Figure 5-3 shows a plot of the 2D mass balance throughout the model simulation for the 1 in 100 year + 35% event.

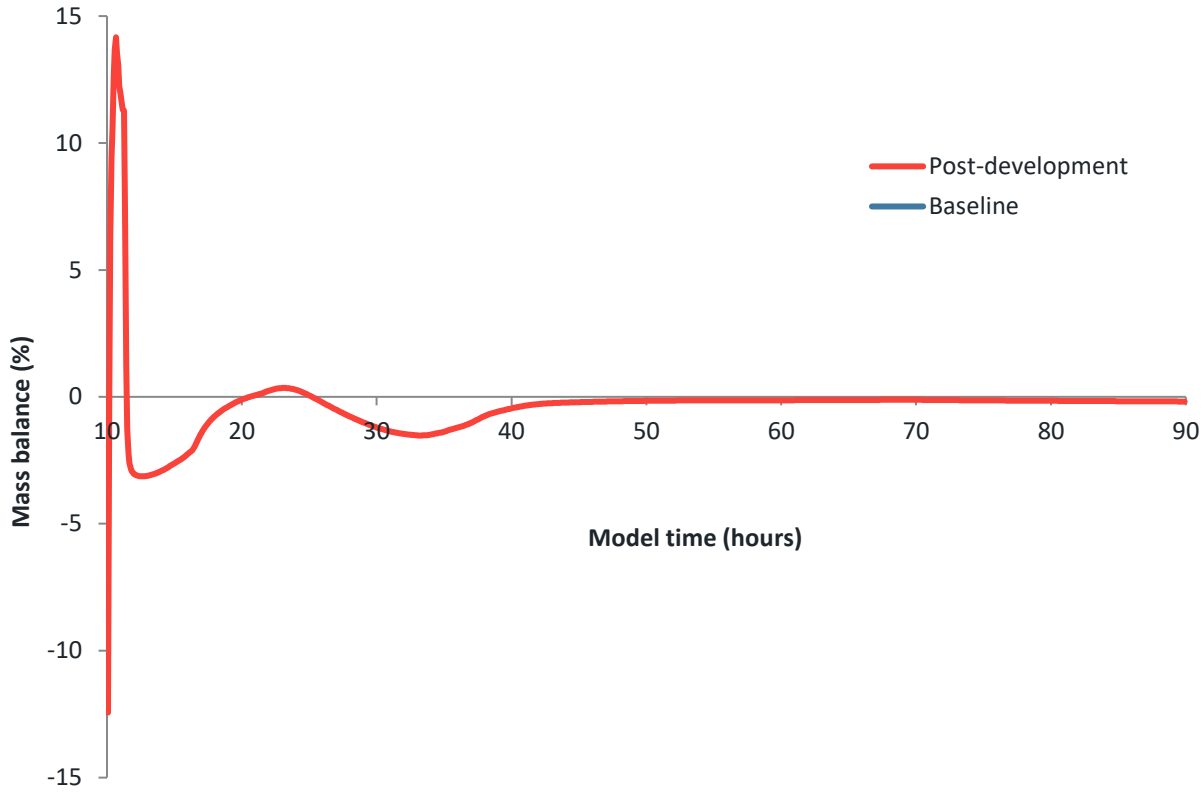

Figure 5-3 - Mass balance for the baseline and post-development scenario in the 1 in 100 year + 35% climate change scenario

5.2.2. The graph indicates that there is a high mass balance error as the model is initialising, due to the channel beginning dry. As the simulation progresses the mass balance error is reduced, and at the time of the peak at 50 model hours the mass balance error is -0.12%. This is well within the typical tolerance of +/- 1% and therefore it is considered that this mass balance error will not impact the maximum water depths and extents.

6 POST DEVELOPMENT FLOOD REGIME

6.1 FLOOD MAPS

6.1.1. Maps showing the depth difference between the baseline and post-development model scenarios for the design scenarios (1 in 100 + 35%, 1 in 100 + 65% and the 1 in 1,000 year events) are shown in Appendix E. Whilst the flood depth, level and hazard maps are shown in Appendices F, G and H respectively. These maps are discussed in the subsequent sections.

6.2 FLOOD MECHANISMS

6.2.1. As in the baseline model, the post-development model demonstrates that the A422 bridge , at the downstream extent of the site, is the key constraint to flow conveyance downstream, with flood waters starting to back up across the floodplain once the A422 bridge capacity is exceeded. This is the primary constraint to the flows which can pass under Highway Link 107 (the River Ouzel Crossing).

6.3 FLOOD EXTENTS

6.3.1. The flood extents in the post-development scenario remain largely the same as those in the baseline scenario. Changes to the flood depth and extent occur on land within the Scheme red line, there are no impacts on third party land, with the exception of area downstream of Highway Link 107 which will become part of the Adjacent Linear Park (as shown in Figure 6-1), where the levels increase between 0.01m to 0.1m. This land is part of the current floodplain and is owned by Milton Keynes Council (who in their role as the Local Planning Authority will give planning consent for the Scheme). Their aspirations as detailed during the pre-application discussions are for this area to become part of the linear park.

6.4 POST DEVELOPMENT SUMMARY

6.4.1. The impacts of the scheme on both flood levels and flows are summarised in Table 6-1 and Table 6-2 respectively. The locations of the key offsite areas are shown in Figure 6-1, whilst the key on-site areas are shown in Figure 6-2.

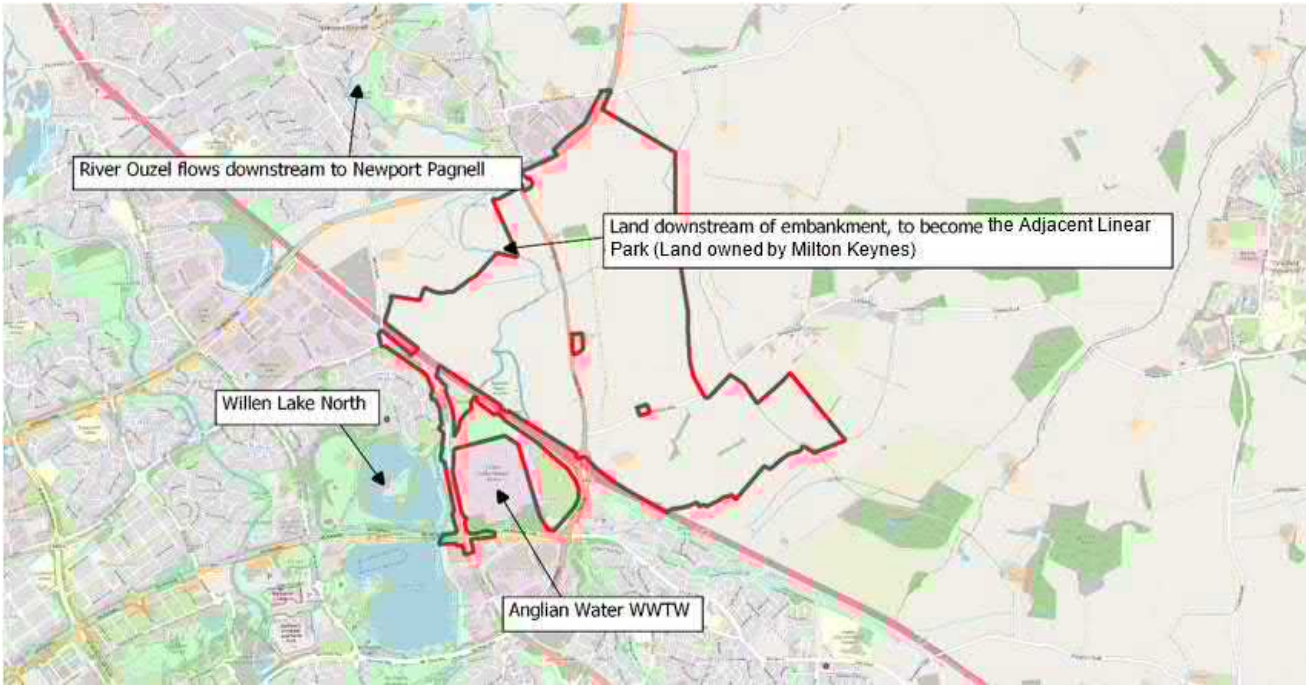

Figure 6-1 - Offsite locations

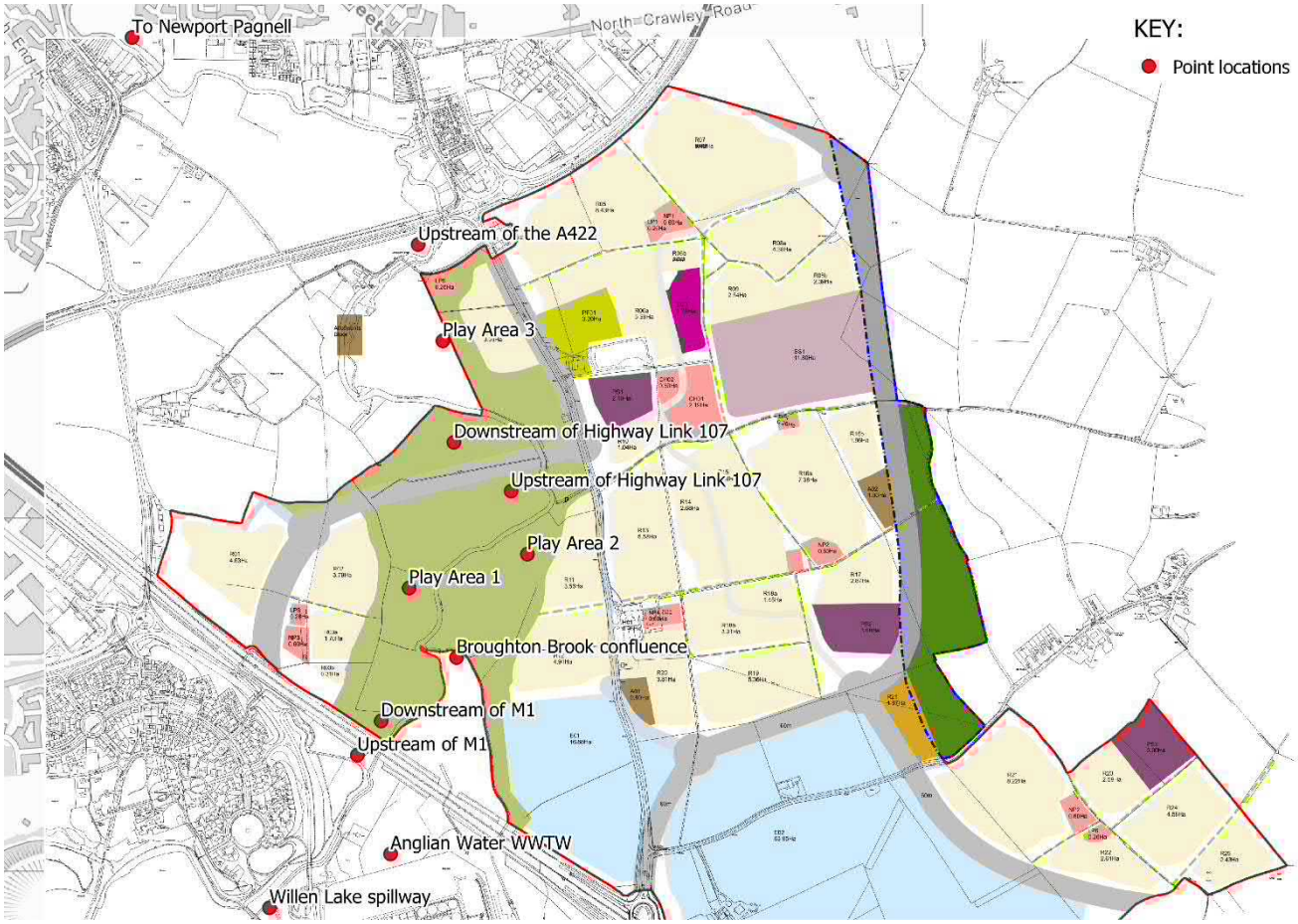

Figure 6-2 – Key Flood Level Locations

6.4.2. Where the flows are out of bank the flows were obtained from a Plot Output (PO) line which is a method of extracting flows at a given location from the model, the location of which is shown in Figure 6-3. Otherwise they were obtained from the 1D information.

Figure 6-3 - Location of Downstream PO Line

Table 6-1 - Flood depths at key locations [m]

Area	Designated Floodplain				Design Scenario			Sensitivity Scenario			Extreme Scenario		
	Critical level	1 in 20 year			1 in 100 year + 35% Climate Change			1 in 100 year + 65% Climate Change			1 in 1,000 year		
	mAOD	Baseline	Proposed	Difference	Baseline	Proposed	Difference	Baseline	Proposed	Difference	Baseline	Proposed	Difference
Anglian Water WWTW	61.2	57.36	57.38	0.02	57.85	57.99	0.13	57.99	58.16	0.17	57.83	57.96	0.14
Willen Lake Spillway	58.95	58.10	58.11	0.00	58.40	58.42	0.02	58.50	58.53	0.03	58.37	58.39	0.02
Willen Lake Weir	59.7	59.30	59.30	0.00	59.57	59.57	0.00	59.64	59.64	0.00	59.55	59.55	0.00
Upstream of M1	60.46	57.47	57.48	0.01	57.94	58.04	0.09	58.05	58.18	0.14	57.92	58.01	0.10
Downstream of M1	60.46	57.38	57.39	0.02	57.71	57.88	0.16	57.80	58.03	0.23	57.70	57.86	0.16
Broughton Brook confluence	-	57.32	57.34	0.02	57.60	57.82	0.22	57.68	57.98	0.30	57.59	57.81	0.21
Play Area 1	57.34	57.12	N/A	N/A	57.42	57.76	0.35	57.51	57.93	0.43	57.41	57.75	0.34
Play Area 2	57.28	57.07	N/A	N/A	57.32	57.72	0.40	57.40	57.89	0.49	57.31	57.71	0.40
Upstream of Highway Link 107 (the River Ouzel Crossing)	62.21	56.75	57.11	0.36	57.19	57.70	0.51	57.29	57.87	0.58	57.19	57.69	0.51
Downstream of Highway Link 107 (the River Ouzel Crossing)	62.21	56.74	56.72	-0.03	57.10	57.05	-0.04	57.18	57.15	-0.04	57.09	57.04	-0.04
Adjacent Linear Park (Play Area 3)	56.41	N/A	N/A	N/A	56.72	56.75	0.03	56.86	56.87	0.01	56.71	56.74	0.03
Upstream of the A422	-	55.85	55.85	0.00	56.44	56.44	0.00	56.60	56.60	0.00	56.42	56.42	0.00
Newport Pagnell	-	54.83	54.83	0.00	55.21	55.21	0.00	55.32	55.32	0.00	55.20	55.20	0.00

Table 6-2 – Comparison of flood flows at key locations [m^3/s]

	Frequent Event			Design Scenario			Sensitivity Scenario			Extreme scenario		
Area	1 in 20 year			1 in 100 year + 35% Climate Change			1 in 100 year + 65% Climate Change			1 in 1000 year		
	Baseline	Proposed	Difference	Baseline	Proposed	Difference	Baseline	Proposed	Difference	Baseline	Proposed	Difference
Willen Lake	32.9	32.9	0.0	62.3	62.3	0.0	69.9	69.9	0.0	59.8	59.8	0.0
Downstream of Highway Link 107 (the River Ouzel Crossing)	56.8	56.6	-0.2	138.0	137.3	-0.7	167.2	166.8	-0.4	135.4	134.9	-0.5
Newport Pagnell	57.4	57.3	-0.1	133.5	133.5	0.0	163.4	163.4	-0.1	131.20	131.24	0.0

ONSITE CHANGES

6.4.3. The flood model shows that there are a range of impacts on the flood regime as a result of the Scheme these are summarised below and shown in Figure 6-4 (flood difference maps for all return periods are in Appendix E):

- A reduction in flood levels of 40mm immediately downstream of Highway Link 107 (the River Ouzel Crossing) for the 1 in 100 plus 65% climate change scenario
- Downstream of parcel R04, point there is a negligible to no change to the flood levels (0.03 for the 1 in 100 year plus 35% climate change and 0.01 for the 1 in 100 year plus 654% scenarios), this continues decreases with distance to the A422, by which point there is no change, and there is no change downstream beyond the A422.
- Upstream of Highway Link 107 (the River Ouzel Crossing) flood waters have a greatest increase in depth in the reach where the Broughton Brook converges with the River Ouzel. In this section an increase in modelled peak flood depths of 510mm is predicted for the 1 in 100 plus 35% climate change scenario, and an increase of 580mm is predicted for the 1 in 100 plus 65% climate change scenario. This is in an area designated as a linear park
- At the M1, for the sensitivity scenario (1 in 100 plus 65%) there is an increase in peak flood water levels of 0.14m and 0.23m (upstream and downstream respectively) with the peak flood level reaching 58.18mAOD which remains 2.28m below the deck level of the carriageway, which is at a level of 60.46mAOD. Given that the level of the carriageway is significantly above the maximum flood level, no increase in flood risk to the M1 is predicted. The increase of flood depth adjacent to the M1 is currently under discussion with Highways England.

6.4.4. The flood risk mitigation and management measures to each aspect of the Scheme is outlined in greater detail in Section 7.

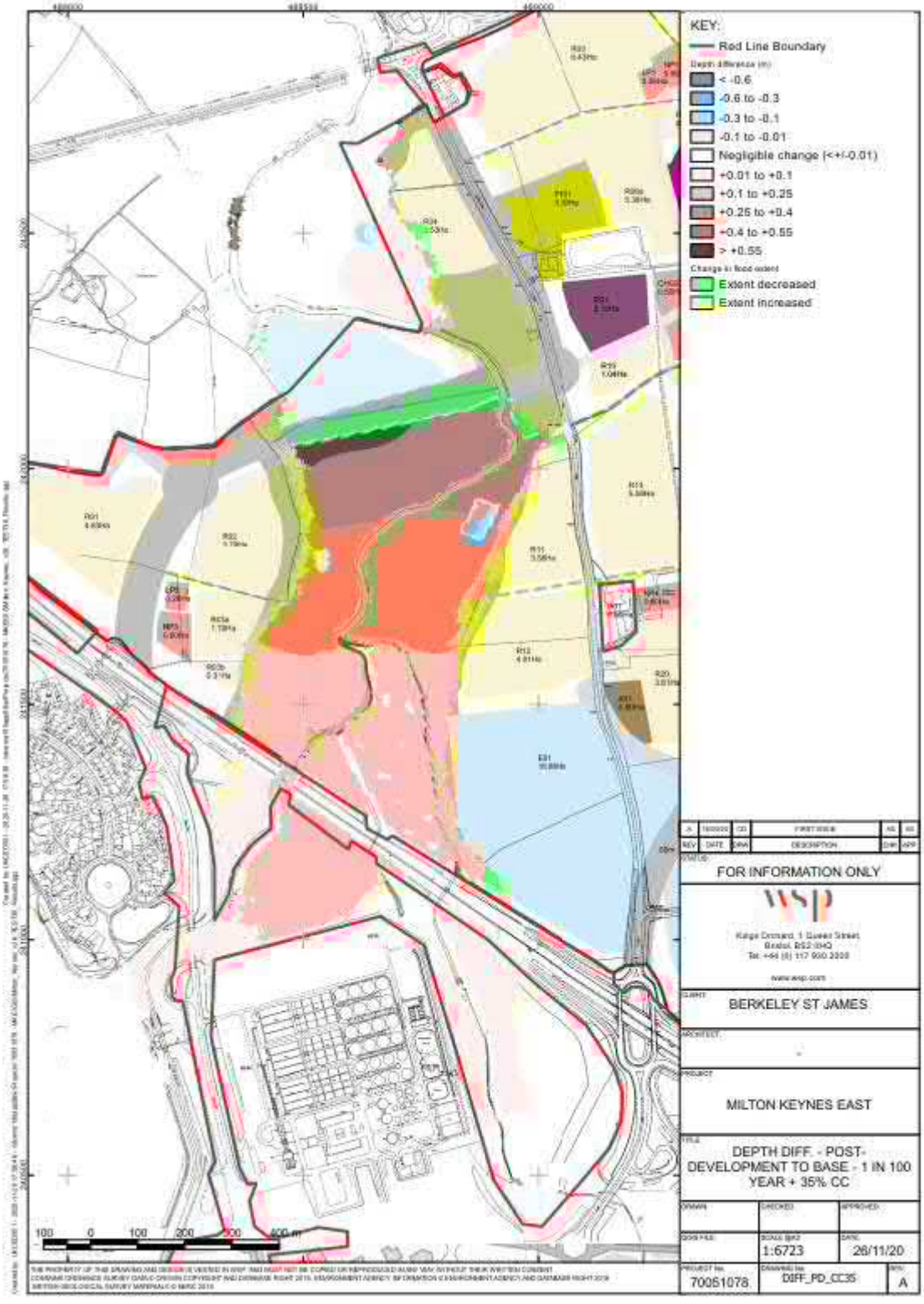

Figure 6-4 - 1 in 100 year +35% climate change flood difference map

LAND BETWEEN LINK 107 AND THE A422

6.4.5. Parts of this area lie outside the red line boundary in land owned by Milton Keynes. Milton Keynes have aspirations for the land to be incorporated onto the proposed linear park The maximum change in levels here occurs adjacent to Play Area 3 in the 1 in 100 year plus 35% climate change event and is 30mm.

6.4.6. The change in the maximum water level is negligible upstream of the A422 for all modelled return periods.

WILLEN LAKE

6.4.7. The change in flood levels gradually reduces with distance from Highway Link 107 (the River Ouzel Crossing) towards Willen Lake. At Willen Lake adjacent to the spillway, The pertinent information is:

- The top of the exceedance spillway is 58.95mAOD.
- The crest of the weir which controls the flows between the main River Ouzel channel towards the site is at a level of 59.7mAOD. In the baseline scenario, the maximum water level in the channel is 59.64mAOD in the 1 in 100 year + 65% climate change scenario.

6.4.8. At Willen Lake adjacent to the exceedance spillway, there is no change in the flood level (<1mm, which is well within the model tolerance). Whilst at the crest of the weir which controls the flows between the main River Ouzel channel towards the site and those diverted into Willen Lake there is no change in modelled flood level.

ANGLIAN WATER WWTW

6.4.9. The Anglian Water WWTW lies to the south of the scheme, to the north east of Willen Lake. Whilst there are very minor changes in water levels on the floodplain, the WWTW is elevated above the floodplain at a level of 61.2mAOD which is 3.04m above the 1 in 100 year plus 65% climate change post development flood level. Therefore, no change in flood risk is predicted.

NEWPORT PAGNELL

6.4.10. As outlined in Table 6-2 the model demonstrates that for all design scenarios there is no change in the peak flows that are conveyed downstream towards Newport Pagnell, or the flood levels at Newport Pagnell as shown in the flood difference maps (Appendix E). This demonstrates that the Scheme does not result in changes in peak flood depths at or downstream of the A422.

6.4.11. There is no change in the overall duration of the flood event for any of the modelled scenarios, the flood peak occurs at 40 modelled hours and returns to baseline conditions at 62 hours. This is comparable to the baseline model results.

7 MITIGATION MEASURES

7.1.1. This section details how the flood risk to each section of the Scheme is to be mitigated and managed.

7.2 DEVELOPMENT PARCELS

7.2.1. Each of the development parcels which are adjacent to the River Ouzel floodplain as shown in Figure 5-1, will be raised 600mm above the 1 in 100 year plus 35% climate change flood level. This platform level remains above the sensitivity design threshold of the 1 in 100 year plus 65% climate change flood level along with the 1 in 1,000 year flood level, this is detailed in the table below..

Table 7-1 - Minimum Platform Levels

	Design Scenario - 1 in 100 year plus 35% climate change		**Sensitivity Scenario - 1 in 100 year plus 65% climate change**		**Extreme Scenario - 1 in 1,000 year**	
Development Parcel	Flood Level (mAOD)	Minimum Platform Level (mAOD)	Flood Level (mAOD)	Freeboard (m)	Flood Level (mAOD)	Freeboard (m)
RO3B	57.84	58.44	58.00	-0.44	57.82	0.62
RO3A	57.83	58.43	57.99	-0.44	57.81	0.62
R02	57.80	58.40	57.97	-0.43	57.79	0.61
R12	57.84	58.44	58.00	-0.44	57.83	0.61
R11	57.74	58.34	57.94	-0.4	57.73	0.61
RO4	56.86	57.46	57.01	-0.45	56.85	0.61

7.3 HIGHWAY LINK 107 (THE RIVER OUZEL CROSSING)

7.3.1. The soffit level of the bridge and flood relief culverts of Highway Link 107 (the River Ouzel Crossing) will be set above the 1 in 100 year plus 35% flood level plus 600mm freeboard (Table 7-2).

Table 7-2 - Comparison of Soffit and Flood Levels for Highway Link 107 (the River Ouzel Crossing)

Soffit Level [MAOD]				
Opening	**Soffit Level**	**Design Scenario - 1 in 100 year plus 35% climate change**	**Sensitivity Scenario - 1 in 100 year plus 65% climate change**	**Extreme Scenario - 1 in 1,000 year**

Bridge	61.00	57.58	57.75	57.58
Central Pedestrian Underpass	59.52	57.72	57.88	57.7
Western Pedestrian Underpass	59.46	57.75	57.90	57.73

7.3.2. It is proposed that the residual risk of blockage of these features will be assessed as part of the FRA but limited to the pedestrian access routes under the Highway Link 107 (the River Ouzel Crossing) A percentage blockage of 25% will be used to inform the blockage sensitivity testing. This will be used to inform the residual risk assessment and the maintenance requirements only.

7.4 PLAY AREAS

7.4.1. To ensure the safety of the play area users the three play areas within the linear park have a platform level raised above the 1 in 20 year flood level plus 150mm freeboard. There is no requirement to provide specific floodplain compensation for these areas as Highway Link 107 (the River Ouzel Crossing) significantly alters the flow and flood regime and facilitates their inclusion without adverse impacts downstream or on other third party land.

7.4.2. The location of the three play areas is shown in Figure 7-1 and the key flood risk information is provided in Table 7-3.

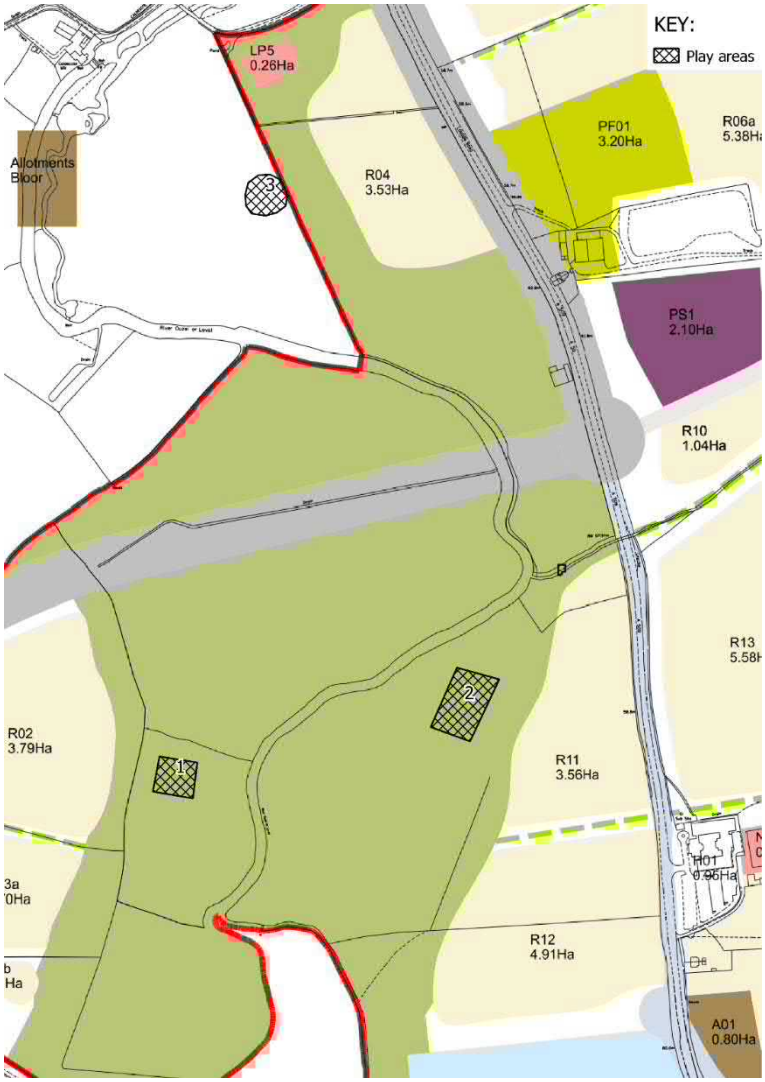

Figure 7-1 - Location of the three play areas

Table 7-3 - Key Flood Risk Information for the Play Areas

Play area	1 in 20 year					1 in 100 +35% climate change			
	Platform Level [mAOD]	Maximum Flood Depth on Platform [m]	Maximum Flood Adjacent to Platform [m]	Time to inundation [hours]	Duration of inundation [hours]	Maximum Flood Depth on Platform [m]	Maximum Flood Adjacent to Platform [m]	Time to inundation [hours]	Duration of inundation [hours]
1	57.34	0.00	0.40	N/A	N/A	0.43	0.99	30	26.5
2	57.28	0.00	0.68	N/A	N/A	0.45	1.27	30	27.5
3	56.41	0.00	0.19	N/A	N/A	0.35	0.70	30	27.25

8 RESERVOIR FLOODING

8.1.1. The Scheme is located within the Environment Agency's Risk of Flooding from Reservoir map. These are associated with the failure of Willen Lake and other upstream reservoirs (Figure 8-1). These flood extents are largely outside of the areas which will be developed as part of the Scheme, with the lower risk categories impacting some of the development parcels. Although it should be considered that this mapping does not take account of the raising of the development parcels to protect against fluvial flooding. Given that reservoirs are highly regulated with regular inspections, this is considered to be of residual risk with no further design considerations required.

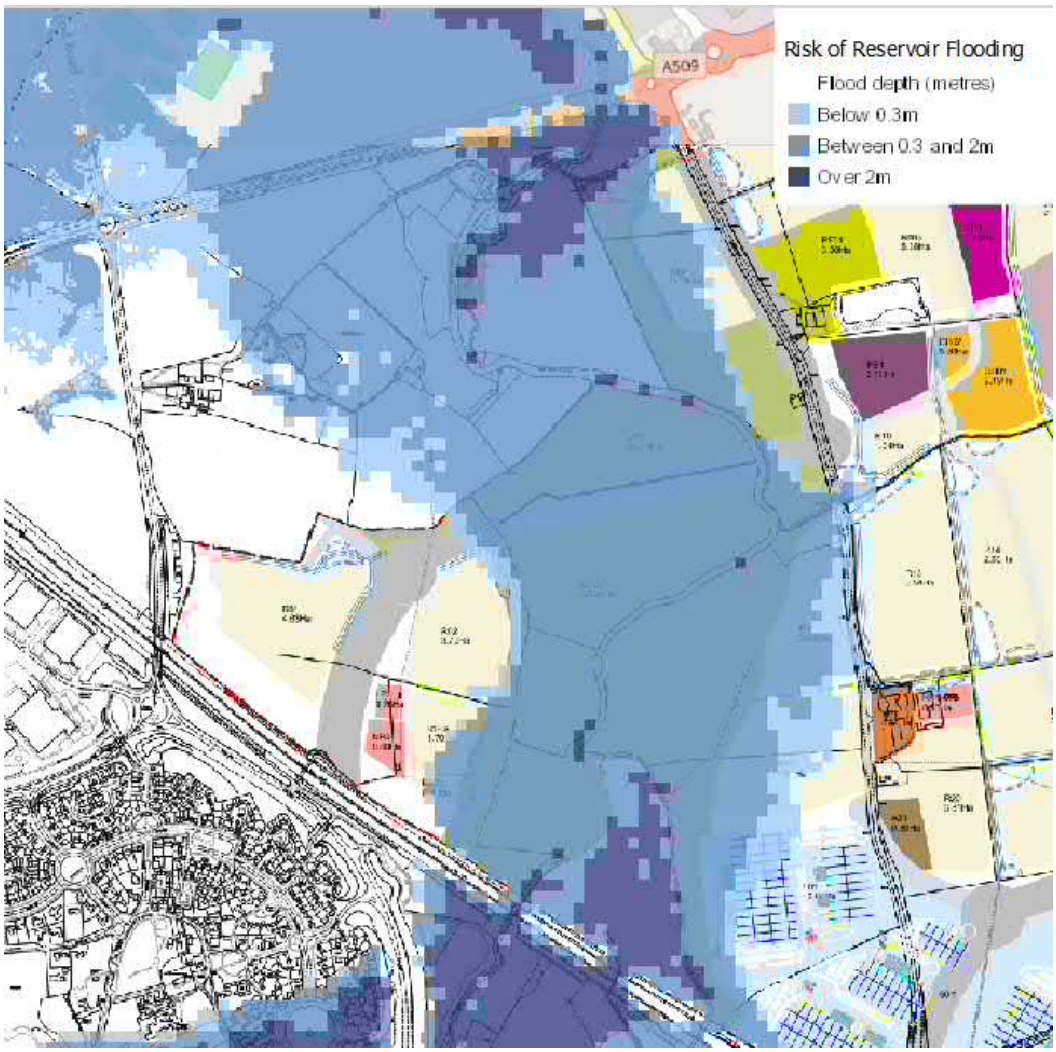

Figure 8-1 - Environment Agency Risk of Flooding from Reservoirs

9 CONCLUSIONS

9.1.1. Hydraulic modelling has been undertaken to assess the impact on flood risk of the proposed Scheme. The modelling has been based on the baseline model previously submitted to the Environment Agency for their review, including the response to the Environment Agency's queries which was submitted on 30 October 2020. The post development model incorporates changes that include the addition of a new topographic grid to represent Highway Link 107 (the River Ouzel Crossing) which includes two flood alleviation culverts / pedestrian walkways, development parcels raised out of the floodplain and the inclusion of the three play areas.

9.1.2. The results of the modelling indicate that the scheme causes an increase in flood depth and extent upstream of Highway Link 107 (the River Ouzel Crossing), but that this increase is largely contained within the red line boundary with the one exception being a negligible impact on third party land (downstream of Highway Link 107), this is land which is owned by Milton Keynes Council, who have an aspiration for this land to form part of the Schemes linear park.

9.1.3. The modelling has been incorporated within the masterplan for the Scheme to ensure that it will be safe for events up to and including the 1 in 100 plus 65% (the sensitivity scenario) as well as the 1 in 1,000 year event (the extreme scenario).

9.1.4. There is no difference in flood flows or levels downstream of the Scheme for any design scenario, it is therefore demonstrated that the Scheme does not alter the flood risk up or downstream.

Appendix A

MASTERPLAN

Notes:
Do not scale from this drawing.
All contractors must visit the site and be responsible for taking and checking Dimensions.
All construction information should be taken from figured dimensions only.
Any discrepancies between drawings, specifications and site conditions must be brought to the attention of the supervising officer.
This drawing and the works depicted are the copyright of JTP.

This drawing is for planning purposes only. It is not intended to be used for construction purposes. Whilst all reasonable efforts are used to ensure drawings are accurate, JTP accept no responsibility or liability for any reliance placed on, or use made of, this plan by anyone for purposes other than those stated above.

Key

- Site Boundary
- Additional Land Boundary
- Residential
- Employment
- Burial Ground
- Existing Hotel
- Community Hub
- Extra Care
- Primary School
- Secondary School
- Playing Fields
- Local/Neighbourhood Play Areas
- Allotments
- River Ouzel Linear Park (floodplain)
- Open Space
- Grid Roads
- Non-Grid Roads
- High Street

Rev	Date	Description	Drawn	Chkd
D3	21.09.20	Minor amendments following Client comments	LB	AH
D2	05.06.20	Minor amendments following Client comments	LB	AH
D1	04.06.20	first issue for comment	LB	AH

Drawing Status
DRAFT

Client
St James

JTP Studios
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Project
Milton Keynes East

Drawing Title
Land Budget Plan 2
Eastern Boundary Option

Scale @ A1 1:5000 Job Ref. 01312
Drawing No. 01312 _LB_02 Revision D3
Scale Bar 0 50 100 150 200 250m

Appendix B

MEETING MINUTES

MEETING NOTES

PROJECT NUMBER	70051078	**MEETING DATE**	16 January 2020
PROJECT NAME	Milton Keynes East – St James	**VENUE**	Skype
CLIENT	Berkeley Homes	**RECORDED BY**	AS
MEETING SUBJECT	Discussion with EA		

PRESENT	Andy Smith (WSP), Charlotte Dunleavy (WSP), Ben Corne (EA)
APOLOGIES	Alastair Atkinson (WSP), Neville Benn (EA)
DISTRIBUTION	As above
CONFIDENTIALITY	**Confidential**

ITEM	SUBJECT	ACTION	DUE
1	**Introduction to the scheme**		
1.1	Site Extents – *The redline boundary plan is still under development, this is will be provided in due course.*		
1.2	Current status of highway and masterplan design / development *The current layout of the highway network is attached for reference, this shows which roads planning will be sought in detail and outline. The plan also shows the flood extents and the watercourses for which modelling is proposed.*		
1.3	Planning approach – HIF Funding / Highway, wider masterplan *The planning application is programmed to be submitted in January 2021 as a hybrid application, with the highways in detail and the plots in outline.*		
1.4	Programme *As above*		
1.5	IDB, LLFA and other stakeholder engagement *Ben will speak to Trevor (IDB) and Ash / Rachel at MKC about a consistent approval process for the modelling. A plan showing which watercourses are to be modelled and which consultees is responsible is attached.*	BC	31/01/20
2	**Climate Change Allowances**		
2.1	December 2019 update and future revisions		
2.2	We propose to use the 1 in 100 year and 1 in 100 year plus 35% cc for design with sensitivity on the 65%		

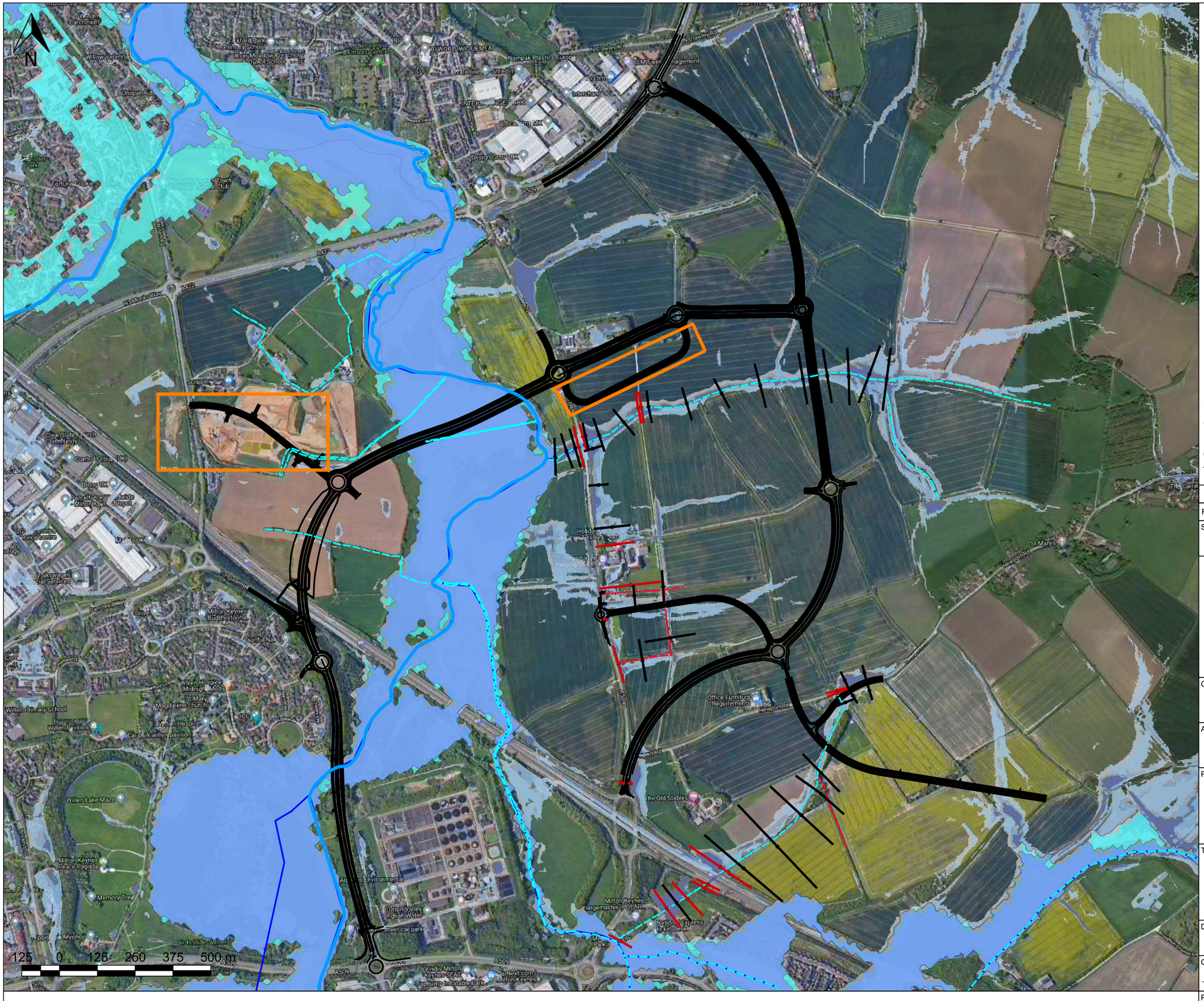
	The use of these allowances were agreed, however, the EA are working on an update to these in light of UKCP18, the release date is currently unknown but considered likely at the end of the year, the design should include a degree of sensitivity in case they are released prior to submission of the planning application as the transition approach / period is unknown.		
3	**Approach to fluvial modelling**		
3.1	A summary of the approach we have taken to date through the utilisation of the current Environment Agency hydraulic model in this area. This was documented in the report issued February 2019. *The use of this model as documented in our report was agreed with no requirement for any changes to the baseline model.*		
3.2	This model assumes that the weirs associated with the overflow lakes are in the lifted flood position, no changes to this approach are proposed. *This approach was agreed. It is noted that Milton Keynes Council are looking into a study of the performance of the lakes but the timescales are beyond the date of the planning application for this scheme.*		
4	**Discussion on acceptable levels of model tolerance:** *"The FRA will have to explore in more detail this impact [increase in flood depths in Pineham Nature Reserve], and how the proposal is going to meet the requirements of Part B of the Exception Test"?*		
4.1	On other schemes we have agreed that up to 60mm in some instances is acceptable. In this case, the increase in flood levels in the 1 in 100 year and 35% climate change scenarios are small and only impact parkland, therefore it is considered that this falls within an acceptable degree of model tolerance. The levels of tolerance that are under discussion are: 1 in 100 year, 1 in 100 year + 35% cc, 1 in 100 year + 65% cc, with a 3mm, 30mm and 60mm increase for these events respectively		
4.2	Impact on the nature reserve is minimal as it occurs only in the lower probability events and then only for a short period of time, when public use would be limited.		
4.3	***Summary of discussion*** *This degree of change would not result in an in-principle objection from the EA, but given the upward trend in flood levels as a result of the scheme, a condition for future agreement would need to be included to ensure that there is agreement from any impacted third party land owners to an increase in flood risk to their land.* *To help set the FFL of the properties the model uncertainty (250-300mm was discussed as potentially being relevant) should be reflected in the mapped flood extents* *If future agreement in flood levels / impacts on third party land is required then the outline application should demonstrate that there are feasible options to reduce the risk.* *WSP to give thought to expanding the floodplain / preferential flow routes as part of the design options to try and reduce the impact on third party land. Also WSP will give consideration to the land use / species needs as the third parties may want additional water on the land.*		
5	**Great Ouse catchment study**		

5.1	The Environment Agency are undertaking a study on storage and conveyance within the Great Ouse catchment and have commented that they would be happy to work in partnership with us if timings align. We are planning to undertake a desk based study to demonstrate that the peaks of the hydrographs do not align and there is no increase in peak flow. *Discussion on the timings for the EA study and potential for collaboration.* *This study is at the data gathering stage and the conclusion of the study is 2-3 years away.* *Further information is provided in 7.1 below*		
6	**Discussion on the approach and location for flood plain compensation.**		
6.1	The Highway Embankment will impact flood mechanisms on the site, therefore the extent of the floodplain will be redefined. Modelling will ensure that no increase in flood flows are conveyed offsite downstream. At this stage we do not foresee any changes to floodplain being required beyond that associated with the highway embankment.		
6.2	Discussion on suitability of level for level, volume for volume approach. Possibly unsuitable as flood waters will likely be throttled by the new highway embankment, therefore additional waters will be held in the upstream part of the site. We propose to provide: § A hydrograph showing no change § Flood plain pre and post scheme (assuming no change off site) tabulated for different return periods *Level for level, volume for volume compensation is to be used across the development site outside of the impact of the highway crossing of the Ouzel, but only if the increase in flood risk is on land under Berkely's control or on third party land with their agreement.* *In the instance of the highway crossing of the Ouzel it was deemed that flood plain compensation for the embankment is not required in level for level volume for volume terms, this will instead need to be achieved by demonstrating that there is no increase in flows at the peak of the hydrograph at the downstream boundary of the site, with a small overall reduction.*		
7	**Discussion regarding the EA's desire for betterment within Newport Pagnell.**		
7.1	While on site we observed robust flood defence structures and anecdotal account that properties near the flood defences are not known to flood. Discussion on the EA's ideal approach for additional protection in this area and what form this might take and what properties could be impacted. *The EA's ideal approach to flood defence is that there are significant flood defence measures already in place at Newport Pagnell and further downstream, these provide a 1 in 100 year standard of protection. However, the impacts of future climate change are likely to reduce the SoP, the EA would like the scheme to provide a reduction in the volume of water discharged from the site to provide a degree of betterment, to help reduce the impacts of climate change. This could be achieved through the provision of additional storage in the tributaries or restricting the surface water discharge below the level the equivalent greenfield rate, where possible.* The EA will look positively on schemes which hold water back, therefore this scheme should look to achieve this even if it is only a small amount that can be achieved as all the reductions across the upper tributaries within the catchment that can be achieved will have a net positive cumulative impact.		

	The reductions in the peak flows will aid the resilience of the defences and increase the lifetime of the defences when considered in terms of the 1 in 100 year plus climate change event.		
	Ben will look into the timings of the peaks in light of the flood warnings / timings that were observed in the days prior to the meeting to provide confirmation that the Ouzel peaks go through secondary. ***Post Meeting Note** – We have undertaken this assessment (please see attached Memo) using the publicly available information and have established that the River Ouzel peaks first and any delay to the peak would have a negative impact downstream, therefore, we do not propose to take the requirements discussed in the meeting further.*	BC	31/01/20
8	**Discussion of our proposed approach to the surface / pluvial water hydraulic modelling.**		
8.1	The watercourses / flow paths we propose to model are shown on the attached plans		
8.2	We proposed to use a fluvial approach through the application of point inflows to a 2d model domain incorporating 1d aspects of the key features / structures / channels derived from the channel survey. *Ben outlined that this is a reasonable approach but that the review will likely sit within MKC responsibility, however this will need to be reviewed by the EA as well if changes to the flood maps are also required as part of the development approach. Ben to discuss review approaches with MKC*	BC	31/01/20
9	**Data Submission / Model Review Approach and Timescales** *The next review should be quicker as the baseline model has now been approved. However, the timings will depend if there are further flood events which will add to the work load of the review team.*		
10	**AOB**		

NEXT MEETING

An invitation will be issued if an additional meeting is required.



KEY:

- Proposed Road Layout

Watercourses

- EA Main Rivers
- IDB Watercourses
- Indicative field drains

Sections for Survey

- Watercourse Cross Sections
- Structure Cross Sections

Risk of Flooding from Surface Water

- 0.1% AEP
- 1% AEP
- 3.3% AEP

Flood Map For Planning

- Flood Zone 1
- Flood Zone 2
- Flood Zone 3
- Areas Benefitting from Flood Defences

Notes: Roads grouped in orange to be applied for in outline PLUS the internal roads to the site to be applied for in outline. All other roads are to be applied for in detail.

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	03/02/20	AWD	FIRST ISSUE	AS	AS

STATUS: FOR INFORMATION ONLY

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Bristol, BS2 0HQ
Tel: +44 (0) 117 930 2000

www.wsp.com

CLIENT: ST JAMES GROUP LTD

ARCHITECT: -

PROJECT: MILTON KEYNES EAST, ST JAMES

TITLE: PROPOSED FLOOD RISK MODELLING EXTENTS

DRAWN:	CHECKED:	APPROVED:
AWD	AS	AS
QGIS FILE: _East_Modelling_Extents	SCALE @A3: 1:12000	DATE: 03/02/20
PROJECT No: 70051078	DRAWING No: 70051078-FR001	REV: A

MEMO

TO	Environment Agency	**FROM**	Andy Smith
DATE	**03 February 2020**	**CONFIDENTIALITY**	**Public**
SUBJECT	**River Ouzel and River Great Ouse Flood Hydrographs**		

Dear Ben and Neville,

We have undertaken a comparative analysis of recent flood events on the River Great Ouse at Newport Pagnell and the River Ouzel at Milton Keynes to understand the timing of their flood peaks. The River Ouzel is a tributary of the River Great Ouse and the confluence of these rivers is located in Newport Pagnell. Flood monitoring data is available for these rivers, with the locations of the monitoring stations shown in figure 1.

Figure 1: Monitoring Stations Locations

Data from GauageMap[1] was used to determine when significant peak flows occurred over the last 12 months, with potential flood events identified in October, November & December 2019 and in January 2020. Real time flood monitoring data for the River Ouzel at Milton Keynes and the River Great Ouse at Newport Pagnell (Cemetery) was downloaded from the Environment Agency's flood monitoring archive[2] on the following dates:

- 14th – 15th October 2019
- 14th – 16th November 2019
- 20th – 22nd December 2019
- 14th – 17th January 2020.

[1] https://www.gaugemap.co.uk/#!Map/Summary/1631/1773/2019-02-01/2020-02-29 (Accessed February 2020)
[2] https://environment.data.gov.uk/flood-monitoring/archive (Accessed February 2020).

For these four events, stage hydrographs were plotted for the River Great Ouse at Newport Pagnell (Cemetery) against the River Ouzel at Milton Keynes (M1 Ultrasonic), as shown in figure 2 – 5. From each of these four hydrographs it can be seen that the River Ouzel at Milton Keynes is peaking before the River Great Ouse at Newport Pagnell.

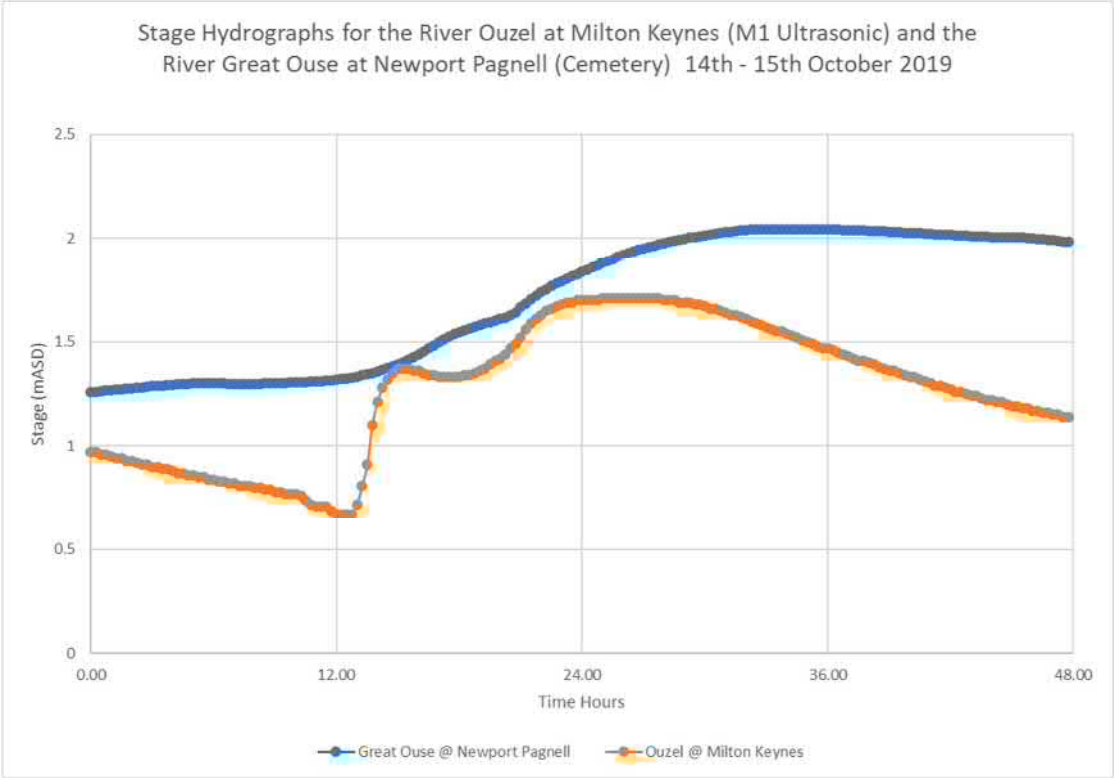


Figure 2: River Great Ouse and River Ouzel Hydrographs 14th - 15th October 2019

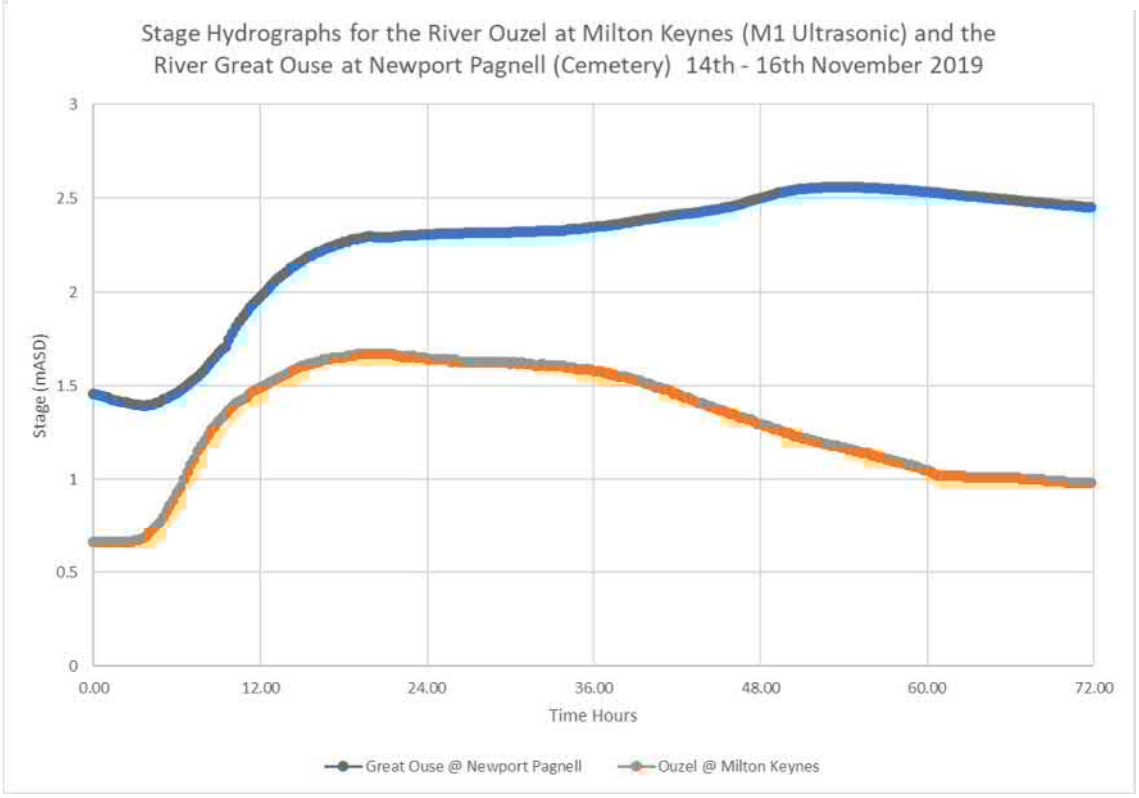


Figure 3: River Great Ouse and River Ouzel Hydrographs 14th - 16th November 2019

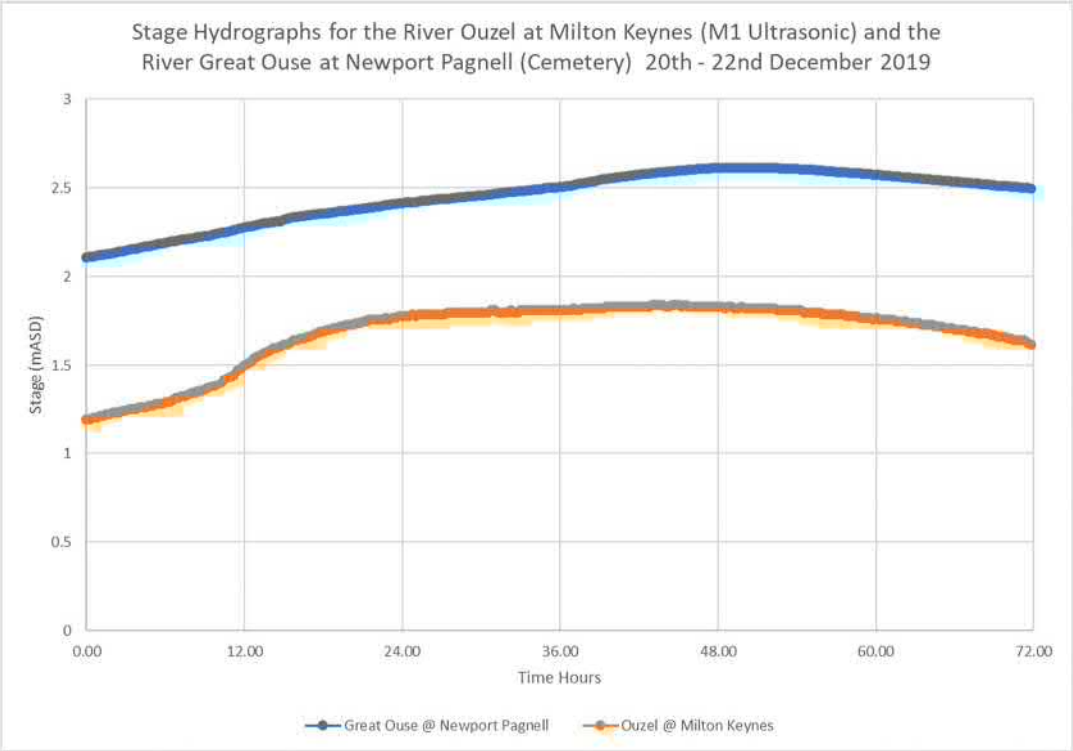


Figure 4 River Great Ouse and River Ouzel Hydrographs 20th – 22nd December 2019

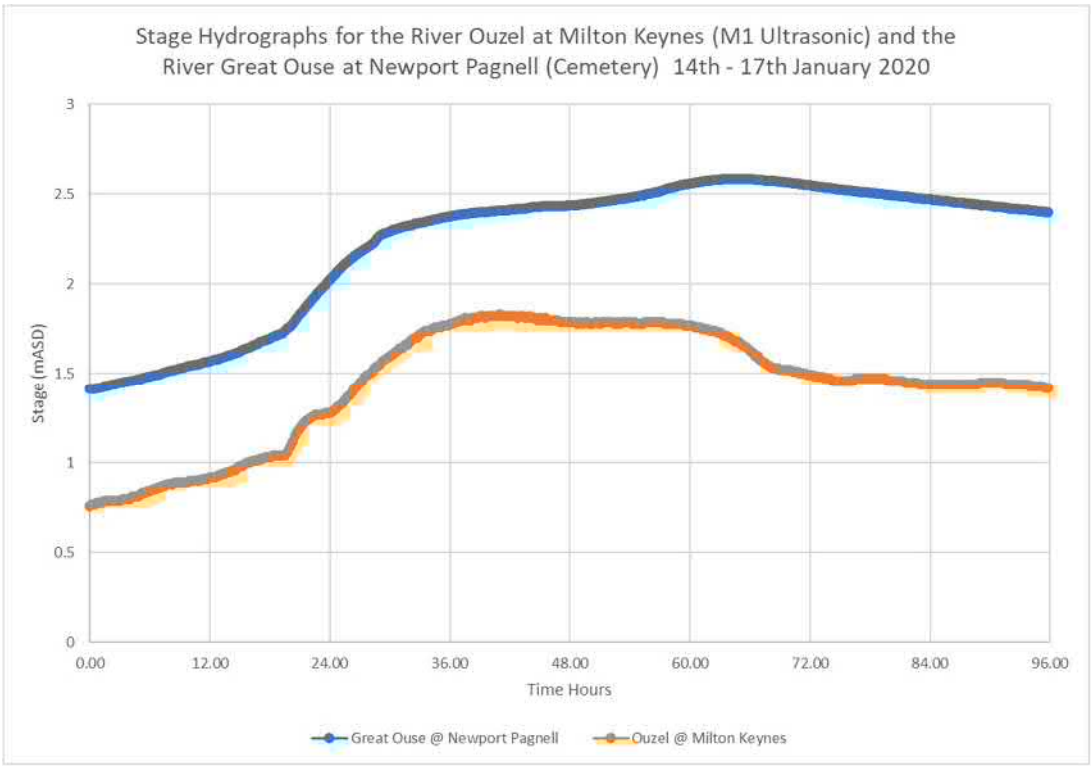


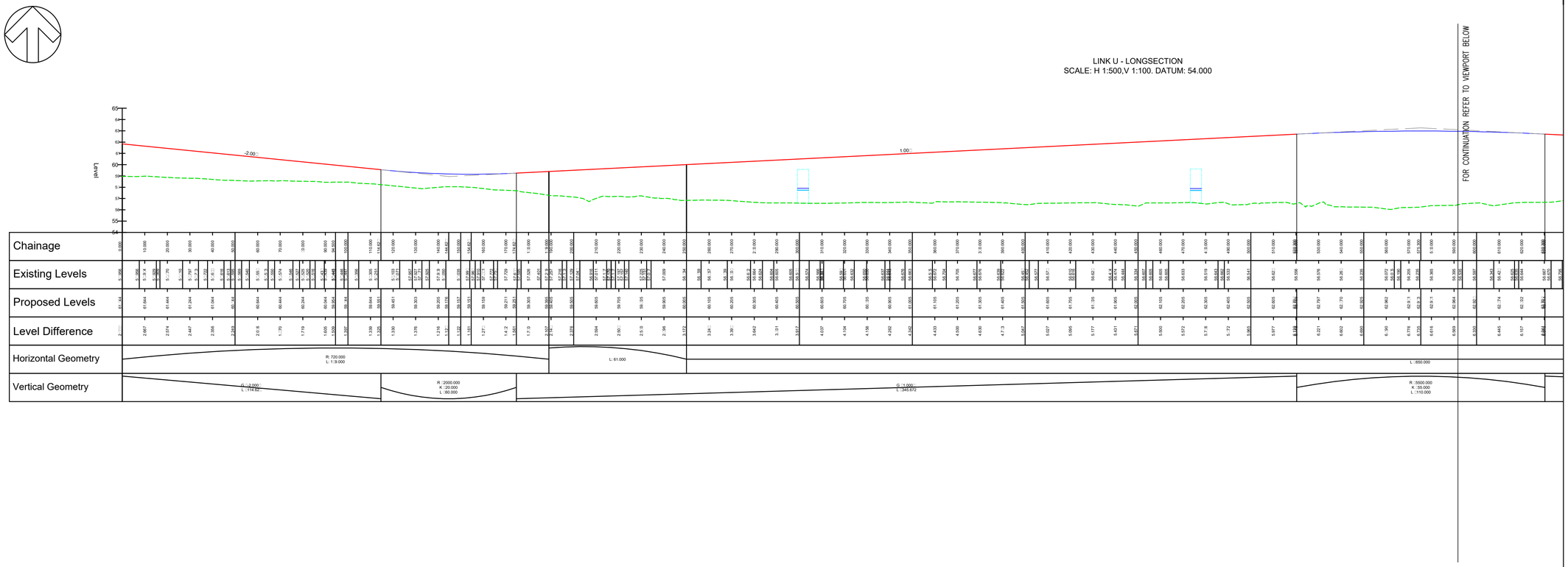
Figure 5 River Great Ouse and River Ouzel Hydrographs 14th – 17th January 2020

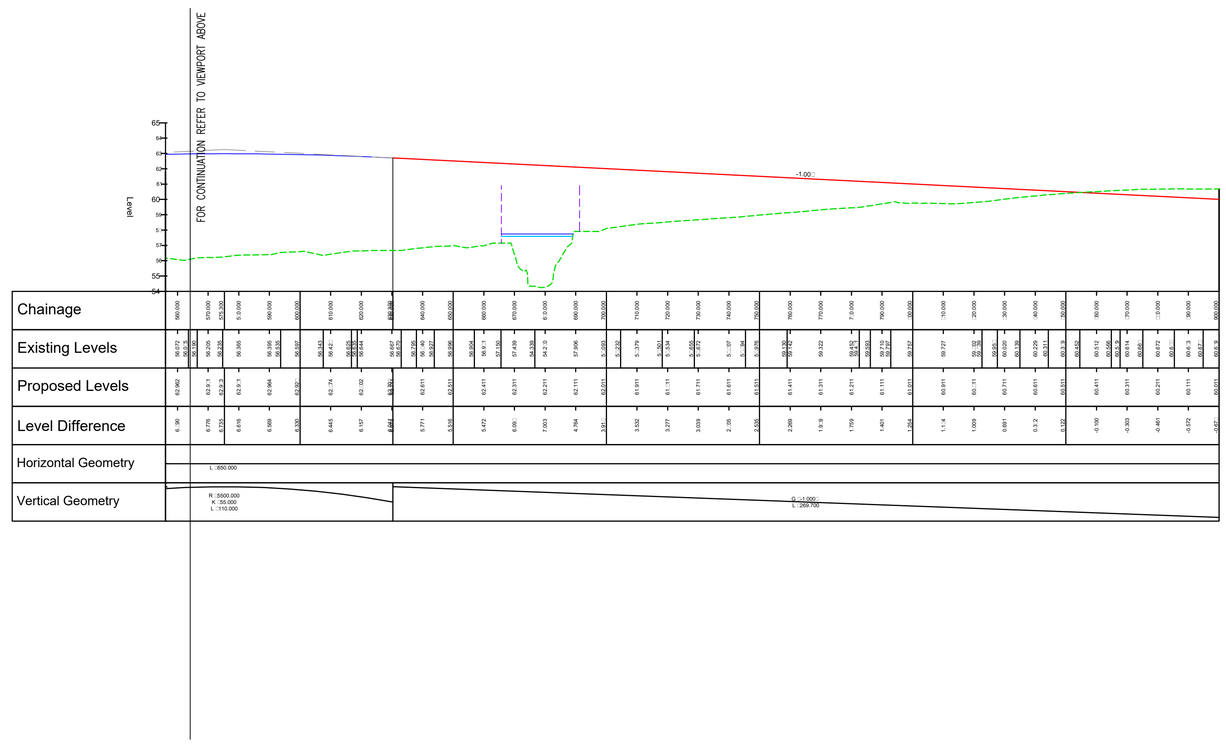
Summary:

- For the flood events in October 2019, November 2019, December 2019 and January 2020 the water level in River Ouzel at Milton Keynes peaked before the water level in the River Great Ouse at Newport Pagnell.
- The River Ouzel is a tributary of the River Great Ouse, so if the flood peak of the Ouzel were to be held back it could exacerbate flooding on the River Great Ouse.
- We do not agree with the suggested approach of small incremental storage areas / reduction in flow in the catchment associated with this scheme to help extend the design life of the flood defences in Newport Pagnell and further downstream, as these measures will delay the flood peak, leading to more change of coincident peaks / additional volume from the River Ouzel and the River Great Ouse, thus reducing the effectiveness of the peaks.

Appendix C

RIVER OUZEL HIGHWAY CROSSING DRAWINGS





DO NOT SCALE

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. LOCATIONS OF RIVER CROSS SECTION AND UNDERPASSES INDICATIVE AND SUBJECT TO CHANGE.
3. CROSS SECTION BASED ON NEAREST SURVEYED PROFILE, CROSS SECTION AT THIS LOCATION IS OUTSTANDING, DESIGN INFORMATION SUBJECT TO CHANGE.
4. THE SOFFIT OF THE BRIDGE OPENING SHOULD BE SET A MINIMUM OF 600mm ABOVE THE 1 IN 100 YEAR PLUS 35% CLIMATE CHANGE FLOOD LEVEL. THIS IS YET TO BE AGREED WITH THE ENVIRONMENT AGENCY AND IS SUBJECT TO CHANGE.
5. THE FLOOD MODEL AND ASSOCIATED BRIDGE OPENINGS HAVE YET TO BE AGREED WITH THE ENVIRONMENT AGENCY AND ARE THEREFORE SUBJECT TO CHANGE.

KEY

PEDESTRIAN UNDERPASS – 5m WIDE X 3m HIGH

INDICATIVE LOCATION OF BRIDGE OPENING

FLOOD LEVEL 100 YEAR + 65%

FLOOD LEVEL 100 YEAR + 35%

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
P01	20/11/2020	AH	FIRST ISSUE	5	5 F

DRAWING STATUS:
S - OR IN ORM ION

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CLIENT:
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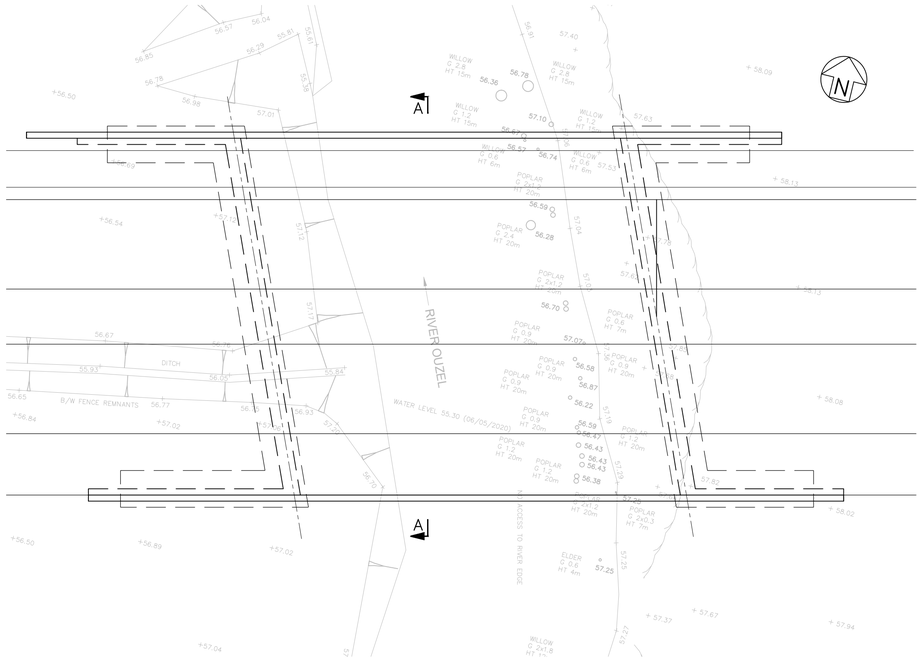
ARCHITECT:
JTP / STEPHEN GEORGE AND PARTNERS

SITE/PROJECT:
MILTON KEYNES EAST

TITLE:
LINK U RIVER CROSS SECTION

SCALE @ A1:	CHECKED:		APPROVED:
1:1000	AS		SAP
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70057521	AH	AH	November 20

DRAWING No: MKE-WSP-ZZ-ZZ-C-SK-004 | REV: P01



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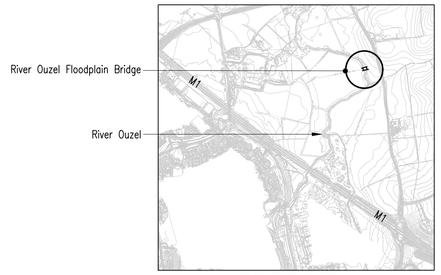

LOCATION PLAN
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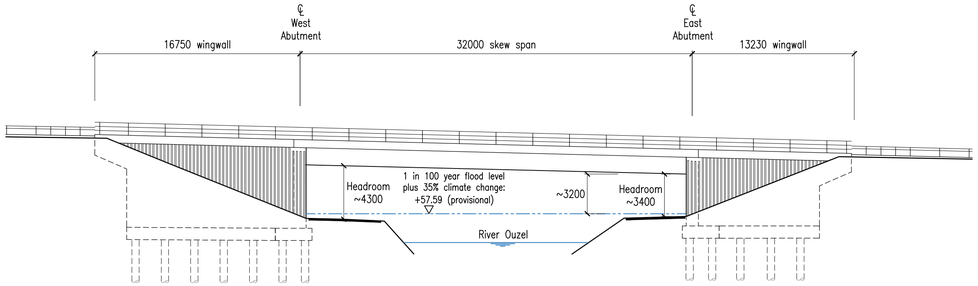

SOUTH ELEVATION
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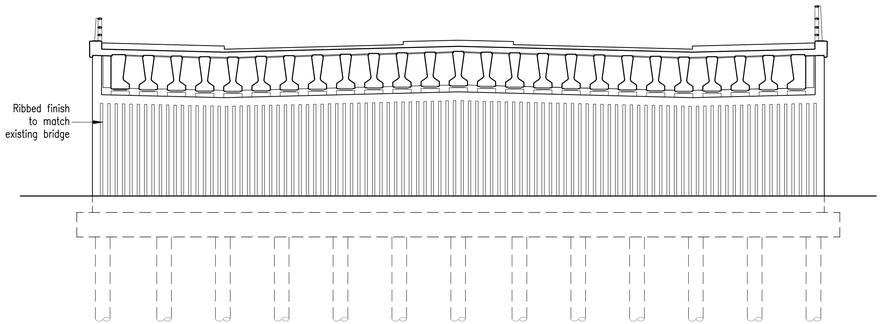
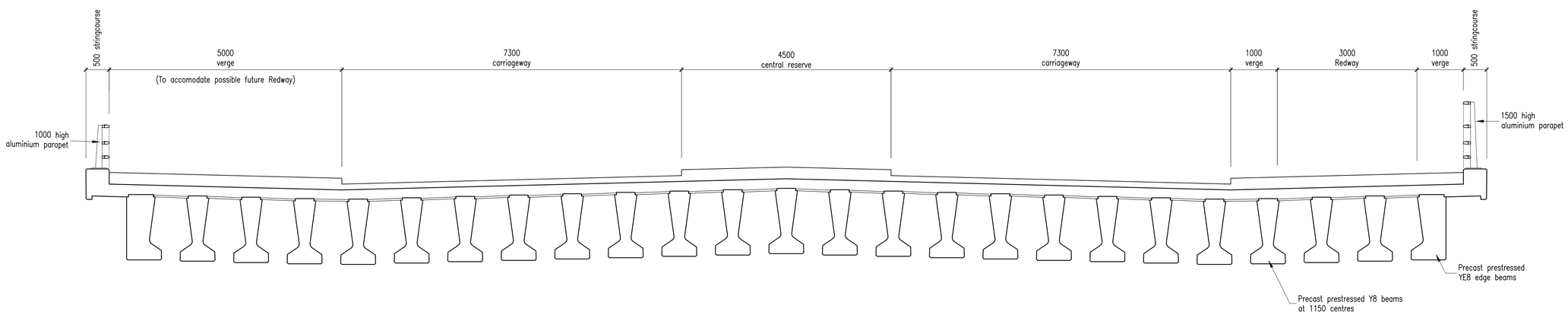


WEST ABUTMENT ELEVATION
1:125



SECTION A–A
1:50

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NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METERS TO ORDNANCE DATUM UNLESS NOTED OTHERWISE.
3. DO NOT SCALE FROM THIS PRINTED DRAWING OR THE CAD MODEL

REV	DATE	BY	DESCRIPTION	CHK	APD
P01	02/11/20	CPW	INITIAL ISSUE	JSCS	JSCS

DRAWING STATUS: S2-FOR INFORMATION

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CLIENT: BERKELEY STRATEGIC

ARCHITECT:

SITE/PROJECT: MILTON KEYNES EAST

TITLE: RIVER OUZEL FLOODPLAIN BRIDGE

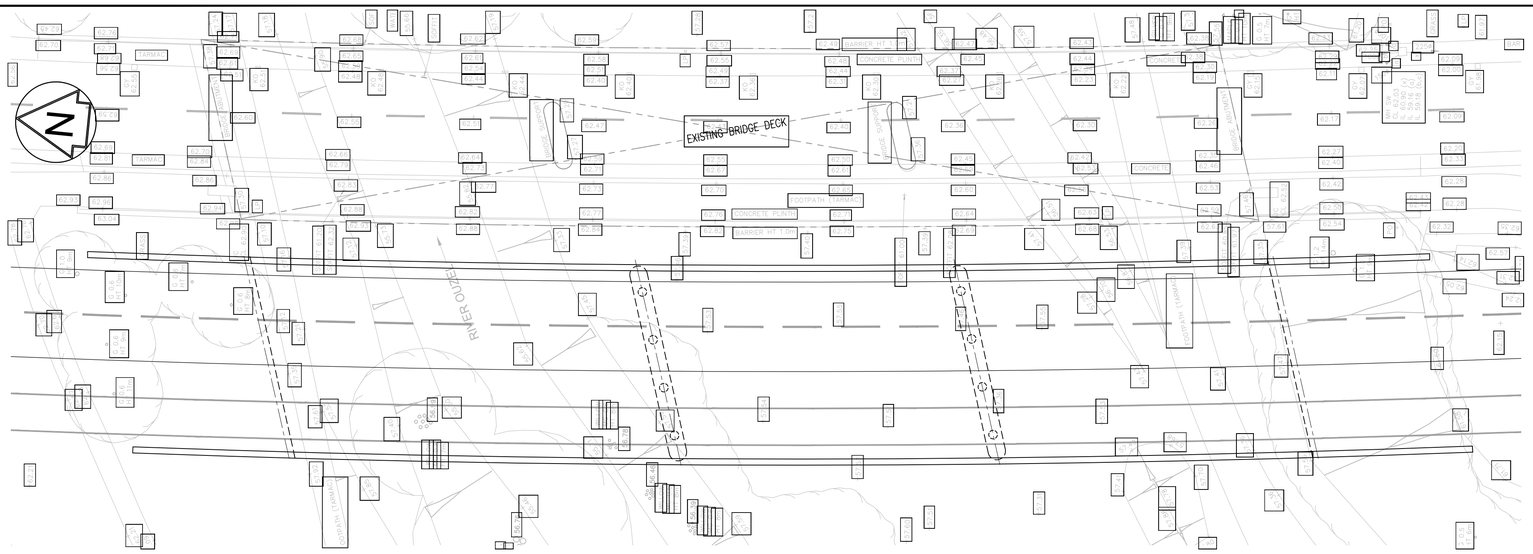
SCALE @ A1:	CHECKED:	APPROVED:
AS SHOWN	JSCS	PD

PROJECT No:	DESIGN:	DRAWN:	DATE:
70014□59	JSCS	CPW	November 20

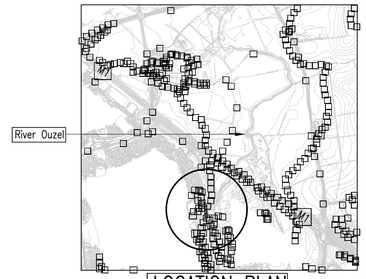
DRAWING No: 107□-WSP-CBR-ROF-DR-BR-001 REV: P01

Appendix D

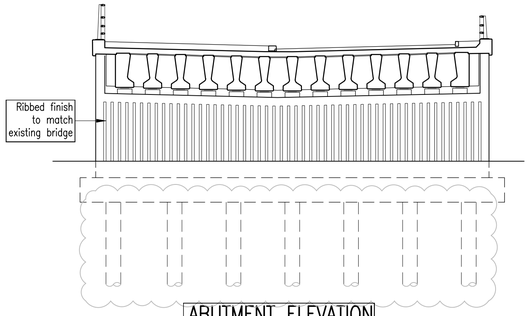
TONGWELL STREET PROPOSALS



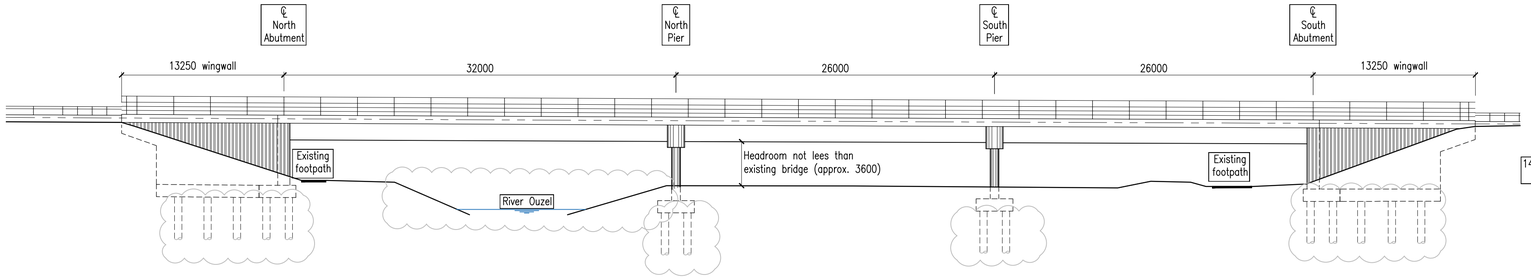
PLAN
1:250



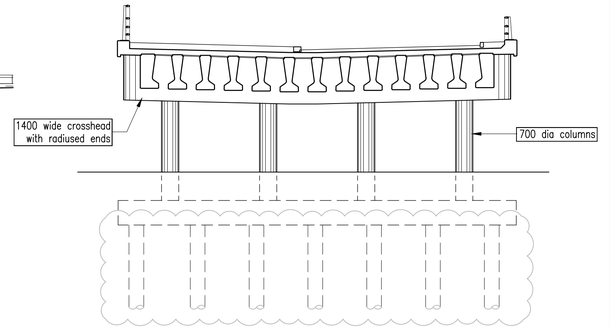
LOCATION PLAN
1:25000



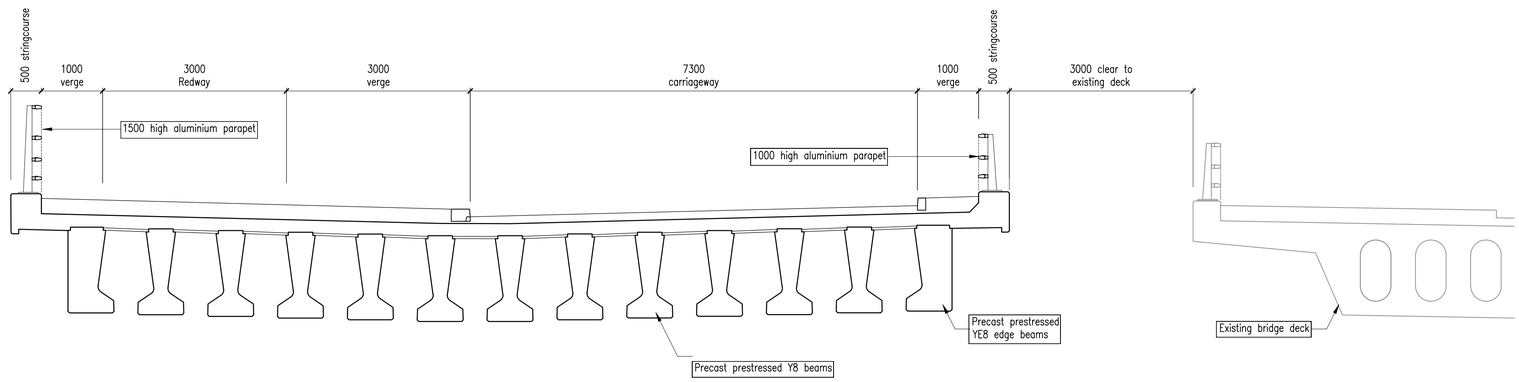
ABUTMENT ELEVATION
1:125



WEST ELEVATION
1:250



PIER ELEVATION
1:125



DECK CROSS SECTION
1:50

DO NOT SCALE

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METERS TO ORDNANCE DATUM UNLESS NOTED OTHERWISE.
3. DO NOT SCALE FROM THIS PRINTED DRAWING OR THE CAD MODEL

REV	DATE	BY	DESCRIPTION	CHK	APD
P03	16/11/20	CPW	WEST ELEVATION: RIVER OUZEL PROFILE NOW SHOWN AT W PIER LOCATION. PILES ADDED.	JSCS	JSCS
P02	28/10/20	CPW	DECK LEVEL RAISED 0.2m. PLUS REVISIONS AS CLOUDED.	JSCS	JSCS
P01	14/10/20	CPW	INITIAL ISSUE	JSCS	JSCS

DRAWING STATUS: S2-FOR INFORMATION

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CLIENT: BERKELEY STRATEGIC

ARCHITECT:

SITE/PROJECT: MILTON KEYNES EAST

TITLE: TONGWELL STREET NORTHBOUND BRIDGE

SCALE @ A1:	CHECKED:	APPROVED:
AS SHOWN	JSCS	PD

PROJECT No:	DESIGN:	DRAWN:	DATE:
70014□59	JSCS	CPW	September 20

DRAWING No: 107□-WSP-CBR-TSN-DR-BR-001 REV: P03

Appendix E

DEPTH DIFFERENCE MAPS

488000 488500 489000

242500 242000 241500 241000 240500

R05 8.43Ha
LP1 0.26Ha
NP1 0.60
5 1.26Ha
R04 3.53Ha
PF01 3.20Ha
R06a 5.38Ha
Allotments
Coldecote
PS1 2.10Ha
CH02 0.50H
R10 1.04Ha
R01 4.63Ha
R02 3.79Ha
R13 5.58Ha
R11 3.56Ha
LP3 0.26Ha
NP3 0.60Ha
R03a 1.70Ha
R03b 0.31Ha
R12 4.91Ha
NP4 0.60Ha
H01 0.95Ha
R20 3.81Ha
A01 0.80Ha
E01 16.88Ha
60m

100 0 100 200 300 400 m

KEY:

- Red Line Boundary

Depth difference (m)

- < -0.6
- -0.6 to -0.3
- -0.3 to -0.1
- -0.1 to -0.01
- Negligible change (<+/-0.01)
- +0.01 to +0.1
- +0.1 to +0.25
- +0.25 to +0.4
- +0.4 to +0.55
- > +0.55

Change in flood extent

- Extent decreased
- Extent increased

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	16/09/20	CD	FIRST ISSUE	AS	AS

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CLIENT: BERKELEY ST JAMES

ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: DEPTH DIFF. - POST-DEVELOPMENT TO BASE - 1 IN 20 YEAR

DRAWN:	CHECKED:	APPROVED:
QGIS FILE:	SCALE @A3: 1:6723	DATE: 26/11/20

PROJECT No:	DRAWING No:	REV:
70051078	DIFF_PD_0020	A

488000
488500
489000
242500
242000
241500
241000
240500

R05
8.43Ha
NP1
LP1 0.60
0.26Ha
R04
3.53Ha
PF01
3.20Ha
R06a
5.38Ha
CH02
0.50Ha
PS1
2.10Ha
R10
1.04Ha
R13
5.58Ha
R01
4.63Ha
R02
3.79Ha
R11
3.56Ha
LP3
0.26Ha
NP3
0.60Ha
R03a
1.70Ha
HI01
0.96Ha
NP4
0.60Ha
R12
4.91Ha
R03b
0.31Ha
R20
3.81Ha
A01
0.80Ha
E01
16.88Ha
60m
Coldecote

100 0 100 200 300 400 m

KEY:

Red Line Boundary

Depth difference (m)

- < -0.6
- -0.6 to -0.3
- -0.3 to -0.1
- -0.1 to -0.01
- Negligible change (<+/-0.01)
- +0.01 to +0.1
- +0.1 to +0.25
- +0.25 to +0.4
- +0.4 to +0.55
- > +0.55

Change in flood extent

- Extent decreased
- Extent increased

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	16/09/20	CD	FIRST ISSUE	AS	AS

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CLIENT: BERKELEY ST JAMES

ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: DEPTH DIFF. - POST-DEVELOPMENT TO BASE - 1 IN 100 YEAR + 35% CC

DRAWN:	CHECKED:	APPROVED:
QGIS FILE:	SCALE @A3: 1:6723	DATE: 26/11/20
PROJECT No: 70051078	DRAWING No: DIFF_PD_CC35	REV: A

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488000
488500
489000
242500
242000
241500
241000
240500

R05
8.43Ha
NP1
LP1 0.60
0.26Ha
PF01
3.20Ha
R06a
5.38Ha
R04
.53Ha
CH02
0.50Ha
PS1
2.10Ha
R10
1.04Ha
Coldecote
R01
4.63Ha
R02
3.79Ha
R13
5.58Ha
R11
3.56Ha
LP3
0.26Ha
NP3
0.60Ha
R03a
1.70Ha
NP4
0.60Ha
H01
0.96Ha
R12
4.91Ha
R03b
0.31Ha
R20
3.81Ha
A01
0.80Ha
E01
16.88Ha
60m

100 0 100 200 300 400 m

KEY:

Red Line Boundary

Depth difference (m)

- < -0.6
- -0.6 to -0.3
- -0.3 to -0.1
- -0.1 to -0.01
- Negligible change (<+/-0.01)
- +0.01 to +0.1
- +0.1 to +0.25
- +0.25 to +0.4
- +0.4 to +0.55
- > +0.55

Change in flood extent

- Extent decreased
- Extent increased

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	16/09/20	CD	FIRST ISSUE	AS	AS

STATUS:
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CLIENT:
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ARCHITECT:
-

PROJECT:
MILTON KEYNES EAST

TITLE:
DEPTH DIFF. - POST-DEVELOPMENT TO BASE - 1 IN 100 YEAR + 65% CC

DRAWN:	CHECKED:	APPROVED:
QGIS FILE:	SCALE @A3: 1:6723	DATE: 26/11/20

PROJECT No:	DRAWING No:	REV:
70051078	DIFF_PD_CC65	A

488000
488500
489000
242500
242000
241500
241000
240500

R05
8.43Ha
NP1
LP1 0.60
0.26Ha
PF01
3.20Ha
R06a
5.38Ha
R04
3.53Ha
CH02
0.50Ha
PS1
2.10Ha
R10
1.04Ha
R13
5.58Ha
R01
4.63Ha
R02
3.79Ha
R11
3.56Ha
LP3
0.26Ha
NP3
0.60Ha
R03a
1.70Ha
PI01
0.96Ha
NP4
0.60Ha
R12
4.91Ha
R03b
0.31Ha
R20
3.81Ha
A01
0.80Ha
E01
16.88Ha
60m
Coldecote

100 0 100 200 300 400 m

KEY:

Red Line Boundary

Depth difference (m)

- < -0.6
- -0.6 to -0.3
- -0.3 to -0.1
- -0.1 to -0.01
- Negligible change (<+/-0.01)
- +0.01 to +0.1
- +0.1 to +0.25
- +0.25 to +0.4
- +0.4 to +0.55
- > +0.55

Change in flood extent

- Extent decreased
- Extent increased

REV	DATE	DRW	DESCRIPTION	CHK	APP
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STATUS: FOR INFORMATION ONLY

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CLIENT: BERKELEY ST JAMES

ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: DEPTH DIFF. - POST-DEVELOPMENT TO BASE - 1 IN 1000 YEAR

DRAWN:	CHECKED:	APPROVED:
QGIS FILE:	SCALE @A3: 1:6723	DATE: 26/11/20
PROJECT No: 70051078	DRAWING No: DIFF_PD_1000	REV: A

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Appendix F

DEPTH MAPS

488000
488500
489000
243000
242500
242000
241500
241000
240500

R07
R05
8.43Ha
NP1
0.60Ha
LP1
0.26Ha
R06b
R04
3.53Ha
PF01
3.20Ha
R06a
5.38Ha
CH02
0.50Ha
PS1
2.10Ha
CH01
2.19Ha
R10
1.04Ha
R14
2.68Ha
R13
5.58Ha
R01
4.63Ha
R02
3.79Ha
R11
3.56Ha
LP3
0.26Ha
NP3
0.60Ha
R03a
1.70Ha
R03b
0.31Ha
R12
4.91Ha
R20
3.81Ha
A01
0.80Ha
E01
16.88Ha
60m

100 0 100 200 300 400 m

KEY:

Max. flood depth (m)

- 0
- 0.2
- 0.4
- 0.6
- 0.8
- 1
- 1.2
- 1.4
- 1.6
- 1.8
- 2
- Red Line Boundary

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	16/09/20	CD	FIRST ISSUE	AS	AS

STATUS: FOR INFORMATION ONLY

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CLIENT: BERKELEY ST JAMES

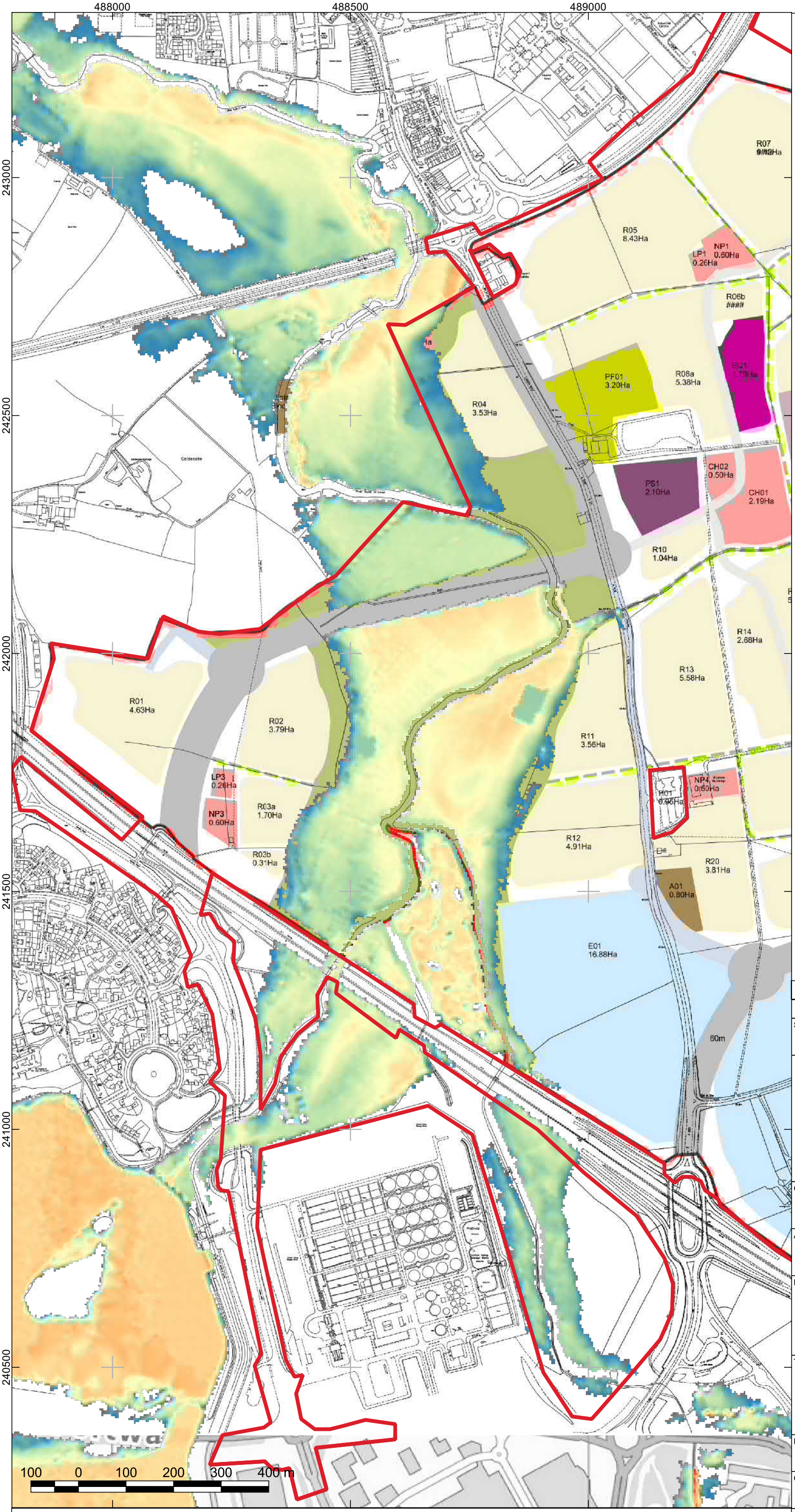
ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: Flood Depth - Post-Development - 1 in 20 year

DRAWN:	CHECKED:	APPROVED:
QGIS FILE:	SCALE @A3: 1:7947	DATE: 26/11/20

PROJECT No:	DRAWING No:	REV:
70051078	DEP_PD_0020	A



KEY:

Max. flood depth (m)

- 0
- 0.2
- 0.4
- 0.6
- 0.8
- 1
- 1.2
- 1.4
- 1.6
- 1.8
- 2

Red Line Boundary

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	16/09/20	CD	FIRST ISSUE	AS	AS

STATUS:

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ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: Flood Depth - Post-Development - 1 in 100 year +35%

DRAWN:	CHECKED:	APPROVED:
QGIS FILE:	SCALE @A3: 1:7955	DATE: 26/11/20

PROJECT No:	DRAWING No:	REV:
70051078	DEP_PD_CC35	A

488000
488500
489000
243000
242500
242000
241500
241000
240500

R07
R05
8.43Ha
NP1
0.60Ha
LP1
0.26Ha
R06b
R04
3.53Ha
PF01
3.20Ha
R06a
5.38Ha
PS1
2.10Ha
CH02
0.50Ha
CH01
2.19Ha
R10
1.04Ha
R14
2.68Ha
R13
5.58Ha
R01
4.63Ha
R02
3.79Ha
R11
3.56Ha
LP3
0.26Ha
NP3
0.60Ha
R03a
1.70Ha
R03b
0.31Ha
H01
0.95Ha
NP4
0.60Ha
R12
4.91Ha
R20
3.81Ha
A01
0.80Ha
E01
16.88Ha
60m

100 0 100 200 300 400 m

KEY:

Max. flood depth (m)

- 0
- 0.2
- 0.4
- 0.6
- 0.8
- 1
- 1.2
- 1.4
- 1.6
- 1.8
- 2

Red Line Boundary

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	16/09/20	CD	FIRST ISSUE	AS	AS

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ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: Flood Depth - Post-Development - 1 in 100 year +65%

DRAWN:	CHECKED:	APPROVED:
QGIS FILE:	SCALE @A3: 1:7955	DATE: 26/11/20

PROJECT No:	DRAWING No:	REV:
70051078	DEP_PD_CC65	A

488000
488500
489000
243000
242500
242000
241500
241000
240500

R07
R05
8.43Ha
NP1
0.60Ha
LP1
0.26Ha
R06b
R04
3.53Ha
PF01
3.20Ha
R06a
5.38Ha
PS1
2.10Ha
CH02
0.50Ha
CH01
2.19Ha
R10
1.04Ha
R14
2.68Ha
R13
5.58Ha
R01
4.63Ha
R02
3.79Ha
R11
3.56Ha
LP3
0.26Ha
NP3
0.60Ha
R03a
1.70Ha
HO1
0.95Ha
NP4
0.60Ha
R12
4.91Ha
R03b
0.31Ha
R20
3.81Ha
A01
0.80Ha
E01
16.88Ha
60m
Caldecote

100 0 100 200 300 400 m

KEY:

Max. flood depth (m)

- 0
- 0.2
- 0.4
- 0.6
- 0.8
- 1
- 1.2
- 1.4
- 1.6
- 1.8
- 2
- Red Line Boundary

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	16/09/20	CD	FIRST ISSUE	AS	AS

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ARCHITECT:
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PROJECT:
MILTON KEYNES EAST

TITLE:
Flood Depth - Post-Development - 1 in 1000 year

DRAWN:	CHECKED:	APPROVED:
QGIS FILE:	SCALE @A3: 1:7955	DATE: 26/11/20

PROJECT No:	DRAWING No:	REV:
70051078	DEP_PD_1000	A

Appendix G

LEVEL MAPS

488500 489000

243000 242500 242000 241500 241000

R07 ###Ha
R05 8.43Ha
NP1 0.60Ha
LP1 0.26Ha
R06b ####
R06a 5.38Ha
PF01 3.20Ha
EC1 1.79Ha
R04 3.53Ha
CH02 0.50Ha
PS1 2.10Ha
CH01 2.19Ha
R10 1.04Ha
R14 2.68Ha
R13 5.58Ha
R02 3.79Ha
R11 3.56Ha
LP3 0.26Ha
NP3 0.60Ha
R03a 1.70Ha
NP4 0.60Ha
R01 0.95Ha
R12 4.91Ha
R03b 0.31Ha
R20 3.81Ha
A01 0.80Ha
E01 16.88Ha
60m

100 0 100 200 300 400 m

KEY:

Red Line Boundary

Max. water level (mAOD)

- 54.5
- 55
- 55.5
- 56
- 56.5
- 57
- 57.5
- 58
- 58.5
- 59
- 59.5

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	16/09/20	CD	FIRST ISSUE	AS	AS

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ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: Flood Level - Post-Development - 1 in 20 year

DRAWN:	CHECKED:	APPROVED:
QGIS FILE:	SCALE @A3: 1:6517	DATE: 26/11/20

PROJECT No:	DRAWING No:	REV:
70051078	LEV_PD_0020	A

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Created by: UKCED001 - 2020-11-26 13:04:46 - \\dcema100app56\e\Projects\70051078 - MKE\GIS\Milton_Keynes_v26_TEST36_Results.qgz

488500
489000
243000
242500
242000
241500
241000

R07
9.##Ha
R05
8.43Ha
NP1
0.60Ha
LP1
0.26Ha
R06b
####
PF01
3.20Ha
R06a
5.38Ha
EC1
1.79Ha
R04
3.53Ha
CH02
0.50Ha
PS1
2.10Ha
CH01
2.19Ha
R10
1.04Ha
R14
2.68Ha
R13
5.58Ha
R02
3.79Ha
R11
3.56Ha
LP3
0.26Ha
NP4
0.60Ha
R01
0.95Ha
NP3
0.60Ha
R03a
1.70Ha
R12
4.91Ha
R03b
0.31Ha
R20
3.81Ha
A01
0.80Ha
E01
16.88Ha
60m
Caldecote
100 0 100 200 300 400 m

KEY:

Red Line Boundary

Max. water level (mAOD)

- 54.5
- 55
- 55.5
- 56
- 56.5
- 57
- 57.5
- 58
- 58.5
- 59
- 59.5

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	16/09/20	CD	FIRST ISSUE	AS	AS

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CLIENT:

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ARCHITECT:

-

PROJECT:

MILTON KEYNES EAST

TITLE:

Flood Level - Post-Development - 1 in 100 year +35%

DRAWN:	CHECKED:	APPROVED:

QGIS FILE:	SCALE @A3:	DATE:
	1:6517	26/11/20

PROJECT No:	DRAWING No:	REV:
70051078	LEV_PD_CC35	A

488500
489000
243000
242500
242000
241500
241000

R07
9.##Ha
R05
8.43Ha
NP1
0.60Ha
LP1
0.26Ha
R06b
####
PF01
3.20Ha
R06a
5.38Ha
EC1
1.79Ha
R04
3.53Ha
CH02
0.50Ha
PS1
2.10Ha
CH01
2.19Ha
R10
1.04Ha
R14
2.68Ha
R13
5.58Ha
R02
3.79Ha
R11
3.56Ha
LP3
0.26Ha
NP4
0.60Ha
R01
0.95Ha
NP3
0.60Ha
R03a
1.70Ha
R12
4.91Ha
R03b
0.31Ha
R20
3.81Ha
A01
0.80Ha
E01
16.88Ha
60m
Caldecote

100 0 100 200 300 400 m

KEY:

Red Line Boundary

Max. water level (mAOD)

- 54.5
- 55
- 55.5
- 56
- 56.5
- 57
- 57.5
- 58
- 58.5
- 59
- 59.5

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	16/09/20	CD	FIRST ISSUE	AS	AS

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CLIENT:

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ARCHITECT:

-

PROJECT:

MILTON KEYNES EAST

TITLE:

Flood Level - Post-Development - 1 in 100 year +65%

DRAWN:	CHECKED:	APPROVED:
QGIS FILE:	SCALE @A3: 1:6517	DATE: 26/11/20

PROJECT No:	DRAWING No:	REV:
70051078	LEV_PD_CC65	A

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488500
489000
243000
242500
242000
241500
241000

R07
###Ha
R05
8.43Ha
NP1
0.60Ha
LP1
0.26Ha
R06b
####
PF01
3.20Ha
R06a
5.38Ha
EC1
1.79Ha
R04
3.53Ha
CH02
0.50Ha
PS1
2.10Ha
CH01
2.19Ha
R10
1.04Ha
R14
2.68Ha
R13
5.58Ha
R02
3.79Ha
R11
3.56Ha
LP3
0.26Ha
NP4
0.60Ha
R01
0.95Ha
NP3
0.60Ha
R03a
1.70Ha
R12
4.91Ha
R03b
0.31Ha
R20
3.81Ha
A01
0.80Ha
E01
16.88Ha
60m
Caldecote
100 0 100 200 300 400 m

KEY:

Red Line Boundary

Max. water level (mAOD)

- 54.5
- 55
- 55.5
- 56
- 56.5
- 57
- 57.5
- 58
- 58.5
- 59
- 59.5

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	16/09/20	CD	FIRST ISSUE	AS	AS

STATUS:

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Tel: +44 (0) 117 930 2000

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CLIENT:

BERKELEY ST JAMES

ARCHITECT:

-

PROJECT:

MILTON KEYNES EAST

TITLE:

Flood Level - Post-Development - 1 in 1000 year

DRAWN:	CHECKED:	APPROVED:

QGIS FILE:	SCALE @A3:	DATE:
	1:6517	26/11/20

PROJECT No:	DRAWING No:	REV:
70051078	LEV_PD_1000	A

Created by: UKCED001 - 2020-11-26 13:05:09 - \\dcema100app56\e\Projects\70051078 - MKE\GIS\Milton_Keynes_v26_TEST36_Results.qgz
Created by: UKCED001 - 2020-11-26 13:05:15 - \\dcema100app56\e\Projects\70051078 - MKE\GIS\Milton_Keynes_v26_TEST36_Results.qgz

Appendix H

HAZARD MAPS

488500
489000
243000
242500
242000
241500
241000

R07
9##Ha
R05
8.43Ha
NP1
0.60Ha
LP1
0.26Ha
R06b
####
5
0.26Ha
PF01
3.20Ha
R06a
5.38Ha
EC1
1.79Ha
R04
3.53Ha
CH02
0.50Ha
PS1
2.10Ha
CH01
2.19Ha
R10
1.04Ha
R14
2.68Ha
R13
5.58Ha
R02
3.79Ha
R11
3.56Ha
LP3
0.26Ha
NP4
0.60Ha
R01
0.95Ha
NP3
0.60Ha
R03a
1.70Ha
R12
4.91Ha
R03b
0.31Ha
R20
3.81Ha
A01
0.80Ha
E01
16.88Ha
60m

100 0 100 200 300 400 m

KEY:

Red Line Boundary

Hazard rating

- 0.00 - 0.75 Low Hazard
- 0.00 - 0.75 Low Hazard
- 0.75 - 1.25 Moderate Hazard
- 0.75 - 1.25 Moderate Hazard
- 1.2 - 2.00 Significant Hazard
- 1.2 - 2.00 Significant Hazard
- > 2.00 Extreme Hazard
- > 2.00 Extreme Hazard

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	16/09/20	CD	FIRST ISSUE	AS	AS

STATUS:

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CLIENT: BERKELEY ST JAMES

ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: Flood Hazard - Post-Development - 1 in 20 year

DRAWN:	CHECKED:	APPROVED:
QGIS FILE:	SCALE @A3: 1:6517	DATE: 26/11/20

PROJECT No:	DRAWING No:	REV:
70051078	HAZ_PD_0020	A

488500
489000
243000
242500
242000
241500
241000

R07
9##Ha
R05
8.43Ha
NP1
0.60Ha
LP1
0.26Ha
R06b
####
PF01
3.20Ha
R06a
5.38Ha
EC1
1.79Ha
R04
3.53Ha
CH02
0.50Ha
PS1
2.10Ha
CH01
2.19Ha
R10
1.04Ha
R14
2.68Ha
R13
5.58Ha
R02
3.79Ha
R11
3.56Ha
LP3
0.26Ha
NP3
0.60Ha
R03a
1.70Ha
H01
0.95Ha
NP4
0.60Ha
R12
4.91Ha
R03b
0.31Ha
R20
3.81Ha
A01
0.80Ha
E01
16.88Ha
60m
Coldecote
River Ouse or Loval

100 0 100 200 300 400 m

KEY:

Red Line Boundary

Hazard rating

0.00 - 0.75	Low Hazard
0.00 - 0.75	Low Hazard
0.75 - 1.25	Moderate Hazard
0.75 - 1.25	Moderate Hazard
1.2 - 2.00	Significant Hazard
1.2 - 2.00	Significant Hazard
> 2.00	Extreme Hazard
> 2.00	Extreme Hazard

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	16/09/20	CD	FIRST ISSUE	AS	AS

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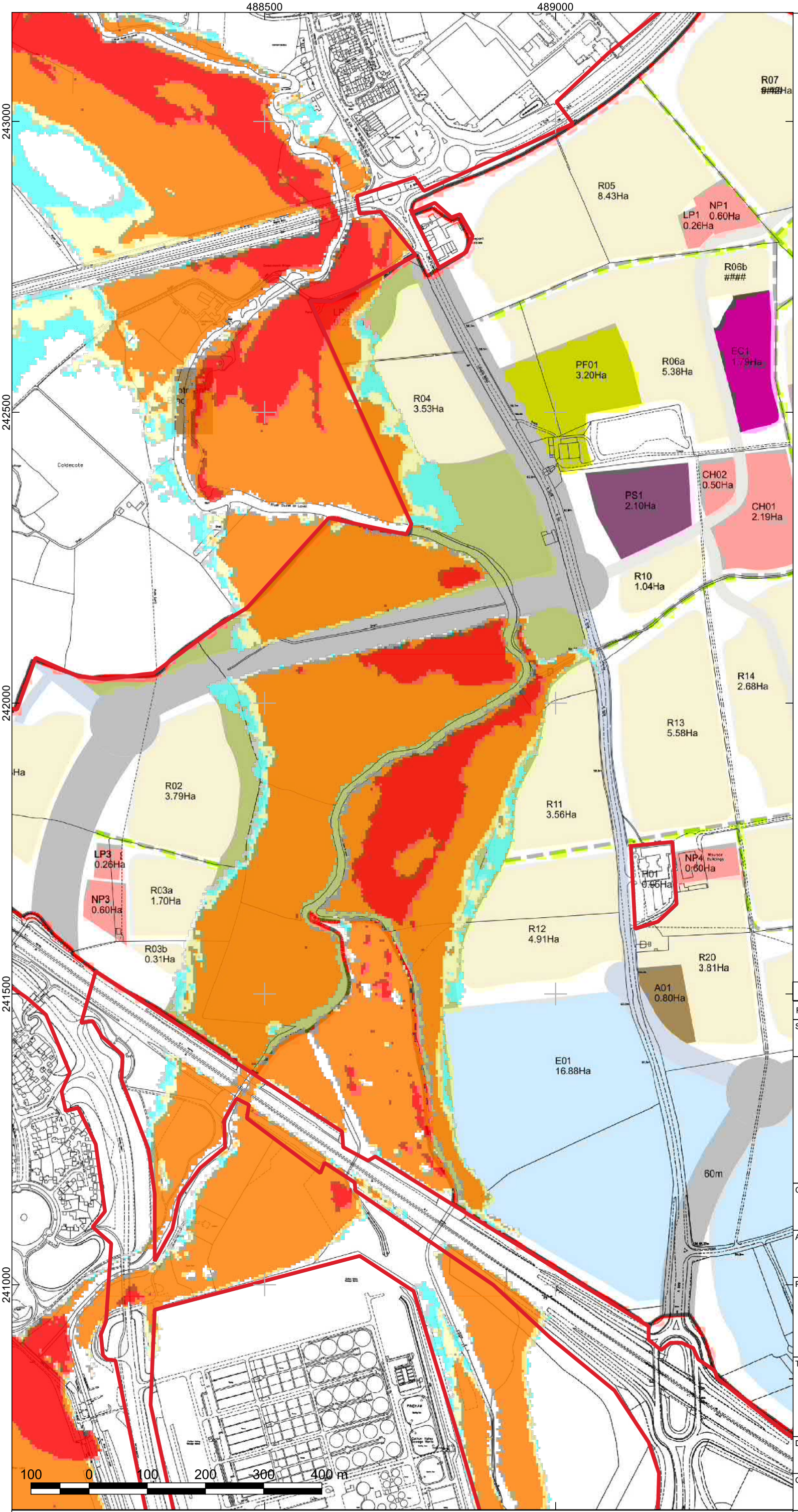
ARCHITECT:
-

PROJECT:
MILTON KEYNES EAST

TITLE:
Flood Hazard - Post-Development - 1 in 100 year +35%

DRAWN:	CHECKED:	APPROVED:
QGIS FILE:	SCALE @A3: 1:6517	DATE: 26/11/20

PROJECT No:	DRAWING No:	REV:
70051078	HAZ_PD_CC35	A



KEY:

- Red Line Boundary

Hazard rating

- 0.00 - 0.75 Low Hazard
- 0.00 - 0.75 Low Hazard
- 0.75 - 1.25 Moderate Hazard
- 0.75 - 1.25 Moderate Hazard
- 1.2 - 2.00 Significant Hazard
- 1.2 - 2.00 Significant Hazard
- > 2.00 Extreme Hazard
- > 2.00 Extreme Hazard

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	16/09/20	CD	FIRST ISSUE	AS	AS

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ARCHITECT: -

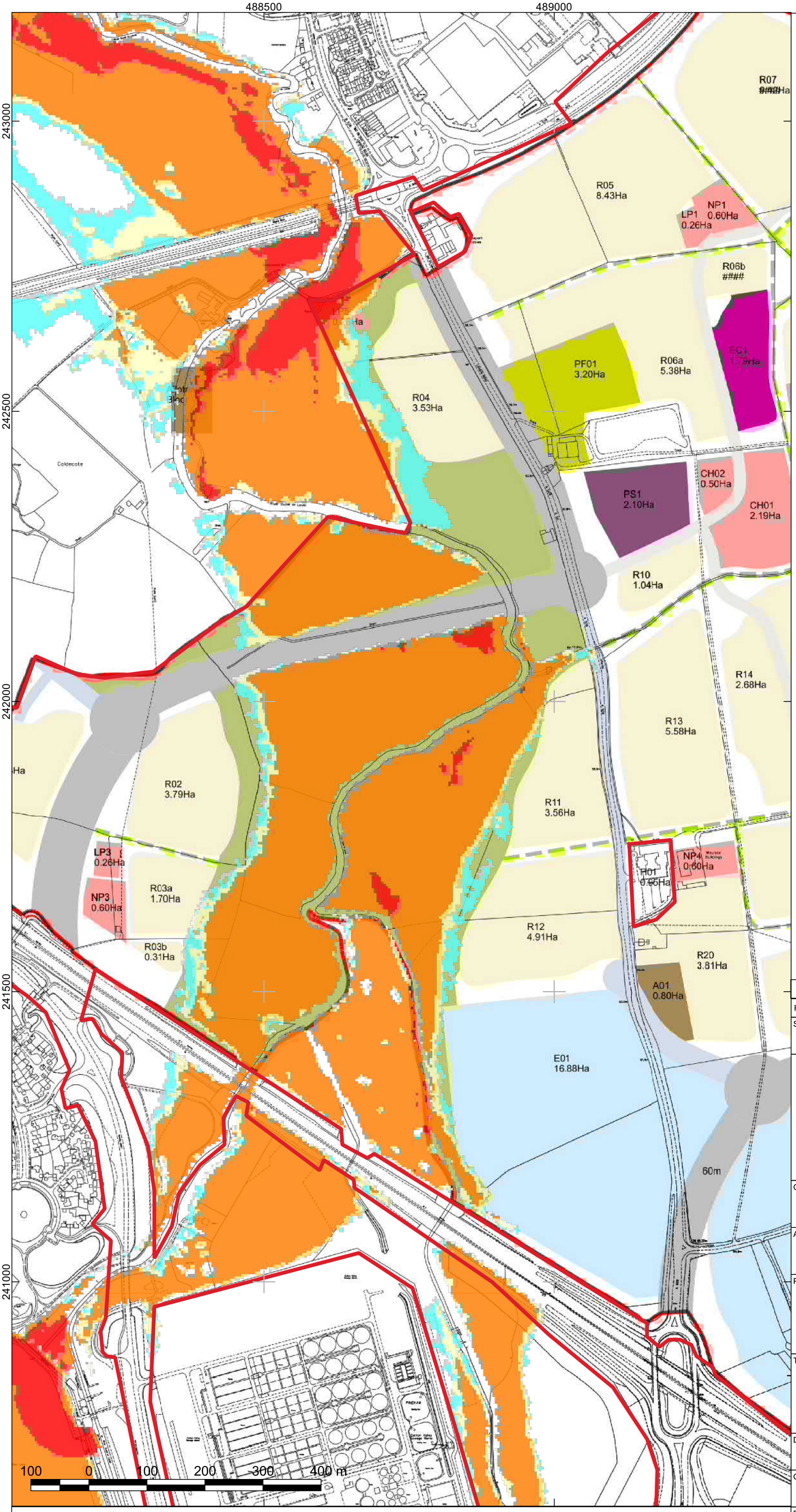
PROJECT: MILTON KEYNES EAST

TITLE: Flood Hazard - Post-Development - 1 in 100 year +65%

DRAWN:	CHECKED:	APPROVED:

QGIS FILE:	SCALE @A3:	DATE:
	1:6517	26/11/20

PROJECT No:	DRAWING No:	REV:
70051078	HAZ_PD_CC65	A



KEY:

- Red Line Boundary

Hazard rating

- 0.00 - 0.75 Low Hazard
- 0.00 - 0.75 Low Hazard
- 0.75 - 1.25 Moderate Hazard
- 0.75 - 1.25 Moderate Hazard
- 1.2 - 2.00 Significant Hazard
- 1.2 - 2.00 Significant Hazard
- > 2.00 Extreme Hazard
- > 2.00 Extreme Hazard

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	16/09/20	CD	FIRST ISSUE	AS	AS

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CLIENT: BERKELEY ST JAMES

ARCHITECT: -

PROJECT: MILTON KEYNES EAST

TITLE: Flood Hazard - Post-Development - 1 in 1000 year

DRAWN:	CHECKED:	APPROVED:
QGIS FILE:	SCALE @A3: 1:6517	DATE: 26/11/20

PROJECT No:	DRAWING No:	REV:
70051078	HAZ_PD_1000	A

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1 Queen Street
Bristol
BS2 0HQ

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Appendix D

MOULSOE STREAM HYDRAULIC MODELLING TECHNICAL NOTE

Project	MKE_WC2
Job Number	7051078
Location	London Road 509, Milton Keynes (488969 242069)
Watercourse	River Ouzel

1. Objectives

WSP was commissioned by St James to support the design of the Milton Keynes East development and complete a Flood Risk Assessment (FRA). This FRA is to be supported by two hydraulic models, one for the River Ouzel and the other for the Moulsoe Brook. These models are to be developed seperately given the different mechanisms and need to test mitigation options seperately as the phasing of the development comes forward.

The Moulsoe Brook is a tributary to the River Ouzel that passes underneath the A509 (London Road). The hydraulic model has been constructed as a 1D/2D Estry Tufflow model to allow for modelling of the floodplain surrounding the channel. Given that the watercourse is IDB maintained and agircultural, there are no features which would require explicitly modelling in the baseline scenario. Details of the model developent are provided below.

2. Model Input Data

Title	Type	Notes
Clipped_1m.asc	Lidar Survey	1m LIDAR data downloaded from environment.data.gov.uk and clipped to the approximate extent of the model. Lidar has been used to represent the 2D terrain.
1mm_open.asc	3D model of ramp up to a proposed road bridge.	1mm asc of proposed road surface bridging the River Ouzel prepared by WSP as part of the design process for the proposed road.
28562-WC2 (River sections).Section-ISIS.dat	river cross-sections	River section survey along the connecting tributary watercourse. They have been used to construct the river sections in the 1D model domain.
Masterplan.png	development area maserplan	layout drawing of the proposed development area. Used to define the layout of the Londond Road materials layer.

3. GIS Data

OS Tiles - 10k: SP88

LIDAR - Resolution: 1m
Date : LIDAR Composite - Data downloaded from environment.data.gov.uk December 2020. Date flown 2016

4. Model Development

The 1D domain of the model has been constructed as a 1D Estry network using river cross-section survey commisioned by the client in accordance with a brief supplied by WSP.

The roughness for the 2D domain was set based on a general surface roughness. An additional materials layer was added to modify the roughness for the length of London Road within the model extent based upon a development layout masterplan provided by the client. As the majority of the exisitng land is used for agricultural purposes this approach was considered sufficient for setting the roughness within the model.

The 2D domain surface was completed using 1m Lidar survey obtained from environent.data.gov.uk. As the lidar survey did not include London Road a shape file was used to fill in the road levels based on assumed tie in levels on each side of the watercourse. Additional zshape files where added to represent proposed ground raising for development areas downstream of Londond Road. At the same time the surface of London Road crossing the watercourse was raised by 1.8m, in line with the proposals developed by WSP for Highway Link 107.

A .asc file and zshape where introduced into the model in order to simulate the proposed road bridge (Link 107) over the River Ouzel. These layers where copied from the larger River Ouzel Model, which has been submitted seperately and reviewed by the Environment Agency.

The fluvial inflow into the model was added as a point inflow at the upstream end of the model. The downstream boundary in the 1D and 2D domains was set as a constant water level. These water levels where set based upon information taken from the larger River Ouzel model. Due to instabilities occuring at model startup a set of initial water level points where added to the 1D domain along the length of the watercourse. To add the initial water levels in the 2D domain a set of IWL shape files where added to the 2D domain and an event modifier was used to allow the downstream boundary water level to be specified for each model run.

5. Model Setup

Model Method	1D/2D
Software	Estry/Tuflow (build: 2018-03-AE-iDP-w64)
Channel and Floodplain	1D surveyed sections modelled using Estry network units. Floodplain has been modelled in 2D in Tuflow.
Other comments	

6. Model inflows and Boundary Conditions

The inflow into the model has been modelled as a point inflow at the top end of the tributary. The inflows have been derived from the hydrology submitted as part of the River Ouzel model and pro-rata'd for the catchment area. The downstream extent of the model has been modelled as a set water level.

Flow Node	Annual Probability Event				
	2	**100**	**1000**	**100+35%CC**	**100+65%CC**
WC2_001	0.3	0.79	1.13	1.06	1.3

The levels for the downstream boundary have been provided by the River Ouzel flood model by extracting the peak water level at the corresponding cross-section along the River Ouzel for a set of events as outlined in the table below.

Downstream Boundary Water Level	Annual Probability Event				
	2	**100**	**1000**	**100+35%CC**	**100+65%CC**
	55.7	57.46	-	57.69	57.86

The 1 in 2 year event has not been modelled in the larger MKE model. This water level has been estimated based upon bank full levels in the River Ouzel taken from Lidar levels

7. Mannings 'n' Roughness Coefficients

The Manning's roughness coefficient values used in the model have been set using generalised estimmates for roughness of general surfaces.

Description	Manning's
Channel	0.04
Floodplain (based on general ground surface)	0.060
Roads	0.025

8. Model File Naming Convention

File name: 70051078_MKE_WC2_@@@_SS1_SS2_ZZ_????C??
e.g. 70051078_MKE_WC2_003_xx_xx_Q100C35_0100C35

MKE_WC2	Hydraulic Model Name
@@@	This will represent the build number of the model
SS1	The model scenario (as detailed below)
SS2	The model scenario (as detailed below)
zz	The return period for the downstream boundary
????C??	The return period for the inflows. For example '0100C35' where 0100 indicates 100 year fluvial event and C35 indicates 35% climte change.

Topographical Model Scenarios

xx	unused scenario marker
PRP	Post Development scenario
BSC	Baseline scenario
WLT	Model run without WLL lines included

9. Model Results

The model shows that the flows are mostly contained within the extent of the channel for all events up to and including the 1 in 100 event with 65% climate change. There are small areas of out of bankflow just upstream of London Road. These are however contained to a small area and do not lead to overtopping of the road. The only notable flooding is as a result of high water levels modelled in the River Ouzel at the downstreamm extent and extracted from the MKE River Ouzel flood model. These lead to flood extents that reach up the watercourse as far as the downstream end of the London Road culvert. The proposed ground raising as part of the development however removes the developmment areas downstream of the road from flood risk. This land raising has been agreed within the Environment Agency for both the River Ouzel and Moulsoe Stream, as the River Ouzel includes flow estimates for the River Ouzel immediatley downstream of London Road.

Checks on the model results have been completed using mannings calculations of the channel completed in excel. These indicte that the containment of the flows to the 1D channel domain is expected.

Appendix A. Structures

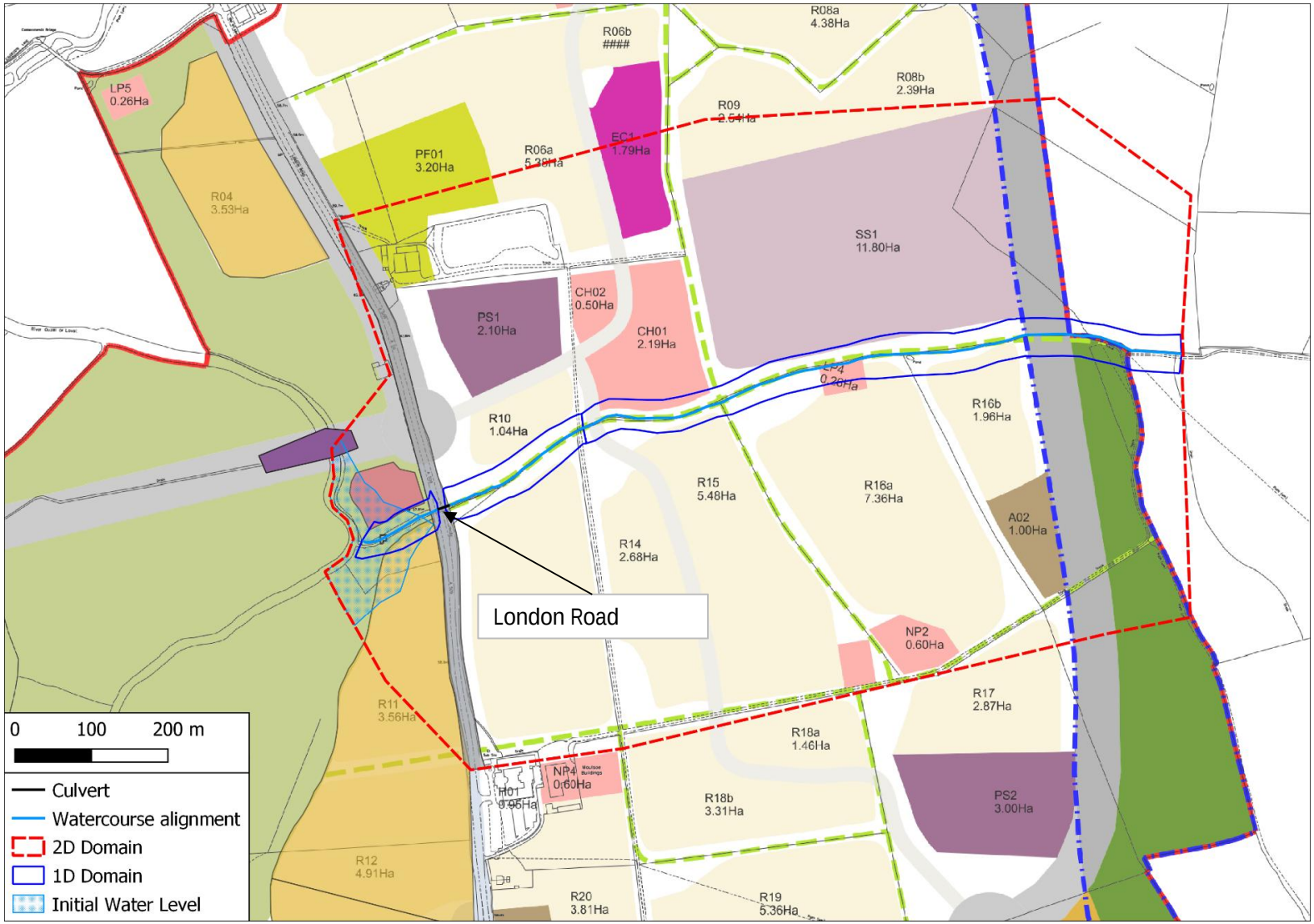
Existing Model

Ref.	Description	Data source	Dimensions	Modelling Approach
1	Culvert underneth London Road.	X-18_323-01-05.dwg	900mm concrete pipe culvert. The culvert has a length of 18m in the baseline scenario and has been extended to 21.5m in length in the post-development scenario.	The culvert has been represented in the model as a 1D network unit.
2	Culvert underneth farm access track	X-18_323-01-05.dwg	1100mm concrete pipe culvert approximately 5m in length.	The culvert has been represented in the model as a 1D network unit. This culvert has been removed for the post development scenario.

Appendix B. Simulation Run List

Model Ref.	Scenrio (S1)	Scenrio (S2)	Flood Event		Build No.	Control File	Result Files
			DS Water lvl (e1)	Return Period (e2)			
MKE_WC2	BSC	xx	Q100	0100C00	004	70051078_MKE_WC2_004_~s1~_~s2~_~e1~_~e2~.tcf	70051078_MKE_WC2_004_xx_BSC_Q100_0100C00
MKE_WC2	BSC	xx	Q100C35	0100C35	004	70051078_MKE_WC2_004_~s1~_~s2~_~e1~_~e2~.tcf	70051078_MKE_WC2_004_xx_BSC_Q100C35_0100C35
MKE_WC2	BSC	xx	Q100C65	0100C65	004	70051078_MKE_WC2_004_~s1~_~s2~_~e1~_~e2~.tcf	70051078_MKE_WC2_004_xx_BSC_Q100C65_0100C65
MKE_WC2	PRP	xx	Q100	0100C00	004	70051078_MKE_WC2_004_~s1~_~s2~_~e1~_~e2~.tcf	70051078_MKE_WC2_004_xx_PRP_Q100_0100C00
MKE_WC2	PRP	xx	Q100C35	0100C35	004	70051078_MKE_WC2_004_~s1~_~s2~_~e1~_~e2~.tcf	70051078_MKE_WC2_004_xx_PRP_Q100C35_0100C35
MKE_WC2	PRP	xx	Q100C65	0100C65	004	70051078_MKE_WC2_004_~s1~_~s2~_~e1~_~e2~.tcf	70051078_MKE_WC2_004_xx_PRP_Q100C65_0100C65

Appendix C. Model Schematics



Appendix E

SCHEME DRAWINGS

Notes:
Do not scale from this drawing.
All contractors must visit the site and be responsible for taking and checking Dimensions.
All construction information should be taken from figured dimensions only.
Any discrepancies between drawings, specifications and site conditions must be brought to the attention of the supervising officer.
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This drawing is for planning purposes only. It is not intended to be used for construction purposes. Whilst all reasonable efforts are used to ensure drawings are accurate, JTP accept no responsibility or liability for any reliance placed on, or use made of, this plan by anyone for purposes other than those stated above.

- Redline Boundary
- Residential
- Employment
- Burial Ground
- Existing Hotel
- Community Hub
- Later Living
- Primary School
- Secondary School
- Playing Fields
- Local Play Area and Buffer
- Neighbourhood Play Area and Buffer
- Allotments
- River Ouzel Linear Park (floodplain)
- Community Woodlands
- Village Greens
- Grid Roads
- Primary Street
- Non-Grid Roads
- Primary Green Corridor
- Secondary Green Corridor
- Tertiary Green Corridor
- Attenuation Basin and Maintenance Access

Rev	Date	Description	Drawn	Chkd
D15	22.02.21	updated following masterplan review	LB	AH
D14	15.02.21	updated following masterplan review	LB	AH
D13	12.02.21	updated following masterplan review	LB	AH
D12	29.01.21	updated following masterplan review	LB	AH
D11	19.01.21	updated following masterplan review	LB	AH
D10	12.11.20	updated following masterplan review	LB	AH
D9	12.11.20	updated following masterplan review	LB	AH
D8	21.07.20	updated following masterplan review	LB	AH
D7	16.06.20	updated following masterplan review	LB	AH
D6	04.06.20	updated following masterplan review	LB	AH
D5	07.04.20	Site boundary updated	JCS	GP
D4	07.04.20	Updated following client comments	JCS	GP
D3	03.04.20	Updated following client comments	JCS	GP
D2	09.03.20	Updated following client comments	JCS	GP
D1	06.03.20	First Issue	JCS	GP

Drawing Status
DRAFT

Client
St James

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Project
Milton Keynes East

Drawing Title
Land Budget Plan

Scale @ A1 1:5000 Job Ref. 01312
Drawing No. 01312 _LB_01 Revision D15
Scale Bar 0 50 100 150 200 250m