Appendix 10.1

Appendix A - Development Masterplan

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0 25 75m

FOR APPROVAL

RB01
RB02
RB03
RB04
RB05A
RB05B
RB05C
RB06
RB07
RB10
RB12B
RB16
RB17
S1
S2
min 19 m
min 29 m
min 17 m
min 43 m
min 23 m
+5m / -3m
+5m / -5m
+3m / -3m
+10m / -10m
- 3m

Legend:

- Development plots
- Potential route between plots
- Maximum extent of RB10 development plot above ground level. Development at grade may be appropriate subject to an additional Flood Risk Assessment as part of a Detailed Application.
- Development zone including public realm
- Public realm including rights of way, emergency access, car parking, sustainable urban drainage systems and infrastructure.
- Dantzic Street enhancements
- Neighbourhood road
- Consented improved green infrastructure works within outline planning application boundary. Application number: *133143/VO/2022*
- Key public open space
- Consented improved green infrastructure works outside outline planning application boundary. Application number: *133143/VO/2022*
- +- 00m Limit of development plot boundary deviation plus or minus by noted dimension in metres.
- - 00m Limit of development plot boundary deviation minus by noted dimension in metres.

  At the detailed planning application stage where permission is sought for a building line, the building line for each plot can deviate on all boundaries of each plot where stated as + or -.
- Outline planning application boundary
- S1 Existing sewer subject to diversion
- S2 Existing sewer subject to a no-build zone

Rev	Details	Drwn	Chkd	Date
P1	Issed for Planning	AE	BC	21/04/23

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Proj. No.	Project	Status
524	Red Bank Manchester	Issed for Planning

Sheet Name: Parameter Plan P1 - Development Plots and Public Realm
Client: FEC

CDE ID	Scale	Size	Rev.
RDB-MLM-00-00-DR-AR-211417	1:1250	A1	P1

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0 25 75m

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RB05A
RB05B
RB05C
RB04
RB03
RB02
RB01
RB12B
RB17
RB16
RB06
RB07
RB10

Legend:

- Development plots
- Emergency vehicle access route
- Primary vehicular servicing route
- Emergency egress route during flood event
- Bridge access from RB10 to emergency egress route during flood event
- Primarily vehicular access point from boundary
- Primarily pedestrian - cycle or emergency vehicle access point from boundary
- Pedestrain access point from boundary
- Pedestrian - cycle route proposed
- Outline planning application boundary

Notes:

- To be read in conjunction with drawing number RDB-MLM-00-00-DR-AR-211417, Parameter Plan P1 - Development Plots and Public Realm. All 'limits of deviation' and 'potential zones of deviation subject to Detailed Planning Application approval' shown within this drawing apply here.

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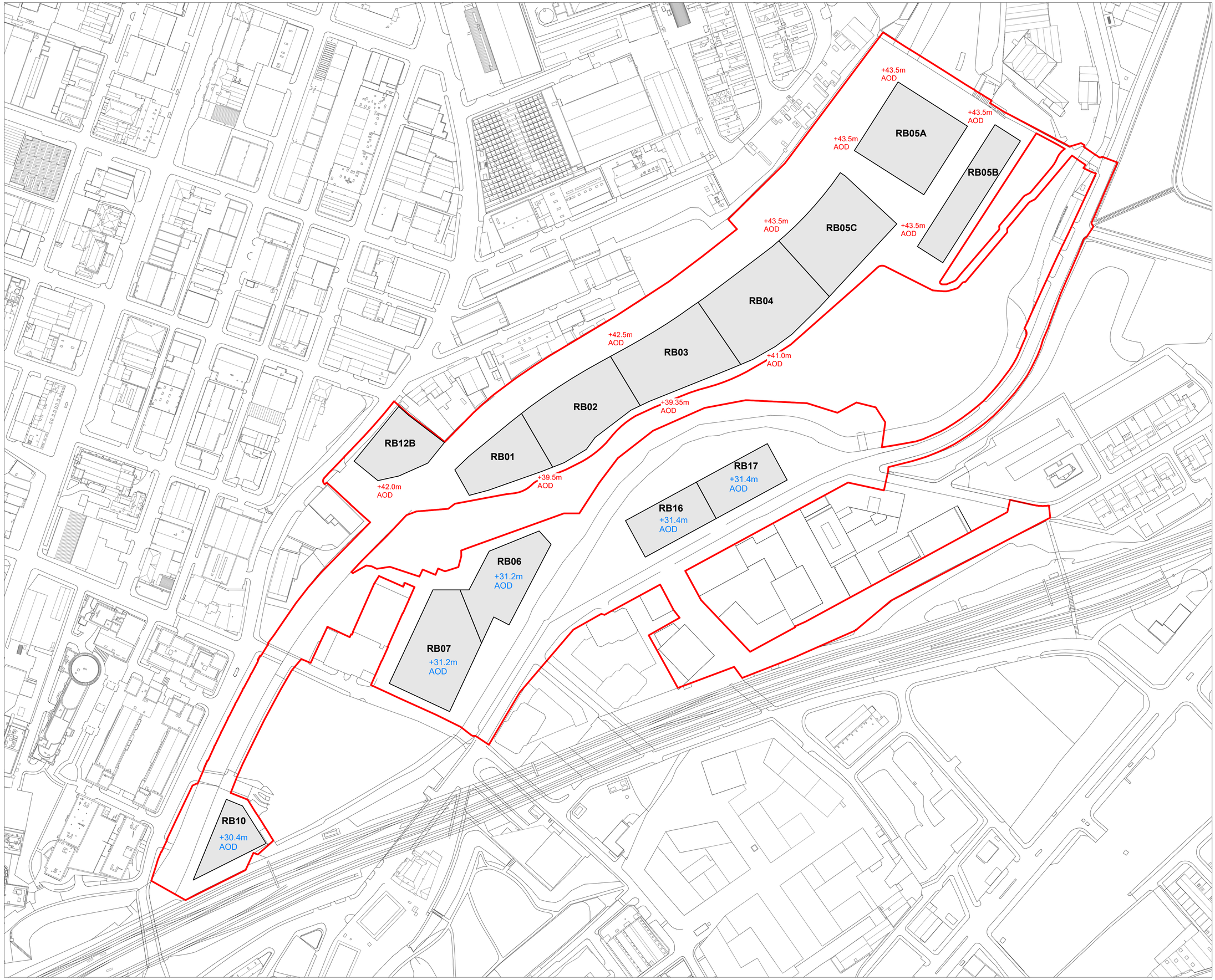
Proj. No.	Project	Status
524	Red Bank Manchester	Issed for Planning

Sheet Name: Parameter Plan P2 - Movement

Client: FEC

CDE ID	Scale	Size	Rev.
RDB-MLM-00-00-DR-AR-211418	1:1250		P1



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Legend:

+41.0m AOD — Proposed site ground level AOD; limit of deviation is + / - 0.5m

+31.6m AOD — Minimum Finished Floor Level AOD excluding freeboard (the only uses below the design flood level may be car parking, cycle parking, refuse stores and a temporary outdoor market use)

Development plots

Outline planning application boundary

Notes:

- To be read in conjunction with drawing number RDB-MLM-00-00-DR-AR-211417, Parameter Plan P1 - Development Plots and Public Realm. All 'limits of deviation' and 'potential zones of deviation subject to Detailed Planning Application approval' shown within this drawing apply here.
- All vulnerable uses including commercial to be located above the design flood level.
- The only uses below the design flood level may be car parking, cycle parking, refuse stores and a temporary outdoor market use.
- Minimum FFLs being proposed for the outline application do not include an allowance for freeboard.
- Flood resistance / resilience measures to be provided to a minimum of 600mm above design flood levels.
- Where residential lobbies are indicated below the design flood level they are to be provided with alternative means of escape (above the flood level).

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Proj. No. 524
Project Red Bank Manchester
Status Issed for Planning
Sheet Name Parameter Plan P5 - Site Levels
Client FEC
CDE ID RDB-MLM-00-00-DR-AR-211421
Scale 1:1250
Size
Rev. P1

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Legend:

- Outline planning application boundary
- Land owned or controlled by applicant

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Proj. No.	Project	Status
524	Red Bank Manchester	Issed for Planning

Sheet Name	Client
Site Location Plan	FEC

CDE ID	Scale	Size	Rev.
RDB-MLM-00-RF-DR-AR-111001	1:1250	A1	P1

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FOR APPROVAL

Legend:

- Outline planning application boundary
- Consented improved green infrastructure works outside outline planning application boundary. Application number: 133143/VO/2022 AREA A
- Consented improved green infrastructure works outside outline planning application boundary. Application number: 133143/VO/2022 AREA B

Rev	Details	Drwn	Chkd	Date
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Proj. No.	Project	Status
524	Red Bank Manchester	Issed for Planning

Sheet Name	Client
Existing Site Plan	FEC

CDE ID	Scale	Size	Rev.
RDB-MLM-00-RF-DR-AR-111002	1:1250	A1	P1

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FOR APPROVAL

Legend:

- Demolition of walls
- Demolition of buildings / structures
- Outline planning application boundary

Rev	Details	Drwn	Chkd	Date
P1	Issed for Planning	AE	BC	21/04/23

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Proj. No.	Project	Status
524	Red Bank Manchester	Issed for Planning

Sheet Name	Client
Demolition Plan	FEC

CDE ID	Scale	Size	Rev.
RDB-MLM-00-RF-DR-AR-111003	1:1250	A1	P1

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0 25 75m

FOR INFORMATION AND NOT FOR APPROVAL

Legend:

- Outline planning application boundary
- Potential bridge (not part of this application)

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Proj. No.	Project	Status
524	Red Bank Manchester	Issed for Planning

Sheet Name	Client
Illustrative Masterplan	FEC

CDE ID	Scale	Size	Rev.
RDB-MLM-00-RF-DR-AR-211180	1:1250	A1	P1

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0 25 75m

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RB05A +93m AOD
RB05B +73m AOD
RB05C +90m AOD
RB04 +93m AOD
RB03 +87m AOD
RB02 +90m AOD
RB01 +123m AOD
RB12B +94m AOD
RB17 +155m AOD
RB16 +98m AOD
RB06 +145m AOD
RB07 +124m AOD
RB10 +211m AOD

+64m AOD
+62m AOD
+59m AOD
min 6 m
min 12 m

Legend:

+xx.xm AOD	Maximum building height AOD
	Building height ranges as specified by the maximum buildng height AOD annotation:
	up to +64m AOD (up to 5-storeys)
	up to +62m AOD (up to 6-storeys)
	up to +59m AOD (up to 7-storeys)
	up to +73m AOD (up to 8-storeys)
	up to +90m AOD (up to 13-storeys)
	up to +94m AOD (up to 14-storeys)
	up to +98m AOD (up to 19-storeys)
	up to +123m AOD (up to 24-storeys)
	up to +124m AOD (up to 27-storeys)
	up to +145m AOD (up to 34-storeys)
	up to +155m AOD (up to 37-storeys)
	up to +211m AOD (up to 55-storeys)
	Outline planning application boundary

Notes:

- To be read in conjunction with drawing number RDB-MLM-00-00-DR-AR-211417, Parameter Plan P1 - Development Plots and Public Realm. All 'limits of deviation' and 'potential zones of deviation subject to Detailed Planning Application approval' shown within this drawing apply here.
- Lift over-runs and plant and equipment to be included within the maximum building heights.

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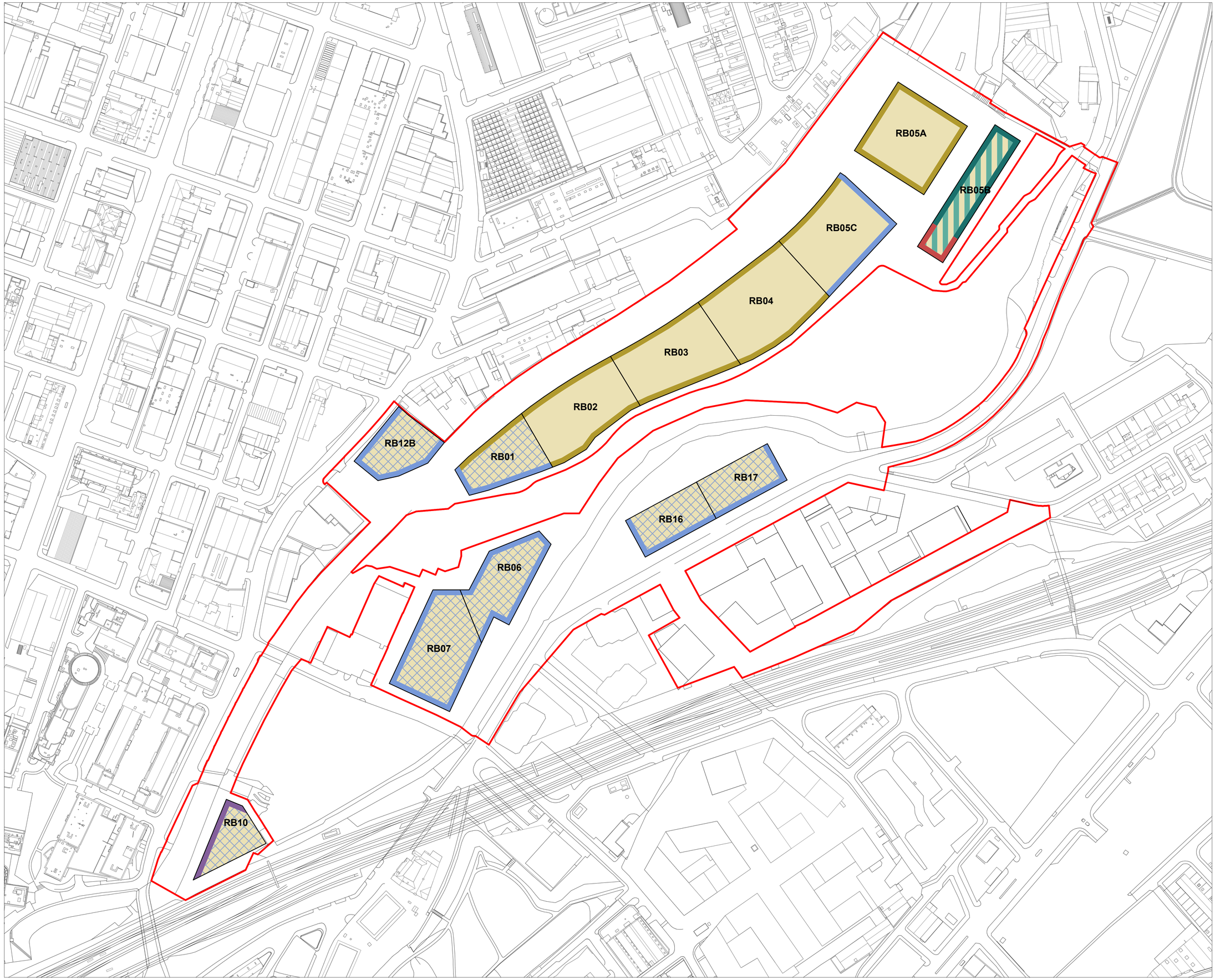
Proj. No. 524
Project Red Bank Manchester
Status Issed for Planning
Sheet Name Parameter Plan P4 - Building Heights (max)
Client FEC
CDE ID RDB-MLM-00-RF-DR-AR-211420
Scale 1:1250
Size
Rev. P1



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Legend:

- Development plot use class C3 or C2
- Development plot either use class F1(a), C3 or C2
- Development plot use class C3 or C2 with non-residential uses up to second floor to include use classes E, F and SG
- Ground and first floor frontage (predominantly) use class C3 or C2
- Ground floor frontage either use class F1(a), C3 or C2
- Ground floor frontage either use class E, F1(a), SG or C2/C3 entrance/residential amenity
- Ground floor frontage either use class E, F, SG or C2/C3 entrance/residential amenity
- Ground floor frontage outdoor market (use classes E & SG) or C2/C3 entrance/residential amenity
- Outline plannning application boundary

Notes:

- To be read in conjunction with drawing number RDB-MLM-00-00-DR-AR-211417, Parameter Plan P1 - Development Plots and Public Realm. All 'limits of deviation' and 'potential zones of deviation subject to Detailed Planning Application approval' shown within this drawing apply here.
- SG = Sui Generis covering the following uses: Laundrette; Public Houses, Wine Bars, Drinking Establishments; Drinking Establishments with Expanded Food Provision; and Hot Food Takeaways.
- Plan to be read in conjunction with the approved Development Specification

Rev	Details	Drwn	Chkd	Date
P1	Issed for Planning	AE	BC	21/04/23

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Proj. No.	Project	Status
524	Red Bank Manchester	Issed for Planning

Sheet Name: Parameter Plan P3 - Use

Client: FEC

CDE ID	Scale	Size	Rev.
RDB-MLM-00-ZZ-DR-AR-211419	1:1250		P1

Appendix 10.1

Appendix B - Development Specification Reports

AVISON YOUNG

Red Bank – Development Specifications

Outline and Detailed Applications

February 2023

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Appendix 1 Red Edge Location Plan (Outline Application)
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Appendix 6 Red Edge Location Plan (Detailed Application)
Appendix 7 Use Class Schedule of Non-Residential Uses (Detailed Application)

Report title: Development Specifications
Prepared by: Ed Harvey
Status: Final
Draft date: 28 February 2023

For and on behalf of Avison Young (UK) Limited

Red Bank Outline Planning Application

1. Introduction

1.1 This Development Specification has been prepared by Avison Young ('AY') and Maccreanor Lavington ('MLM') on behalf of Far East Consortium ("FEC") to inform the preparation of the technical assessments to support an outline planning application proposed residential led mixed use development at Red Bank, Manchester.

1.2 The Development Specification provides details covering:

- Outline Application Area
- Type of Planning Application
- Quantum of Residential Development
- Indicative Residential Mix
- Quantum of Non-Residential Uses
- Quantum of Clubhouse Buildings
- Quantum of Health Centre Use
- Quantum of Primary School Use
- Quantum of Cycle Parking
- Quantum of Car Parking

1.3 The Development Specification for each component is provided below.

2. Outline Application Area

2.1 The outline application boundary as drawn on the Site Edge Red Location Plan attached at **Appendix 1** extends to 10.29 hectares (25.41 acres).

2.2 Please note that the boundary is subject to legal review in February 2023 and as a result there could be minor changes which revise the site area. The final site area will be confirmed once the legal process is complete.

3. Type of Planning Application

3.1 The type of planning application will be an outline planning application with all matters reserved.

3.2 Approval will be sought for the suite of Parameter Plans attached at **Appendix 2** which should be used for undertaking the technical assessments. The suite of Parameter Plans include:

- Parameter Plan P1 – Development Plots and Public Realm
- Parameter Plan P2 – Movement
- Parameter Plan P3 – Use
- Parameter Plan P4 – Maximum Building Heights
- Parameter Plan P5 – Site Levels

3.3 An Illustrative Masterplan will be submitted with the outline planning application which shows a potential configuration of the proposed development. The Illustrative Masterplan will not be for approval. An Indicative Phasing Plan will also be submitted with the planning application which will show the phases referred to in the EIA Strategy Note. A condition will be imposed on the outline planning permission which requires the submission of a Detailed Phasing Plan.

3.4 The suite of documents required in support of the outline planning application is provided at **Appendix 3**.

4. Quantum of Residential Development

4.1 The outline planning application will seek approval for *up to* 3,250 residential units (use classes C3 and C2) across the site.

4.2 Parameter Plan P3 – Use defines the residential development as follows:

- Development plot use class C3 (predominately) or C2 (yellow colour)
- Ground floor frontage use class C3 (predominantly) or C2 (light brown colour)
- Ground floor frontage either use class F1(a), C3 or C2 (green colour)
- Ground floor frontage either use class E, F1(a), SG or C2/C3 entrance / residential amenity (red colour)
- Ground floor frontage either use class E, F, SG or C2/C3 entrance / residential amenity (light blue colour)
- Development plot either (predominantly) use class F1(a), C3 or C2 (yellow and green stripped)
- Development plot (predominately) use class C3 or C2 with non-residential uses up to second floor to include uses classes E, F and SG (yellow with green hatch)

5. Residential Mix

5.1 Manchester City Council ('MCC') has requested that Residential Mix forms part of the Development Specification. For the purpose of preparing this outline planning application, the residential mix is:

Table 1: Outline Application Residential Mix

Property Size	Amount
1 Bedroom Property	24.5%
2 Bedroom Property	63.3%
3 Bedroom Property	12.1%

6. Quantum of Non-Residential Uses

6.1 A mix of uses are proposed as part of the development. Attached at **Appendix 4** is a Use Class Schedule of Non-Residential Uses for which outline planning permission is sought.

6.2 The outline planning application will seek approval for the following amounts of class E, F and Sui Generis uses as specified on the schedule at Appendix 4:

Table 2: Outline Non-Residential Uses Quantum

Floor Area	Use Classes E, F and Sui Generis
Gross Internal Area	Up to 6,300 sq m
Gross External Area	Up to 7,000 sq m

6.3 Parameter Plan P3 – Use defines the residential development as follows:

- Ground floor frontage either use class E, F1(a), SG or C2/C3 entrance / residential amenity (red colour)
- Ground floor frontage use class E, F or SG of C2/C3 entrance / residential amenity (light blue colour)
- Ground floor outdoor market (use classes E and SG)
- Development plot (predominately) use class C3 or C2 with non-residential uses up to second floor to include uses classes E, F and SG (yellow with green hatch colour)

7. Quantum of Clubhouse Buildings

7.1 Standalone clubhouse buildings are proposed which will provide amenity for the residents of the development.

7.2 The outline planning application will seek approval for:

Table 3: Outline Clubhouse Buildings Quantum

Floor Area	Clubhouse Residents Amenity
Gross Internal Area	Up to 3,250 sq m
Gross External Area	Up to 3,600 sq m

8. Quantum of Health Centre Use

8.1 The outline planning application will seek approval for health centre uses (Use Class E) as follows:

Table 4: Outline Health Centre Use Quantum

Floor Area	Health Centre Uses (Use Class E)
Gross Internal Area	Up to 3,250 sq m
Gross External Area	Up to 3,600 sq m

8.2 Parameter Plan P3 – Use defines the residential development as follows:

- Ground floor frontage use class E, F or SG of C2/C3 entrance / residential amenity (light blue colour)
- Development plot (predominately) use class C3 or C2 with non-residential uses up to second floor to include uses classes E, F and SG (yellow with green hatch colour)

9. Quantum of Primary School Use

9.1 The outline planning application will seek approval for a primary school (Use Class F1(a)) as follows:

Table 5: Outline Quantum of Primary School Use

Floor Area	Primary School (Use Class F1(a)
Gross Internal Area	Up to 2,750 sq m
Gross External Area	Up to 3,000 sq m

9.2 Parameter Plan P3 – Use defines the residential development as follows:

- Ground floor frontage either use class F1(a), C3 or C2 (green colour)
- Ground floor frontage either use class E, F1(a), SG or C2/C3 entrance / residential amenity (red colour)
- Development plot either (predominately) use class F1(a), C3 or C2 (yellow and green stripped)

10. Quantum of Cycle Parking

10.1 The amount of cycle parking proposed as part of the outline planning application is:

- 1 secure cycle space per residential property (total *up to* 3,250 cycle spaces)

11. Quantum of Car Parking

11.1 The amount of car parking proposed as part of the outline planning application is 12% which comprises:

- Up to 325 spaces for the residential development proposed by the outline application
- Up to 25 spaces for the non-residential development proposed by the outline application
- 75 spaces for the proposed NT02-NT04 full application

12. Introduction

12.1 This Development Specification has been prepared by Avison Young ('AY'), Hawkins Brown and Maccreanor Lavington Architects ('MLA') on behalf of Far East Consortium ("FEC") to inform the preparation of the technical assessments to support the detailed planning application proposing residential led development at Plots NT02-04.

12.2 The Development Specification provides details covering:

- Detailed Application Area
- Residential Accommodation Schedule
- Clubhouse Accommodation Schedule
- Non-Residential Uses Accommodation Schedule
- Residential Mix Schedule
- Quantum of Cycle Parking
- Quantum of Car Parking
- Breakdown of Car Parking between Plots

12.3 The Development Specification for each component is provided below.

12.4 The suite of documents required in support of the detailed planning application is provided at **Appendix 5**.

13. Detailed Application Area

13.1 The detailed application boundary as drawn on the Site Edge Red Location Plan attached at **Appendix 6** extends to 2.7 hectares (6.67 acres).

13.2 Please note that the boundary is subject to legal review in February 2023 and as a result there could be minor changes which revise the site area. The final site area will be confirmed once the legal process is complete.

14. Quantum of Residential Development

14.1 The detailed planning application will seek approval for 1,550 residential units (use classes C3) across the three plots.

14.2 The breakdown of units between plots is as follows:

Table 6: Detailed Residential Development Quantum

Plot	Residential Development Quantum
NT02	316
NT03	577
NT04	656
Total Full	**1,549**

15. Clubhouse Accommodation Schedule

15.1 A clubhouse providing a combination of residents' amenity space and commercial uses (Use Class E, F and Sui Generis) will be provided at NT02. The detailed planning application will seek approval for the total size of the clubhouse building as follows:

Table 7: Detailed Clubhouse Building Total Quantum

Floor Area	Clubhouse: Total Area
Gross Internal Area	2,155 sq m
Gross External Area	2,257 sq m
Net Internal Area	1,467 sq m

15.2 As stated above, within the clubhouse building there will be a combination of residents' amenity space and commercial uses (Use Class E, F and Sui Generis) which is broken down as follows:

Clubhouse Resident Amenity Use

15.3 Part of the clubhouse will be solely for residents' use. It will provide functions such as: Gym/fitness/wellness studio, communal kitchen, cinema, launderette, library, gaming room, workspace, podcast room, pitch theatre, café/bar, table sports room and arts & crafts. The total size of the clubhouse which is only accessible to residents as amenity area is:

Table 8: Detailed Clubhouse Building Resident Amenity Quantum

Floor Area	Clubhouse: Resident Amenity Area
Gross Internal Area	1,721 sq m
Gross External Area	1,804 sq m
Net Internal Area	1,125 sq m

Clubhouse Non-Residential Use

15.4 Part of the clubhouse proposed on ground, first and sixth floor levels will provide non-residential, commercial uses (Use Class E, F and Sui Generis) and will be accessible to the public. Attached at **Appendix 7** is a Use Class Schedule of Non-Residential Uses for which detailed planning permission is sought. The total size of the clubhouse which will be non-residential commercial uses and accessible to the public is:

Table 9: Detailed Clubhouse Building Non-Residential Use Quantum

Floor Area	Clubhouse: Non-Residential Use
Gross Internal Area	434 sq m
Gross External Area	452 sq m
Net Internal Area	341 sq m

15.5 The extent of non-residential uses proposed in the Clubhouse is also provided within the total extent of non-residential uses proposed for which full planning permission is sought. The total extent of non-residential uses proposed across the NT02-NT04 development is provided in the following section.

16. Quantum of Non-Residential Uses

16.1 A mix of uses are proposed as part of the development. Attached at **Appendix 7** is a Use Class Schedule of Non-Residential Uses for which detailed planning permission is sought.

16.2 Plots NT02-04 will include provision of flexible non-residential floorspace units providing for Use Classes E, F or Sui Generis uses. A breakdown of the uses between plots is set out below and includes the non-residential uses proposed in the clubhouse which is accessible to the public:

Table 10: Detailed Non-Residential Uses Total Quantum

Plot	GIA	GEA	NIA
NT02	434 sq m	452 sq m	341 sq m
NT03	966 sq m	1,086 sq m	895 sq m
NT04	694 sq m	745 sq m	623 sq m
Total Full	2,094 sq m	2,283 sq m	1,859 sq m

17. Residential Mix Schedule

17.1 For the purpose of the detailed planning application, the proposed residential mix is as follows:

Table 11: Detailed Residential Mix

Plot	1 bed	2 bed	3 bed
NT02	124	184	8
NT03	230	306	41
NT04	285	339	32
Total Full	639 (41%)	829 (54%)	81 (5%)

18. Quantum of Cycle Parking

18.1 The amount of cycle parking proposed as part of the detailed planning application is:

- NT02 = 316 cycles no
- NT03 = 577 cycles no
- NT04 = 656 cycles no

19. Breakdown of Car Parking

19.1 The amount of car parking proposed for the detailed application is:

Table 12: Detailed Proposed Car Parking Spaces

Plot	Podium (Residents only)		Dulwich Street (private estate) – Residents only		Total Residential Car Parking Spaces (%)	Dulwich Street (private estate) – Visitors		Dantzic & Dalton Street (adopted highways) – Visitors		Total Visitor Spaces
	Standard	Accessible	Standard On-Street	Accessible On-Street		Standard On-Street	Accessible On-Street	Standard On-Street	Accessible On-Street	
NT02	0	0	0	0	**0 (0%)**	0	1	0	0	1
NT03	37	3	0	0	**40 (7%)**	0	1	0	1	2
NT04	41	2	18	5	**66 (10%)**	0	0	12	1	13
Total Full	78	5	18	5	**106 (7%)**	0	2	12	2	16

Appendix 1

Red Edge Location Plan (Outline Application)

Appendix 2

Parameter Plans

Suite of Outline

Appendix 3 Schedule of Application Submission Documents (Outline Application)

Appendix 4 Use Class Schedule of Non-Residential Uses (Outline Application)

Appendix 5 Schedule of Application Submission Documents (Detailed Application)

Appendix 6

(Detailed Application)

Red Edge Location Plan

Appendix 7 Use Class Schedule of Non-Residential Uses (Detailed Application)

Contact details

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Avison Young

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Appendix 10.1

Appendix C - Statutory Consultations

Mostyn, Stephen

From:	McLaughlin, Anne-marie <Anne-Marie.McLaughlin@environment-agency.gov.uk>
Sent:	02 March 2023 17:34
To:	Mostyn, Stephen; john.sherrington@spclimited.co.uk
Cc:	Chambers, Julia; Davies, Andy; Ruckledge, John; Hilary Brett-Parr; Jon Suckley; Brimblecombe, Jack; Outterside, James; Standring, Ian; a.english@maccreanorlavington.com; Blazej Czuba
Subject:	ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)
Attachments:	ENVPAC.1.GMC.00443 - EA Review of Flood Risk Mitigation Strategy.pdf
Filed:	-1
Filed Location:	\\uk.wspgroup.com\central data\Projects\70079xxx\70079268 - Redbank & Dantzic Street Masterplan\01 Comms\1A Emails\DI Internal\230302 173416 - McLaughlin, Anne-marie - ENVPAC 1 GMC 00443 - EA Review of Flood Risk Mitig....msg
Filed Location Folder:	\\uk.wspgroup.com\central data\Projects\70079xxx\70079268 - Redbank & Dantzic Street Masterplan\01 Comms\1A Emails\DI Internal

Hi Stephen,

Please find attached our preliminary commentary of the overview provided of the 'Application 4' and 'Application 5' Flood Risk Mitigation Strategy as outlined in your email dated 14th February 2023.

As previously highlighted, this review is subject to the approval of the EA's acceptance of the 'Application 4' and 'Application 5' flood models, where we understand further flood models are intended to be issued to us by Monday (6th March), and confirmation of detailed plans intended to submitted for each planning submission.

We advise at this time that if it is the intention to produce one FRA / Flood Risk Mitigation Strategy report, a clear distinction is made on the assessment and intended mitigation measures for each individual application. This is to ensure determination of the suitability and acceptability of the assessment / mitigation proposals for each individual planning application is clearly identified / recognised.

Further to the above, our commentary includes advice for your consideration on the forthcoming FRA / Flood Risk Mitigation Strategy where we would welcome discussions and / or further technical review of the full FRA / Flood Risk Mitigation Strategy once the above matters have been addressed.

Should you have any queries and wish to discuss the contents of our response, then please feel free to contact me.

Many thanks,

Anne-Marie

Anne-Marie McLaughlin
Planning Advisor, Green Growth Team & Sustainable Places Team | Greater Manchester, Merseyside, Cheshire
Environment Agency | Richard Fairclough House, Knutsford Road, Latchford, Warrington WA4 1HT
SP Team Email: SPPlanning.RFH@environment-agency.gov.uk
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Mostyn, Stephen

From: Davies, Andy <Andy.Davies1@environment-agency.gov.uk>
Sent: 27 March 2023 11:10
To: Mostyn, Stephen; Ruckledge, John; McLaughlin, Anne-marie
Cc: Hilary Brett-Parr; Jon Suckley; Brimblecombe, Jack; Outterside, James; Standring, Ian; a.english@maccreanorlavington.com; Blazej Czuba; Ken Thompson; john.sherrington@spclimited.co.uk; Sara Gallego; Holly Wilkinson; Prebble, Nick; Timea Nacsa; Chambers, Julia; James Thomson
Subject: RE: ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)

Hi Stephen,

Many thanks for circulating the summary.

See few amendments in chain below to fully capture EA perspective. However, nothing I believe which alters the 'status-quo' from conversations held last week.

Happy to discuss further if required.

Kind regards,
Andy

Andy Davies
Project Manager, Green Growth Team & Sustainable Places Team | Greater Manchester, Merseyside, Cheshire
Environment Agency | Richard Fairclough House, Knutsford Road, Latchford, Warrington WA4 1HT
SP Team Email: SPPlanning.RFH@environment-agency.gov.uk
Mobile: **0739 379 8325**
Pronouns: he/him/his

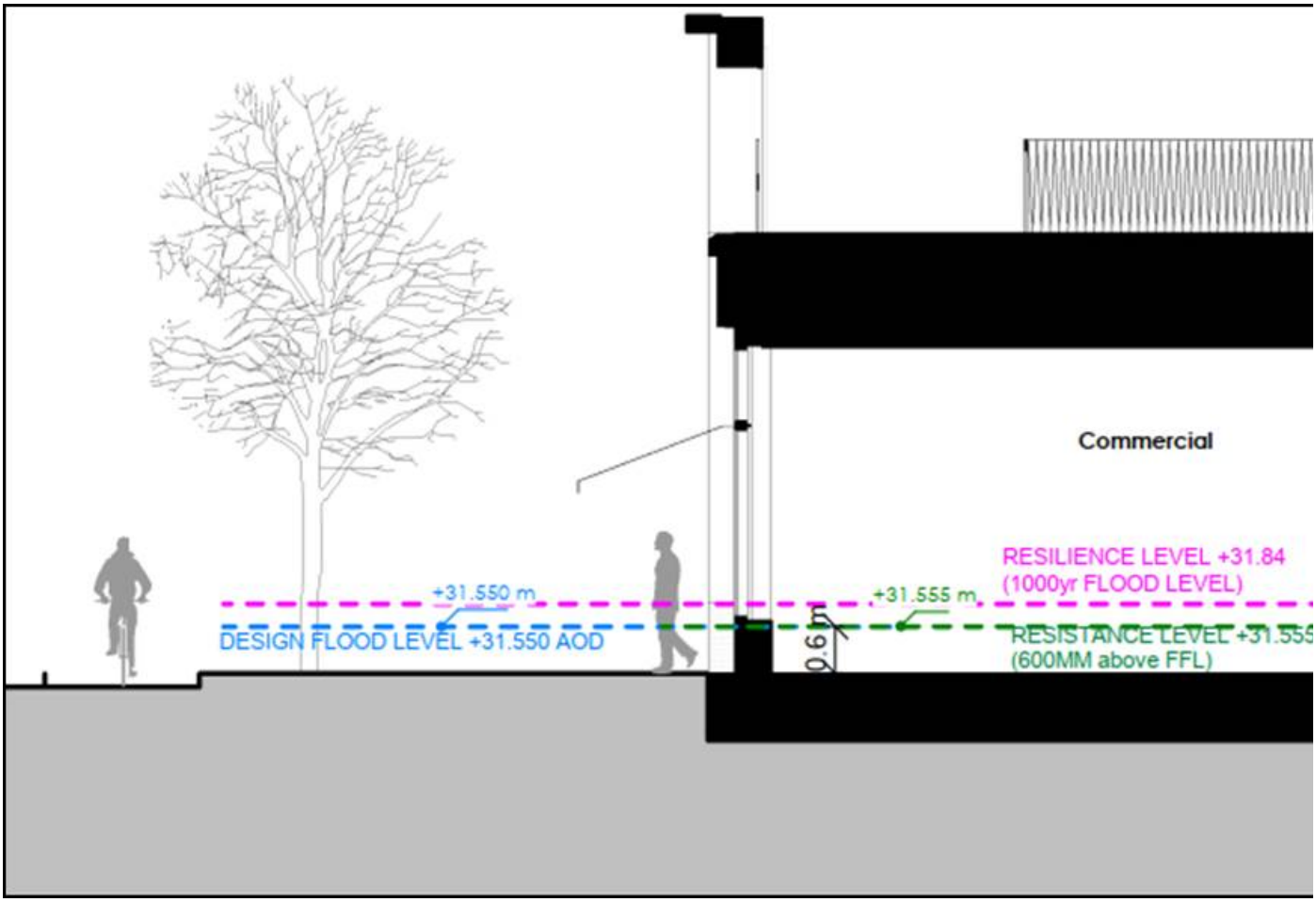
From: Mostyn, Stephen <Stephen.Mostyn@wsp.com>
Sent: 24 March 2023 13:05
To: Davies, Andy <Andy.Davies1@environment-agency.gov.uk>; Ruckledge, John <john.ruckledge@environment-agency.gov.uk>; McLaughlin, Anne-marie <Anne-Marie.McLaughlin@environment-agency.gov.uk>
Cc: Hilary Brett-Parr <hilary.brett@fecil.uk>; Jon Suckley <Jon.Suckley@asteerplanning.com>; Brimblecombe, Jack <Jack.Brimblecombe@wsp.com>; Outterside, James <James.Outterside@wsp.com>; Standring, Ian <Ian.Standring@wsp.com>; a.english@maccreanorlavington.com; Blazej Czuba <b.czuba@maccreanorlavington.com>; Ken Thompson <k.thompson@maccreanorlavington.com>; john.sherrington@spclimited.co.uk; Sara Gallego <s.gallego@maccreanorlavington.com>; Holly Wilkinson <hollywilkinson@hawkinsbrown.com>; Prebble, Nick <Nick.Prebble@environment-agency.gov.uk>; Timea Nacsa <timea.nacsa@fecil.uk>; Chambers, Julia <julia.chambers@wsp.com>; James Thomson <JamesThomson@hawkinsbrown.com>
Subject: RE: ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)

Andy,

Following on from yesterday's call, here is a record of main points discussed and agreed with respect to flood risk assessment.

- **Omission of freeboard:** The EA have reviewed the justification provided by masterplan architect and are comfortable with the approach taken to the omission of freeboard where necessary given the constraints. The EA advises that the architectural design detail/justification for this approach will need to be provided as part of the associated FRA (evidence base/narrative). However, the EA would also advocate/welcome, where possible, potential at the detailed design stage for consideration to be given as to whether FFLS can be raised further i.e. above the 'design flood event' .

- **Flood Resistance / Resilience:** The EA confirmed that flood resistance / resilience measures are required up to 600mm above the design flood level but indicated that the FRA should leave a degree of flexibility for the level at which resistance should be included up to and the level which resilience should be included up to, reflective of the fact that detail design of the development/plots currently remains undetermined/unknown to the EA. This can then be agreed on a plot by plot basis as each plot is brought forward for development taking into account the 1000-year flood level.
- **Emergency Plan:** The FRA will include details on flood levels, flood mitigation measures and safe access and egress routes including flood hazard mapping and recommends that the end user of the site subscribes to the EA Automated Flood Warning System and that a detailed Emergency Plan is produced. The FRA will set out the parameters / requirements for a detailed Emergency Plan but the key information listed above is included in the FRA. We understand that the EA accept this approach for planning.
- **Application 5 (NT04):** See section below. The FFL of commercial units along Dantzic Street will be set below the design flood level. Flood resistance will be provided to 600mm above FFL. Flood resilience will be provided up to the 1000-year flood level. Demountable flood barriers or similar will be provided at door thresholds. Safe egress will be provided to land above the design flood level. We understand that this approach is acceptable to the EA. – In association with this, it understood that 'dry' safe/access can be provided from all development plots.
- **Application 5 (NT03):** Commercial unit in NT03 with FFL of 31.72m AOD should have flood resilience measures up to a minimum of the 1000-year flood level which is 31.84m AOD



Please let us know if you have any comments on the summary above or would like to discuss any of the items in further detail.

Kind Regards,

Stephen Mostyn
Associate
Development Infrastructure

From: Mostyn, Stephen
Sent: 23 March 2023 10:01
To: Davies, Andy <Andy.Davies1@environment-agency.gov.uk>; McLaughlin, Anne-marie <Anne-Marie.McLaughlin@environment-agency.gov.uk>; Chambers, Julia <julia.chambers@wsp.com>
Cc: Ruckledge, John <john.ruckledge@environment-agency.gov.uk>; Hilary Brett-Parr <hilary.brett@fecil.uk>; Jon Suckley <Jon.Suckley@asteerplanning.com>; Brimblecombe, Jack <Jack.Brimblecombe@wsp.com>; Outterside, James <James.Outterside@wsp.com>; Standring, Ian <Ian.Standring@wsp.com>; a.english@maccreanorlavington.com; Blazej Czuba <b.czuba@maccreanorlavington.com>; Ken Thompson <k.thompson@maccreanorlavington.com>; john.sherrington@spclimited.co.uk; Sara Gallego <s.gallego@maccreanorlavington.com>; Holly Wilkinson <hollywilkinson@hawkinsbrown.com>; Prebble, Nick <nick.prebble@environment-agency.gov.uk>
Subject: RE: ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)

Hi Andy,

Apologies I've not been able to send the below earlier but here are the key agenda items for today's meeting from a Flood Risk Assessment perspective:

'we advise that further explanation is needed as to why the minimum 300mm freeboard is not appropriate / needed. We understand all residential accommodation will be from the 1st floor level and above but 'less vulnerable' uses at ground floor level should still be afforded some freeboard allowance.'

Please see below justification provided by the masterplan architect for your review and consideration:

General approach
The project aims to deliver a rich mix of commercial and community uses, particularly so around RB06, Rb07, RB10, RB16 and RB17, as these plots directly adjoin the River Irk and are the nearest to Central Manchester. Most of these plots were identified in the Victoria North Strategic Regeneration Framework (SRF) as mixed-use. The plots are envisaged to sit among high-quality public realm and it is critical to the success of the project that the uses within the buildings have a direct relationship with the surrounding public realm. They ground floor uses will be required to be accessible and active, therefore should be at a similar level to those of the adjoining public realm.

RB06 and RB07
The existing levels around these two plots along the River edge and Roger Street are approximately +30.0 AOD. The Union Waterfront needs to remains at +30.0 AOD to provide sufficient flood storage. The design flood level on both the plots is +31.2, therefore approximately 1.2 metres above the existing public realm. Setting FFL at flood level would lead to a 1.2 metre difference between public realm and building ground floor, which careful design could incorporate without detrimental impact on active ground floors. A 300mm freeboard would lead to a 1.5 metre difference in levels, which would have detrimental impact on the quality of the scheme.

RB10
The existing levels around the plots are approximately +29.0 AOD. The public realm around the plot cannot be raised above the flood level as it provides flood storage as well as access to existing Network Rail and other arch uses. The flood level is approximately +30.35, therefore approximately 1.35 metres above the public realm. The illustrative masterplan suggests an outdoor covered market use and residential ancillary use such as bin storage or cycle storage sitting underneath an elevated building. Only the residential lobby and the residential core of the building are proposed to be raised above the flood level. A 1.35 metre difference between public

realm and the FFL would at least maintain visual connectivity between the two. A 300mm freeboard would lead to an approximate 1.65 metre difference in levels, which would substantially affect the design quality and legibility of a building entrance and prevent visual surveyance from the building to the public realm.

RB16/17
Dantzic Street is seen as a new high street destination for the Masterplan, with a generous provision of ground and potentially first floor commercial and community uses. Active frontage is not sought to Travis Island Wetlands as substantial level difference will be required to maximise flood storage within them. The existing levels around these two plots along Dantzic Street are approximately +31.0 to +31.5 AOD. The flood level is approximately +31.36 AOD and +31.66 with a 300mm freeboard. As such, there may be instances where freeboard may be achieved for some or the majority of the plots, subject to detailed public realm and building design. However, we would seek flexibility at this stage to ensure that quality active frontages can be achieved along this key high street location.

NT02 – NT04 General approach
The project aims to deliver a rich mix of commercial and community uses, with a focus on the frontages of NT02-04 on Dantzic Street. Most of these plots were identified in the Victoria North Strategic Regeneration Framework (SRF) as mixed-use. The plots are envisaged to sit among high-quality public realm, and it is critical to the success of the project that the uses within the buildings have a direct relationship with the surrounding public realm. They ground floor uses will be required to be accessible and active, therefore should be at a similar level to those of the adjoining public realm.

NT04
Dantzic Street is seen as a new high street destination for the Masterplan, with a generous provision of ground floor commercial and community uses. NT04 completes this high street at the eastern end. The existing levels to the frontage onto Dantzic Street are approximately 30.5m+ AOD to 31.0m+ AOD. It is proposed to adjust the levels in the public realm at the back of pavement to the proposed FFL level of the commercial units at 30.955m+AOD consistently along the frontage to facilitate level access.

The design flood level for NT04 is 31.55+ AOD, which is 595mm above the proposed FFL. It is proposed to provide flood resistance measures to the façade up to 600mm above the proposed FFL (i.e. up to 31.555m+ AOD) in order to mitigate any potential flooding whilst maintaining level access into the active uses.

'We welcome the inclusion of flood resistance (water exclusion) / resilience (water ingress) measures to be provided at a minimum 600mm above 'flood levels'. We advise such measures are designed to consider the 0.1% AEP to ensure mitigation for residual flood risk is implemented.'

Agreement of the level that flood resistance should be provided up to and agreement of the level that flood resilience should be provided up to.

'The FRA must show how users of the development will remain safe. Therefore, safe access / egress routes must be identified and linked to flood warning and evacuation plans where necessary.'

The FRA will recommend emergency evacuation plans are put in place and the requirement for flood warnings. Confirmation required that the provision of emergency evacuation plans will be conditioned as a pre occupation requirement.

Apart from the above, the outstanding items to discuss were the approach being taken for Application 5, and in particular plot NT04. FFL is below design flood level - what level should flood resistant construction be provided. Current approach is aligned with that of Victoria Riverside (flood resistance to 600mm above FFL).

NT03 lowest FFL is actually 31.72m AOD (commercial). Where FFL's of NT03 are not 300mm above design flood level should same approach be taken as agreed for Application 4 ?

From: Davies, Andy <Andy.Davies1@environment-agency.gov.uk>
Sent: 13 March 2023 13:50
To: Mostyn, Stephen <Stephen.Mostyn@wsp.com>; McLaughlin, Anne-marie <Anne-

Marie.McLaughlin@environment-agency.gov.uk>; Chambers, Julia <julia.chambers@wsp.com>
Cc: Ruckledge, John <john.ruckledge@environment-agency.gov.uk>; Hilary Brett-Parr <hilary.brett@fecil.uk>; Jon Suckley <Jon.Suckley@asteerplanning.com>; Brimblecombe, Jack <Jack.Brimblecombe@wsp.com>; Outterside, James <James.Outterside@wsp.com>; Standring, Ian <Ian.Standring@wsp.com>; a.english@maccreanorlavington.com; Blazej Czuba <b.czuba@maccreanorlavington.com>; Ken Thompson <k.thompson@maccreanorlavington.com>; john.sherrington@spclimited.co.uk; Sara Gallego <s.gallego@maccreanorlavington.com>; Holly Wilkinson <hollywilkinson@hawkinsbrown.com>; Prebble, Nick <nick.prebble@environment-agency.gov.uk>
Subject: RE: ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)

Afternoon Stephen,

Many thanks for your email below – I've just tried to give you a call to discuss this. However, both my calls to your mob and office phone went through to voicemail.

More than happy to discuss matters over the phone if easier. However, cognisant to current internal resource pressures please would it be possible for you to outline exactly you / WSP would like to achieve via a meeting this week? I.e. the key agenda items.

As context to this ask…

Noting your email in chain primarily to matters associated with Application 5, please see attached email which advises the wider FEC/VN project team that we (the EA) are still awaiting the submission of an updated iteration of 'Application 5' flood model and in association with this detailed plans (*preferentially those which will be sought for planning approval*) enabling confirmation/confidence that the flood model submitted to the EA is an accurate representation of the intended development and, in turn, any assessment of development flood risk derived from this is appropriate.

As per our recent written correspondence / letter (SO/2023/122923/01-L01) relating primarily to assessment of flood intervention principles for 'Application 4', until we are able to gain confirmation that flood modelling presented is an accurate/representation of intended end-development design, in turn, we will be unable to confidently conclude/advise as to whether planned flood resistance/resilience proposals are appropriate due to the potential for variations to flood risk and it's management to still occur e.g. an uplift in design flood level as a result of intervention on Dantzic Street. However, that said, echoing our recent correspondence/letter, the general principles intended to employed for determining how development plot fluvial flood risk is to managed as part of 'Application 5' appear to be sound from our current understanding of the likely level of risk /fluvial flood impact the 'Application 5' development could experience within an 1:100 + CC% /Design Flood event. My only additional remark to this would be that whereby FFL are to be below the 1:1000 year event (*potentially only Plot NT04 based on the node data you present),* consideration/narrative is provided (within the forthcoming FRA) as to how this residual risk can be appropriately managed.

@Chambers, Julia – I note from Stephen's email below the reference to an impermeable concrete upstand offering protection to the NT04 development plot which I would presume based on prior reviewed modelling outputs / understanding of general fluvial flood risk for the area is situated on/in immediate proximity to Dantzic Street . Design elements such as, with the potential to alter local floodwater levels /floodwater distribution are the type of details we are seeking to understand further as part of efforts to determine flood model appropriateness. Please can it be ensured that details on the impermeable concrete upstand are provided as part of forthcoming updated 'Application 5' / flood model review submissions.

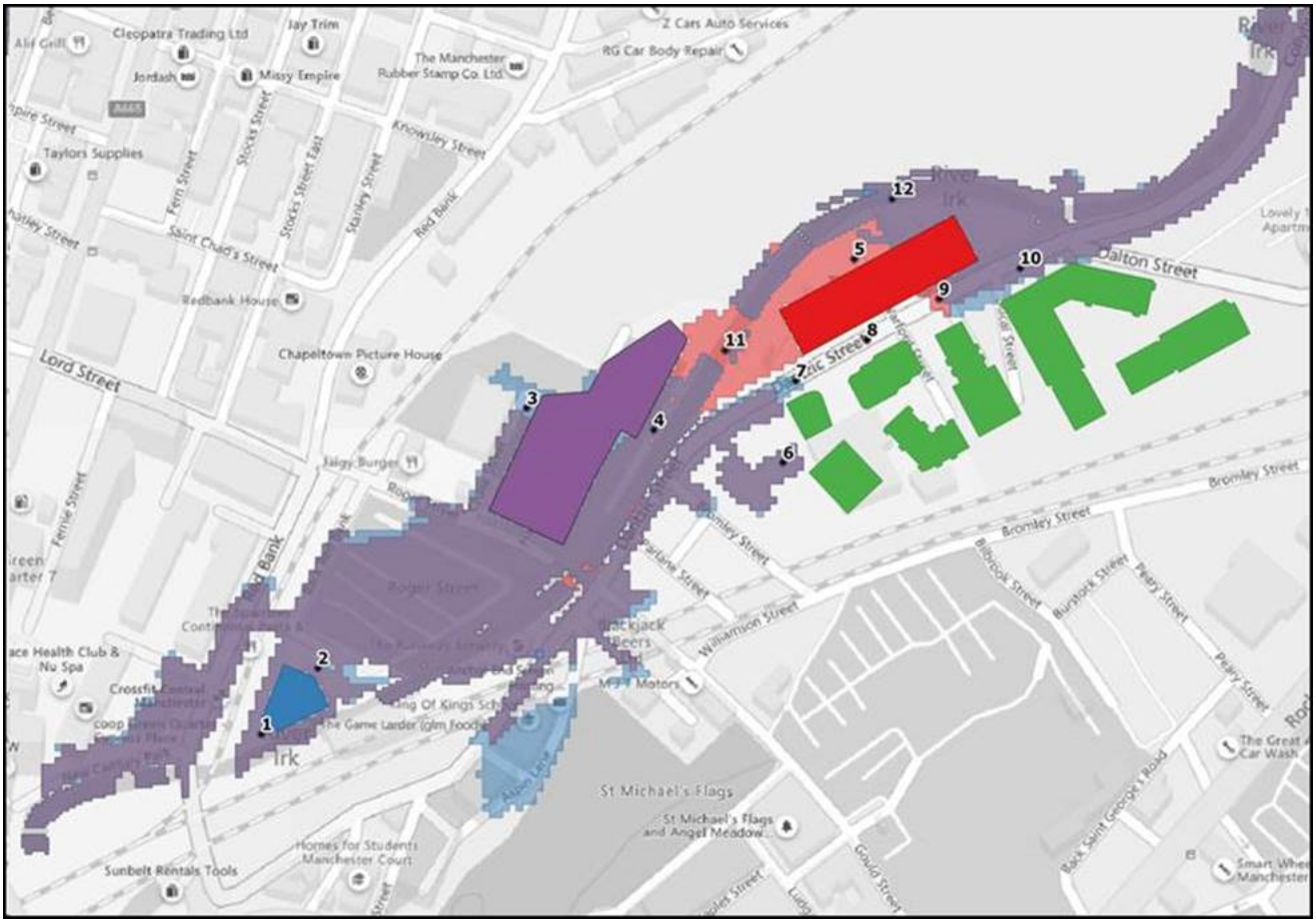
Happy to discuss any of the above further as required.

Kind regards
Andy

From: Mostyn, Stephen <Stephen.Mostyn@wsp.com>
Sent: 10 March 2023 19:23
To: McLaughlin, Anne-marie <Anne-Marie.McLaughlin@environment-agency.gov.uk>; john.sherrington@spclimited.co.uk
Cc: Chambers, Julia <julia.chambers@wsp.com>; Davies, Andy <Andy.Davies1@environment-agency.gov.uk>; Ruckledge, John <john.ruckledge@environment-agency.gov.uk>; Hilary Brett-Parr <hilary.brett@fecil.uk>; Jon Suckley <Jon.Suckley@asteerplanning.com>; Brimblecombe, Jack <Jack.Brimblecombe@wsp.com>; Outterside, James <James.Outterside@wsp.com>; Standring, Ian <Ian.Standring@wsp.com>; a.english@maccreanorlavington.com; Blazej Czuba <b.czuba@maccreanorlavington.com>; Ken Thompson <k.thompson@maccreanorlavington.com>; Sara Gallego <s.gallego@maccreanorlavington.com>; Holly Wilkinson <hollywilkinson@hawkinsbrown.com>
Subject: RE: ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)

Hi Anne-Marie,

Thank you for sending through the attached initial comments on outline flood strategy that was put forward. Please see below an update related to the Application 5 flood strategy. This



The standard that we are seeking to achieve for setting of FFL's is for them to be at or above the design flood level plus 300mm of freeboard. We can confirm that there will be no 'more vulnerable' uses below the design flood level plus 300mm. All more vulnerable uses will be at first floor level or above. Safe routes of access are provided to all residential areas. See above flood level Nodes map and attached spreadsheet to show flood level info taken from the WSP modelling and below updated strategy for Application 5 only:

NT02:

- The FFL for plot NT02 is set above the design flood level.
- NT02 design Flood Level is 30.88m (Node 7). The finished floor level (FFL) of NT02 is 31.55m AOD which is more than 300mm above the design flood level and is also above the 1000 yr flood level which is 31.31m AOD. This is in line with previous discussions.
- Flood resistance or resilience measures are therefore not considered to be required for NT02.

NT03:

- The FFL for plot NT03 is set above the design flood level.
- The FFL of NT03 is 32.00m and the design flood Levels for Nodes 7 and 10 are 30.88m and 31.51m respectively- for the purpose of this exercise the worst case flood level at Node 10 has been used. The FFL of NT03 is therefore 490mm above the worst case design flood level and is also above the 1000yr flood level for Node 10 which is 31.84m.
- Flood resistance or resilience measures are therefore not considered to be required for NT03.

NT04:

- The lowest FFL for plot NT04 is shown to be 30.955m – this is associated with the less vulnerable commercial usages along Dantzic Street. The design flood level at Node 10 is 31.51m – this is 555mm above the FFL
- With respect to mitigation for NT04, the proposals are that flood resistance in the form of an impermeable concrete upstand will be provided to 600mm above FFL which is 31.555m, and that resilience measures up to 300mm above this level which is 31.855m. Flood doors or retractable flood barriers will be provided at door thresholds. This is aligned with the approach taken for the neighbouring consented Victoria Riverside development. Please can the EA confirm whether this approach is acceptable for ground floor commercial usages at plot NT04? Note that residential access lobbies are set above the design flood level.
- It will be recommended as a mitigation measure in the FRA that the end user of plot NT04 is to sign up to the EA Automate Flood Warning system and an Emergency Evacuation Plan (EEP) is put in place so that users know the procedure to follow in the event of a flood warning and so that they can evacuate before the onset of a flood or escape to a safe refuge above the flood level if required.
- Safe access and egress for the commercial plots will be provided via a ramped corridor to the rear of the units which emerges along Dalton Street at a level of approximately 31.70m so roughly 200mm above design flood level. A plan to show this route and levels will be provided.

Please note that the flood strategy that i provided you with for your initial review still applies fully to Application 4 but the above is the position for Application 5 and this is consistent with the pre-app discussions between the EA and the wider FEC team. We note your request for a clear distinction in the FRA report between the flood strategies applied to Application 4 and 5 and we will make sure that this is clear in the report but for the avoidance of doubt, the strategy for Application 5 is as set out above (plots NT02 to NT04) and the original strategy submitted and which you have commented on applies to Application 4.

We will forward further information and drawings to illustrate the above approach with greater clarity but think it would be useful to have a Teams call to discuss your initial flood strategy comments in more detail during w/c commencing 13th March. Can you confirm your availability please?

Kind Regards,

Stephen Mostyn
Associate
Development Infrastructure

From: McLaughlin, Anne-marie <Anne-Marie.McLaughlin@environment-agency.gov.uk>
Sent: 02 March 2023 17:34
To: Mostyn, Stephen <Stephen.Mostyn@wsp.com>; john.sherrington@spclimited.co.uk

Cc: Chambers, Julia <julia.chambers@wsp.com>; Davies, Andy <andy.davies1@environment-agency.gov.uk>; Ruckledge, John <john.ruckledge@environment-agency.gov.uk>; Hilary Brett-Parr <hilary.brett@fecil.uk>; Jon Suckley <Jon.Suckley@asteerplanning.com>; Brimblecombe, Jack <Jack.Brimblecombe@wsp.com>; Outterside, James <James.Outterside@wsp.com>; Standring, Ian <Ian.Standring@wsp.com>; a.english@maccreanorlavington.com; Blazej Czuba <b.czuba@maccreanorlavington.com>
Subject: ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)

Hi Stephen,

Please find attached our preliminary commentary of the overview provided of the 'Application 4' and 'Application 5' Flood Risk Mitigation Strategy as outlined in your email dated 14th February 2023.

As previously highlighted, this review is subject to the approval of the EA's acceptance of the 'Application 4' and 'Application 5' flood models, where we understand further flood models are intended to be issued to us by Monday (6th March), and confirmation of detailed plans intended to submitted for each planning submission.

We advise at this time that if it is the intention to produce one FRA / Flood Risk Mitigation Strategy report, a clear distinction is made on the assessment and intended mitigation measures for each individual application. This is to ensure determination of the suitability and acceptability of the assessment / mitigation proposals for each individual planning application is clearly identified / recognised.

Further to the above, our commentary includes advice for your consideration on the forthcoming FRA / Flood Risk Mitigation Strategy where we would welcome discussions and / or further technical review of the full FRA / Flood Risk Mitigation Strategy once the above matters have been addressed.

Should you have any queries and wish to discuss the contents of our response, then please feel free to contact me.

Many thanks,

Anne-Marie

Anne-Marie McLaughlin
Planning Advisor, Green Growth Team & Sustainable Places Team | Greater Manchester, Merseyside, Cheshire
Environment Agency | Richard Fairclough House, Knutsford Road, Latchford, Warrington WA4 1HT
SP Team Email: SPPlanning.RFH@environment-agency.gov.uk
Mobile: **07717344174**
Pronouns: she/her

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Information in this message may be confidential and may be legally privileged. If you have received this message by mistake, please notify the sender immediately, delete it and do not copy it to anyone else. We have checked this email and its attachments for viruses. But you should still check any attachment before opening it. We may have to make this message and any reply to it public if asked to under the Freedom of Information Act, Data Protection Act or for litigation. Email messages and attachments sent to or from any Environment Agency address may also be accessed by someone other than the sender or recipient, for business purposes.

Brimblecombe, Jack

To: Mostyn, Stephen
Subject: RE: ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)

From: Davies, Andy <Andy.Davies1@environment-agency.gov.uk>
Sent: 27 March 2023 11:10
To: Mostyn, Stephen <Stephen.Mostyn@wsp.com>; Ruckledge, John <john.ruckledge@environment-agency.gov.uk>; McLaughlin, Anne-marie <Anne-Marie.McLaughlin@environment-agency.gov.uk>
Cc: Hilary Brett-Parr <hilary.brett@fecil.uk>; Jon Suckley <Jon.Suckley@asteerplanning.com>; Brimblecombe, Jack <Jack.Brimblecombe@wsp.com>; Outterside, James <James.Outterside@wsp.com>; Standring, Ian <Ian.Standring@wsp.com>; a.english@maccreanorlavington.com; Blazej Czuba <b.czuba@maccreanorlavington.com>; Ken Thompson <k.thompson@maccreanorlavington.com>; john.sherrington@spclimited.co.uk; Sara Gallego <s.gallego@maccreanorlavington.com>; Holly Wilkinson <hollywilkinson@hawkinsbrown.com>; Prebble, Nick <nick.prebble@environment-agency.gov.uk>; Timea Nacsa <timea.nacsa@fecil.uk>; Chambers, Julia <julia.chambers@wsp.com>; James Thomson <JamesThomson@hawkinsbrown.com>
Subject: RE: ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)

Hi Stephen,

Many thanks for circulating the summary.

See few amendments in chain below to fully capture EA perspective. However, nothing I believe which alters the 'status-quo' from conversations held last week.

Happy to discuss further if required.

Kind regards,
Andy

Andy Davies
Project Manager, Green Growth Team & Sustainable Places Team | Greater Manchester, Merseyside, Cheshire
Environment Agency | Richard Fairclough House, Knutsford Road, Latchford, Warrington WA4 1HT
SP Team Email: SPPlanning.RFH@environment-agency.gov.uk
Mobile: **0739 379 8325**
Pronouns: he/him/his

From: Mostyn, Stephen <Stephen.Mostyn@wsp.com>
Sent: 24 March 2023 13:05
To: Davies, Andy <Andy.Davies1@environment-agency.gov.uk>; Ruckledge, John <john.ruckledge@environment-agency.gov.uk>; McLaughlin, Anne-marie <Anne-Marie.McLaughlin@environment-agency.gov.uk>
Cc: Hilary Brett-Parr <hilary.brett@fecil.uk>; Jon Suckley <Jon.Suckley@asteerplanning.com>; Brimblecombe, Jack <Jack.Brimblecombe@wsp.com>; Outterside, James <James.Outterside@wsp.com>; Standring, Ian <Ian.Standring@wsp.com>; a.english@maccreanorlavington.com; Blazej Czuba <b.czuba@maccreanorlavington.com>; Ken Thompson <k.thompson@maccreanorlavington.com>; john.sherrington@spclimited.co.uk; Sara Gallego <s.gallego@maccreanorlavington.com>; Holly Wilkinson

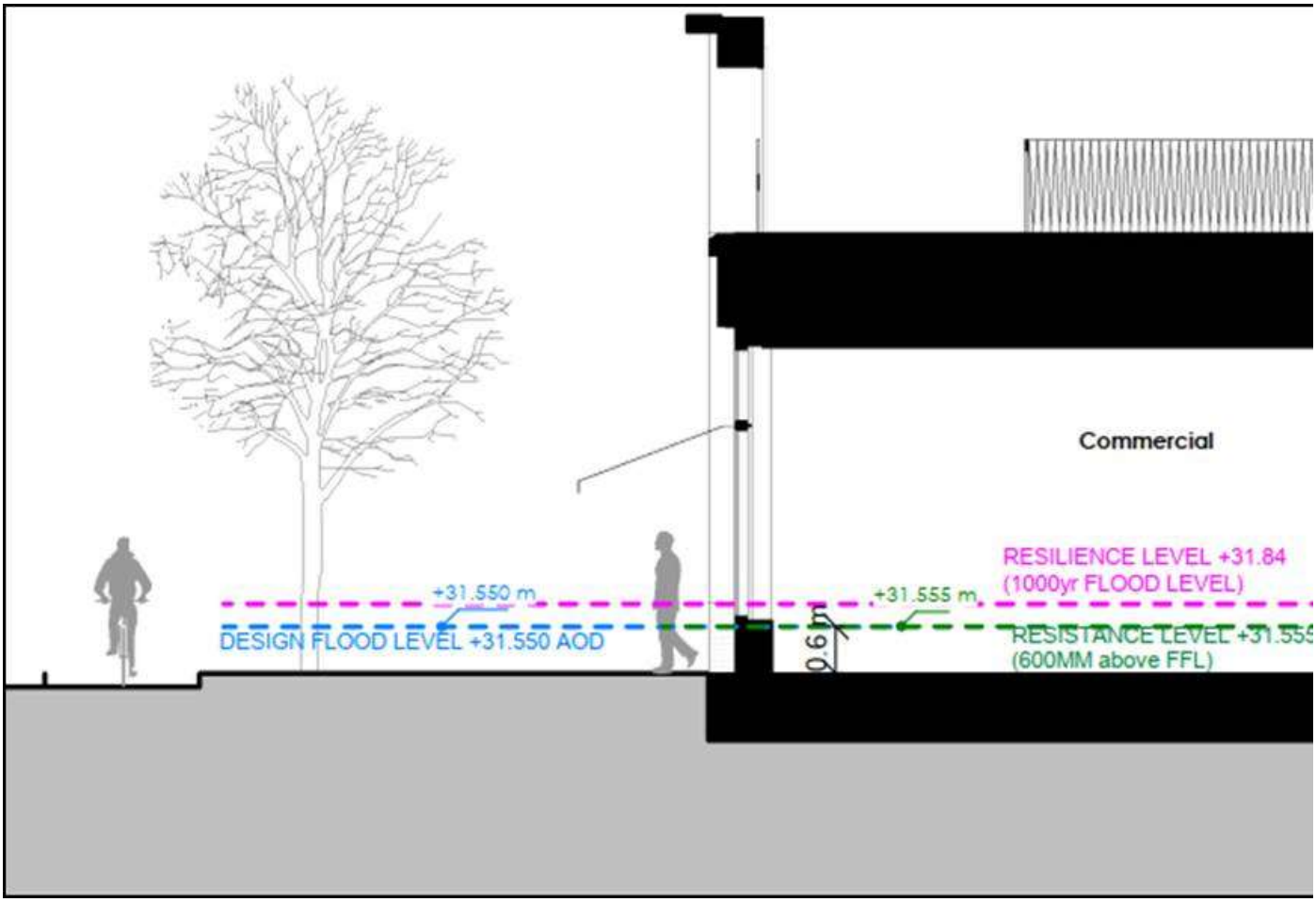
<hollywilkinson@hawkinsbrown.com>; Prebble, Nick <Nick.Prebble@environment-agency.gov.uk>; Timea Nacsa <timea.nacsa@fecil.uk>; Chambers, Julia <julia.chambers@wsp.com>; James Thomson <JamesThomson@hawkinsbrown.com>
Subject: RE: ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)

Andy,

Following on from yesterday's call, here is a record of main points discussed and agreed with respect to flood risk assessment.

- **Omission of freeboard:** The EA have reviewed the justification provided by masterplan architect and are comfortable with the approach taken to the omission of freeboard where necessary given the constraints. The EA advises that the architectural design detail/justification for this approach will need to be provided as part of the associated FRA (evidence base/narrative). However, the EA would also advocate/welcome, where possible, potential at the detailed design stage for consideration to be given as to whether FFLS can be raised further i.e. above the 'design flood event' .

- **Flood Resistance / Resilience:** The EA confirmed that flood resistance / resilience measures are required up to 600mm above the design flood level but indicated that the FRA should leave a degree of flexibility for the level at which resistance should be included up to and the level which resilience should be included up to, reflective of the fact that detail design of the development/plots currently remains undetermined/unknown to the EA. This can then be agreed on a plot by plot basis as each plot is brought forward for development taking into account the 1000-year flood level.
- **Emergency Plan:** The FRA will include details on flood levels, flood mitigation measures and safe access and egress routes including flood hazard mapping and recommends that the end user of the site subscribes to the EA Automated Flood Warning System and that a detailed Emergency Plan is produced. The FRA will set out the parameters / requirements for a detailed Emergency Plan but the key information listed above is included in the FRA. We understand that the EA accept this approach for planning.
- **Application 5 (NT04):** See section below. The FFL of commercial units along Dantzic Street will be set below the design flood level. Flood resistance will be provided to 600mm above FFL. Flood resilience will be provided up to the 1000-year flood level. Demountable flood barriers or similar will be provided at door thresholds. Safe egress will be provided to land above the design flood level. We understand that this approach is acceptable to the EA. – In association with this, it understood that 'dry' safe/access can be provided from all development plots.
- **Application 5 (NT03):** Commercial unit in NT03 with FFL of 31.72m AOD should have flood resilience measures up to a minimum of the 1000-year flood level which is 31.84m AOD



Please let us know if you have any comments on the summary above or would like to discuss any of the items in further detail.

Kind Regards,

Stephen Mostyn
Associate
Development Infrastructure

From: Mostyn, Stephen
Sent: 23 March 2023 10:01
To: Davies, Andy <Andy.Davies1@environment-agency.gov.uk>; McLaughlin, Anne-marie <Anne-Marie.McLaughlin@environment-agency.gov.uk>; Chambers, Julia <julia.chambers@wsp.com>
Cc: Ruckledge, John <john.ruckledge@environment-agency.gov.uk>; Hilary Brett-Parr <hilary.brett@fecil.uk>; Jon Suckley <Jon.Suckley@asteerplanning.com>; Brimblecombe, Jack <Jack.Brimblecombe@wsp.com>; Outterside, James <James.Outterside@wsp.com>; Standring, Ian <Ian.Standring@wsp.com>; a.english@maccreanorlavington.com; Blazej Czuba <b.czuba@maccreanorlavington.com>; Ken Thompson <k.thompson@maccreanorlavington.com>; john.sherrington@spclimited.co.uk; Sara Gallego <s.gallego@maccreanorlavington.com>; Holly Wilkinson <hollywilkinson@hawkinsbrown.com>; Prebble, Nick <nick.prebble@environment-agency.gov.uk>
Subject: RE: ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)

Hi Andy,

Apologies I've not been able to send the below earlier but here are the key agenda items for today's meeting from a Flood Risk Assessment perspective:

'we advise that further explanation is needed as to why the minimum 300mm freeboard is not appropriate / needed. We understand all residential accommodation will be from the 1st floor level and above but 'less vulnerable' uses at ground floor level should still be afforded some freeboard allowance.'

Please see below justification provided by the masterplan architect for your review and consideration:

General approach
The project aims to deliver a rich mix of commercial and community uses, particularly so around RB06, Rb07, RB10, RB16 and RB17, as these plots directly adjoin the River Irk and are the nearest to Central Manchester. Most of these plots were identified in the Victoria North Strategic Regeneration Framework (SRF) as mixed-use. The plots are envisaged to sit among high-quality public realm and it is critical to the success of the project that the uses within the buildings have a direct relationship with the surrounding public realm. They ground floor uses will be required to be accessible and active, therefore should be at a similar level to those of the adjoining public realm.

RB06 and RB07
The existing levels around these two plots along the River edge and Roger Street are approximately +30.0 AOD. The Union Waterfront needs to remains at +30.0 AOD to provide sufficient flood storage. The design flood level on both the plots is +31.2, therefore approximately 1.2 metres above the existing public realm. Setting FFL at flood level would lead to a 1.2 metre difference between public realm and building ground floor, which careful design could incorporate without detrimental impact on active ground floors. A 300mm freeboard would lead to a 1.5 metre difference in levels, which would have detrimental impact on the quality of the scheme.

RB10
The existing levels around the plots are approximately +29.0 AOD. The public realm around the plot cannot be raised above the flood level as it provides flood storage as well as access to existing Network Rail and other arch uses. The flood level is approximately +30.35, therefore approximately 1.35 metres above the public realm. The illustrative masterplan suggests an outdoor covered market use and residential ancillary use such as bin storage or cycle storage sitting underneath an elevated building. Only the residential lobby and the residential core of the building are proposed to be raised above the flood level. A 1.35 metre difference between public realm and the FFL would at least maintain visual connectivity between the two. A 300mm freeboard would lead to an approximate 1.65 metre difference in levels, which would substantially affect the design quality and legibility of a building entrance and prevent visual surveyance from the building to the public realm.

RB16/17
Dantzic Street is seen as a new high street destination for the Masterplan, with a generous provision of ground and potentially first floor commercial and community uses. Active frontage is not sought to Travis Island Wetlands as substantial level difference will be required to maximise flood storage within them. The existing levels around these two plots along Dantzic Street are approximately +31.0 to +31.5 AOD. The flood level is approximately +31.36 AOD and +31.66 with a 300mm freeboard. As such, there may be instances where freeboard may be achieved for some or the majority of the plots, subject to detailed public realm and building design. However, we would seek flexibility at this stage to ensure that quality active frontages can be achieved along this key high street location.

NT02 – NT04 General approach
The project aims to deliver a rich mix of commercial and community uses, with a focus on the frontages of NT02-04 on Dantzic Street. Most of these plots were identified in the Victoria North Strategic Regeneration Framework (SRF) as mixed-use. The plots are envisaged to sit among high-quality public realm, and it is critical to the success of the project that the uses within the buildings have a direct relationship with the surrounding public realm. They ground floor uses will be required to be accessible and active, therefore should be at a similar level to those of the adjoining public realm.

NT04
Dantzic Street is seen as a new high street destination for the Masterplan, with a generous provision of ground floor commercial and community uses. NT04 completes this high street at the eastern end. The existing levels to the frontage onto Dantzic Street are approximately 30.5m+ AOD to 31.0m+ AOD. It is proposed to adjust the levels in the public realm at the back of pavement to the proposed FFL level of the commercial units at 30.955m+AOD consistently along the frontage to facilitate level access.

The design flood level for NT04 is 31.55+ AOD, which is 595mm above the proposed FFL. It is proposed to

provide flood resistance measures to the façade up to 600mm above the proposed FFL (i.e. up to 31.555m+ AOD) in order to mitigate any potential flooding whilst maintaining level access into the active uses.

'We welcome the inclusion of flood resistance (water exclusion) / resilience (water ingress) measures to be provided at a minimum 600mm above 'flood levels'. We advise such measures are designed to consider the 0.1% AEP to ensure mitigation for residual flood risk is implemented.'

Agreement of the level that flood resistance should be provided up to and agreement of the level that flood resilience should be provided up to.

'The FRA must show how users of the development will remain safe. Therefore, safe access / egress routes must be identified and linked to flood warning and evacuation plans where necessary.'

The FRA will recommend emergency evacuation plans are put in place and the requirement for flood warnings. Confirmation required that the provision of emergency evacuation plans will be conditioned as a pre occupation requirement.

Apart from the above, the outstanding items to discuss were the approach being taken for Application 5, and in particular plot NT04. FFL is below design flood level - what level should flood resistant construction be provided. Current approach is aligned with that of Victoria Riverside (flood resistance to 600mm above FFL).

NT03 lowest FFL is actually 31.72m AOD (commercial). Where FFL's of NT03 are not 300mm above design flood level should same approach be taken as agreed for Application 4 ?

From: Davies, Andy <Andy.Davies1@environment-agency.gov.uk>
Sent: 13 March 2023 13:50
To: Mostyn, Stephen <Stephen.Mostyn@wsp.com>; McLaughlin, Anne-marie <Anne-Marie.McLaughlin@environment-agency.gov.uk>; Chambers, Julia <julia.chambers@wsp.com>
Cc: Ruckledge, John <john.ruckledge@environment-agency.gov.uk>; Hilary Brett-Parr <hilary.brett@fecil.uk>; Jon Suckley <Jon.Suckley@asteerplanning.com>; Brimblecombe, Jack <Jack.Brimblecombe@wsp.com>; Outterside, James <James.Outterside@wsp.com>; Standring, Ian <Ian.Standring@wsp.com>; a.english@maccreanorlavington.com; Blazej Czuba <b.czuba@maccreanorlavington.com>; Ken Thompson <k.thompson@maccreanorlavington.com>; john.sherrington@spclimited.co.uk; Sara Gallego <s.gallego@maccreanorlavington.com>; Holly Wilkinson <hollywilkinson@hawkinsbrown.com>; Prebble, Nick <nick.prebble@environment-agency.gov.uk>
Subject: RE: ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)

Afternoon Stephen,

Many thanks for your email below – I've just tried to give you a call to discuss this. However, both my calls to your mob and office phone went through to voicemail.

More than happy to discuss matters over the phone if easier. However, cognisant to current internal resource pressures please would it be possible for you to outline exactly you / WSP would like to achieve via a meeting this week? I.e. the key agenda items.

As context to this ask…

Noting your email in chain primarily to matters associated with Application 5, please see attached email which advises the wider FEC/VN project team that we (the EA) are still awaiting the submission of an updated iteration of 'Application 5' flood model and in association with this detailed plans (*preferentially those which will be sought for planning approval*) enabling confirmation/confidence that the flood model submitted to the EA is an accurate representation of the intended development and, in turn, any assessment of development flood risk derived from this is appropriate.

As per our recent written correspondence / letter (SO/2023/122923/01-L01) relating primarily to assessment of flood intervention principles for 'Application 4', until we are able to gain confirmation that flood modelling presented is an accurate/representation of intended end-development design, in turn, we will be unable to confidently conclude/advise as to whether planned flood resistance/resilience proposals are appropriate due to the potential for variations to flood risk and it's management to still occur e.g. an uplift in design flood level as a result of intervention on Dantzic Street. However, that said, echoing our recent correspondence/letter, the general principles intended to employed for determining how development plot fluvial flood risk is to managed as part of 'Application 5' appear to be sound from our current understanding of the likely level of risk /fluvial flood impact the 'Application 5' development could experience within an 1:100 + CC% /Design Flood event. My only additional remark to this would be that whereby FFL are to be below the 1:1000 year event (*potentially only Plot NT04 based on the node data you present),* consideration/narrative is provided (within the forthcoming FRA) as to how this residual risk can be appropriately managed.

@Chambers, Julia – I note from Stephen's email below the reference to an impermeable concrete upstand offering protection to the NT04 development plot which I would presume based on prior reviewed modelling outputs / understanding of general fluvial flood risk for the area is situated on/in immediate proximity to Dantzic Street . Design elements such as, with the potential to alter local floodwater levels /floodwater distribution are the type of details we are seeking to understand further as part of efforts to determine flood model appropriateness. Please can it be ensured that details on the impermeable concrete upstand are provided as part of forthcoming updated 'Application 5' / flood model review submissions.

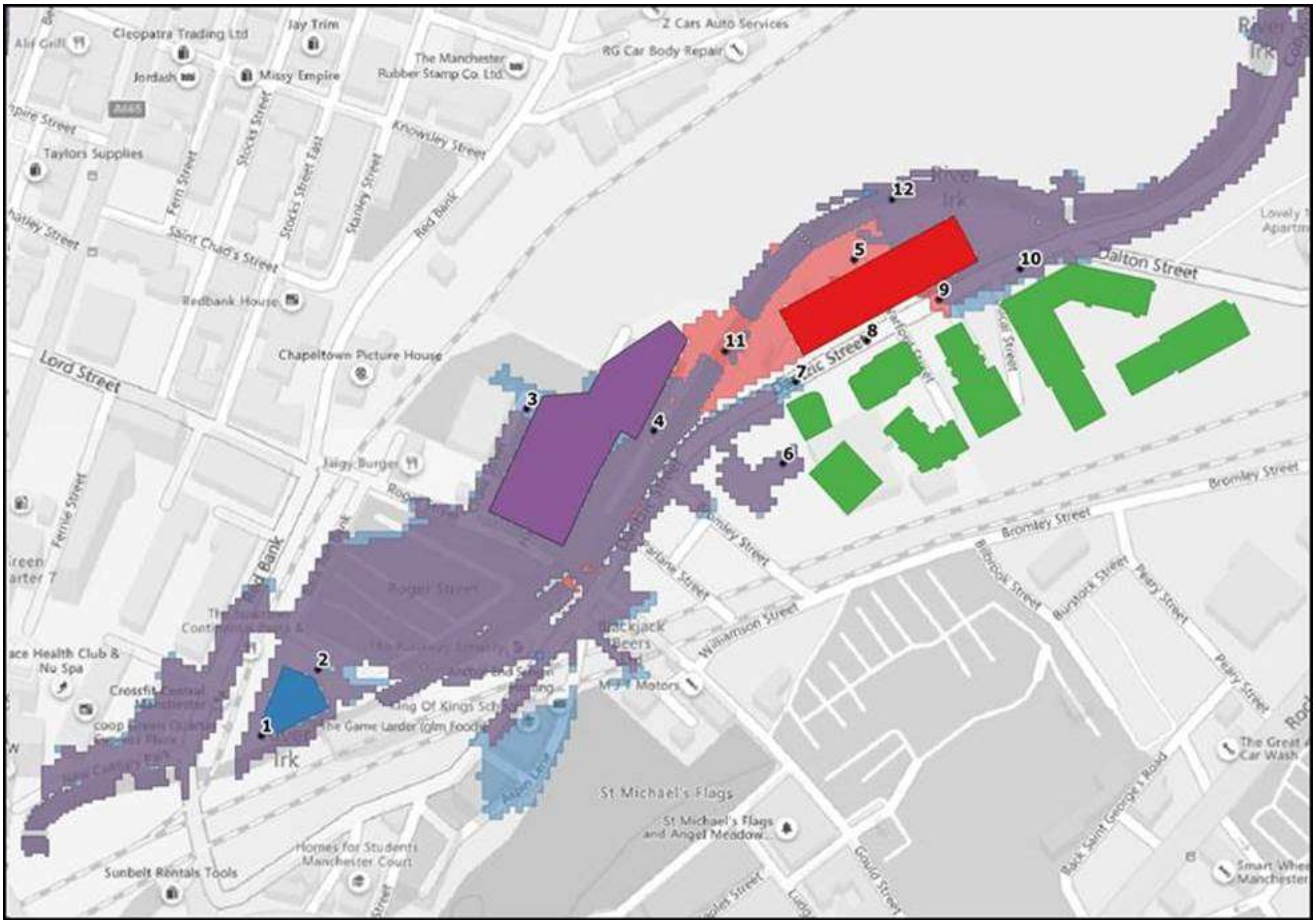
Happy to discuss any of the above further as required.

Kind regards
Andy

From: Mostyn, Stephen <Stephen.Mostyn@wsp.com>
Sent: 10 March 2023 19:23
To: McLaughlin, Anne-marie <Anne-Marie.McLaughlin@environment-agency.gov.uk>; john.sherrington@spclimited.co.uk
Cc: Chambers, Julia <julia.chambers@wsp.com>; Davies, Andy <Andy.Davies1@environment-agency.gov.uk>; Ruckledge, John <john.ruckledge@environment-agency.gov.uk>; Hilary Brett-Parr <hilary.brett@fecil.uk>; Jon Suckley <Jon.Suckley@asteerplanning.com>; Brimblecombe, Jack <Jack.Brimblecombe@wsp.com>; Outterside, James <James.Outterside@wsp.com>; Standring, Ian <Ian.Standring@wsp.com>; a.english@maccreanorlavington.com; Blazej Czuba <b.czuba@maccreanorlavington.com>; Ken Thompson <k.thompson@maccreanorlavington.com>; Sara Gallego <s.gallego@maccreanorlavington.com>; Holly Wilkinson <hollywilkinson@hawkinsbrown.com>
Subject: RE: ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)

Hi Anne-Marie,

Thank you for sending through the attached initial comments on outline flood strategy that was put forward. Please see below an update related to the Application 5 flood strategy. This



The standard that we are seeking to achieve for setting of FFL's is for them to be at or above the design flood level plus 300mm of freeboard. We can confirm that there will be no 'more vulnerable' uses below the design flood level plus 300mm. All more vulnerable uses will be at first floor level or above. Safe routes of access are provided to all residential areas. See above flood level Nodes map and attached spreadsheet to show flood level info taken from the WSP modelling and below updated strategy for Application 5 only:

NT02:

- The FFL for plot NT02 is set above the design flood level.
- NT02 design Flood Level is 30.88m (Node 7). The finished floor level (FFL) of NT02 is 31.55m AOD which is more than 300mm above the design flood level and is also above the 1000 yr flood level which is 31.31m AOD. This is in line with previous discussions.
- Flood resistance or resilience measures are therefore not considered to be required for NT02.

NT03:

- The FFL for plot NT03 is set above the design flood level.
- The FFL of NT03 is 32.00m and the design flood Levels for Nodes 7 and 10 are 30.88m and 31.51m respectively- for the purpose of this exercise the worst case flood level at Node 10 has been used. The FFL of NT03 is therefore 490mm above the worst case design flood level and is also above the 1000yr flood level for Node 10 which is 31.84m.
- Flood resistance or resilience measures are therefore not considered to be required for NT03.

NT04:

- The lowest FFL for plot NT04 is shown to be 30.955m – this is associated with the less vulnerable commercial usages along Dantzic Street. The design flood level at Node 10 is 31.51m – this is 555mm above the FFL

- With respect to mitigation for NT04, the proposals are that flood resistance in the form of an impermeable concrete upstand will be provided to 600mm above FFL which is 31.555m, and that resilience measures up to 300mm above this level which is 31.855m. Flood doors or retractable flood barriers will be provided at door thresholds. This is aligned with the approach taken for the neighbouring consented Victoria Riverside development. Please can the EA confirm whether this approach is acceptable for ground floor commercial usages at plot NT04? Note that residential access lobbies are set above the design flood level.
- It will be recommended as a mitigation measure in the FRA that the end user of plot NT04 is to sign up to the EA Automate Flood Warning system and an Emergency Evacuation Plan (EEP) is put in place so that users know the procedure to follow in the event of a flood warning and so that they can evacuate before the onset of a flood or escape to a safe refuge above the flood level if required.
- Safe access and egress for the commercial plots will be provided via a ramped corridor to the rear of the units which emerges along Dalton Street at a level of approximately 31.70m so roughly 200mm above design flood level. A plan to show this route and levels will be provided.

Please note that the flood strategy that i provided you with for your initial review still applies fully to Application 4 but the above is the position for Application 5 and this is consistent with the pre-app discussions between the EA and the wider FEC team. We note your request for a clear distinction in the FRA report between the flood strategies applied to Application 4 and 5 and we will make sure that this is clear in the report but for the avoidance of doubt, the strategy for Application 5 is as set out above (plots NT02 to NT04) and the original strategy submitted and which you have commented on applies to Application 4.

We will forward further information and drawings to illustrate the above approach with greater clarity but think it would be useful to have a Teams call to discuss your initial flood strategy comments in more detail during w/c commencing 13th March. Can you confirm your availability please?

Kind Regards,

Stephen Mostyn
Associate
Development Infrastructure

From: McLaughlin, Anne-marie <Anne-Marie.McLaughlin@environment-agency.gov.uk>
Sent: 02 March 2023 17:34
To: Mostyn, Stephen <Stephen.Mostyn@wsp.com>; john.sherrington@spclimited.co.uk
Cc: Chambers, Julia <julia.chambers@wsp.com>; Davies, Andy <andy.davies1@environment-agency.gov.uk>; Ruckledge, John <john.ruckledge@environment-agency.gov.uk>; Hilary Brett-Parr <hilary.brett@fecil.uk>; Jon Suckley <Jon.Suckley@asteerplanning.com>; Brimblecombe, Jack <Jack.Brimblecombe@wsp.com>; Outterside, James <James.Outterside@wsp.com>; Standring, Ian <Ian.Standring@wsp.com>; a.english@maccreanorlavington.com; Blazej Czuba <b.czuba@maccreanorlavington.com>
Subject: ENVPAC/1/GMC/00443 - EA Review of Flood Risk Mitigation Strategy (Email dated 14th February 2023)

Hi Stephen,

Please find attached our preliminary commentary of the overview provided of the 'Application 4' and 'Application 5' Flood Risk Mitigation Strategy as outlined in your email dated 14th February 2023.

As previously highlighted, this review is subject to the approval of the EA's acceptance of the 'Application 4' and 'Application 5' flood models, where we understand further flood models are intended to be issued to us by Monday (6th March), and confirmation of detailed plans intended to submitted for each planning submission.

We advise at this time that if it is the intention to produce one FRA / Flood Risk Mitigation Strategy report, a clear distinction is made on the assessment and intended mitigation measures for each individual application. This is to ensure determination of the suitability and acceptability of the assessment / mitigation proposals for each individual planning application is clearly identified / recognised.

Further to the above, our commentary includes advice for your consideration on the forthcoming FRA / Flood Risk Mitigation Strategy where we would welcome discussions and / or further technical review of the full FRA / Flood Risk Mitigation Strategy once the above matters have been addressed.

Should you have any queries and wish to discuss the contents of our response, then please feel free to contact me.

Many thanks,

Anne-Marie

Anne-Marie McLaughlin
Planning Advisor, Green Growth Team & Sustainable Places Team | Greater Manchester, Merseyside, Cheshire
Environment Agency | Richard Fairclough House, Knutsford Road, Latchford, Warrington WA4 1HT
SP Team Email: SPPlanning.RFH@environment-agency.gov.uk
Mobile: **07717344174**
Pronouns: she/her

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Information in this message may be confidential and may be legally privileged. If you have received this message by mistake, please notify the sender immediately, delete it and do not copy it to anyone else. We have checked this email and its attachments for viruses. But you should still check any attachment before opening it. We may have to make this message and any reply to it public if asked to under the Freedom of Information Act, Data Protection Act or for litigation. Email messages and attachments sent to or from any Environment Agency address may also be accessed by someone other than the sender or recipient, for business purposes.

MEETING NOTES

PROJECT NUMBER	70079268	**MEETING DATE**	09 February 2023
PROJECT NAME	Manchester Victoria North – Redbank Area	**VENUE**	Microsoft Teams
CLIENT	Far East Consortium	**RECORDED BY**	JEB
MEETING SUBJECT	Wastewater Proposals Update		

PRESENT	Jack Brimblecombe, Stephen Mostyn, Julia Chambers (WSP); John Sherrington (FEC); Graham Price (MCC)
APOLOGIES	David Smith, Laura Peacock (MCC)
DISTRIBUTION	As above

ITEM	SUBJECT	ACTION	DUE
1	**Overview – Structure of Applications & proposals**		
1.1	An overview of the structure of the two planning applications (4 and 5) was provided to GP and the position of Dantzic Street within them. It was advised that Dantzic Street will form part of both applications.		
1.2	SM explained the proposed Dantzic Street drainage strategy. A new adoptable surface water carrier drain will take connections from the proposed plots and public realm associated with Application 5 plus draining the newly widened portion of Dantzic Street. The carrier drain will then discharge into the River Irk.		
1.3	GP advised that the MCC LLFA flood risk team have not yet seen the proposals due to the planning conditions having not yet been discharged.		
2	**Highway gullies along Dantzic Street**		
2.1	At present, it is proposed that the existing highway gullies on Dantzic Street will continue to discharge to the existing combined sewer as they do currently.		
2.2	It was advised that if the gullies on Dantzic Street are to connect into the carrier drain this would result in untreated runoff being discharged into the River Irk. Environment Agency would need to be approached with regards to discharging untreated highway runoff to the river.		
2.3	GP is concerned with the highway gullies and their connections being altered as these are ultimately MCC highways' maintenance responsibility.		
3	**Dantzic Street SuDS Proposals**		
3.1	There is currently no attenuation proposed for Dantzic Street.	FEC	

3.2	Rain gardens have been suggested for Dantzic Street. These rain gardens will run parallel to the carriageway in dedicated SuDS zones. GP advised that rain gardens are adoptable by MCC but they attract commuted sums for future maintenance.		
3.3	GP suggested obtaining the list of adoptable features from MMC Flood Risk team. Advised that Richard Thomas is best to reach out to.	WSP	
3.4	GP enquired about pollution controls e.g. in case of a fuel spill. WSP advised that consideration will be given to pollution mitigation once conversations with UU have been bottomed out.		
4	**Other Related Items**		
4.1	SM enquired about standard details from MCC for SuDS/Attenuation features. GP suggested touching base with Laura Peacock at MCC who has developed a document including these details.	WSP	
4.2	GP advised that conversations with Laura Peacock at MCC Flood Risk for further discussion on the drainage proposals.		
5	**Any Other Business**		

Brimblecombe, Jack

From: Jon Suckley <Jon.Suckley@asteerplanning.com>
Sent: 13 January 2022 18:42
To: Jon Suckley
Subject: Fwd: 132252/VO/2021
Attachments: image001.png; image002.png; image003.png; image004.png; Red Bank Data Screen Report.pdf; Red Bank Data Screen.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

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Asteer Planning LLP Legal Disclaimer

Begin forwarded message:

> **From:** "Lucas, Neil (Avison Young - UK)" <Neil.Lucas@avisonyoung.com>
> **Date:** 12 January 2022 at 11:31:26 GMT
> **To:** Jon Suckley <Jon.Suckley@asteerplanning.com>
> **Cc:** "Harvey, Ed (Avison Young - UK)" <Ed.Harvey@avisonyoung.com>
> **Subject: 132252/VO/2021**
>
> Jon – FYI
> Happy to pick up when we speak.
> Neil
>
> **Neil Lucas**
> Director

Mobile +44 07734862006
neil.lucas@avisonyoung.com | avisonyoung.com

From: Jennifer Atkinson <jennifer.atkinson@manchester.gov.uk>
Sent: 12 January 2022 11:16
To: Adam Lockett <Adam.Lockett@manchester.gov.uk>; Ian Slater <ian.slater@manchester.gov.uk>; Lucas, Neil (Avison Young - UK) <Neil.Lucas@avisonyoung.com>
Subject: Fw: 132252/VO/2021

CAUTION: External Sender

All
Please see below from the flood risk management team about the culvert investigation. May I suggest that this is coordinated with FEC so there is no duplication of work.
Thanks Jen

Jennifer Atkinson
Principal Planner
Development Management North
Planning Building Control and Licensing - Growth and Development
Manchester City Council
Tel: 0161 234 4517
Email: jennifer.atkinson@manchester.gov.uk
www.manchester.gov.uk
Location address: Manchester City Council Town Hall Extension Lloyd Street Manchester M2 5DB.
Postal Address: Manchester City Council P.O. Box 532 Town Hall Manchester M60 2LA

From: Flood Risk Management <floodriskmanagement@manchester.gov.uk>
Sent: 12 January 2022 10:54
To: Jennifer Atkinson <jennifer.atkinson@manchester.gov.uk>
Subject: 132252/VO/2021

Jen
Please could you let the MCC PM know we've had 2 consultants asking about the culvert for temp & perm schemes. Not for us to say how this is managed but they might want to consider a more integrated approach. Probably won't be cheap to investigate.
Kind Regards,
Laura

From: Flood Risk Management <floodriskmanagement@manchester.gov.uk>
Sent: 12 January 2022 10:36
To: Matthew Willis <MWillis@pellfrischmann.com>
Subject: RE: Victoria North

Good morning Matthew,
Thank you for your enquiry.
Please find attached Data Screen we previously sent to Arup who are working on the permanent scheme.
The indicative culvert is shown as a dashed purple line. The asset has not been verified by modern survey.
The inlet to the culvert is indicated to the north of the site.
The 1984 survey extract recorded a 600dia outfall into the main river near MCC's GIS indicative culvert.
This is all the data we hold on the indicative asset.
Should you wish to discuss the data or planning Conditions further, please do not hesitate to contact us.
Kind Regards,
Laura

From: Matthew Willis <MWillis@pellfrischmann.com>
Sent: 11 January 2022 11:22
To: Flood Risk Management <floodriskmanagement@manchester.gov.uk>
Subject: Victoria North

Good Afternoon,
I am working for MCC on the Victoria North project, PF are the appointed technical advisors. The attached planning approval references condition 17 and highlights the Cheetham Hill Junction culverted ordinary watercourse, are you able to provide any information you have on this?

Thanks,

Matthew Willis MEng GMICE MAPM
Senior Engineer
Piccadilly House T: 0161 826 9400
49 Piccadilly D: 0161 826 9403
Manchester,M1 2AP M:07514048149

www.pellfrischmann.com

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Lead Local Flood Authority
Highways Service
Growth and Neighbourhoods Directorate
Manchester City Council
PO Box 532
Town Hall
Manchester
M60 2LA
Email: floodriskmanagement@manchester.gov.uk

DATE 04/11/2022

Dear Sir or Madam,

RE: Our Ref: MCC004/11/2022

We acknowledge with thanks your payment received on 20/10/2022 for our LLFA data screen service.

Please find enclosed plan showing the results of the data screen. The position of features shown on this plan is approximate only and is given in accordance with the best information currently available.

The enclosed plan cannot be used to substitute a competent site investigation.

The enclosed plan is being provided to you subject to Manchester City Council's terms and conditions which are shown attached.

I trust the above meets your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter, please do not hesitate to contact us.

Yours Faithfully,

Neil Bayliss-Rowe, Highways Development Control & Flood Risk Manager, Lead Local Flood Authority

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TERMS AND CONDITIONS – LLFA DATA SCREEN

These provisions apply to LLFA data supplied by Manchester City Council ("MCC").

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- This data Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- MCC has taken all reasonable care to compile this data Map. This data Map and any information supplied with it is provided for general guidance only and MCC makes no representation, undertaking or warranty of any kind as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position of any culverted assets shown on the data Map are approximate only. MCC strongly recommends that a comprehensive site investigation is undertaken in addition to reviewing this data Map to determine and ensure the precise location of any assets. The exact location, positions and depths should be obtained by an appropriate survey which may include but shall not be limited to GPR and CCTV.
- The data screened may be modified over time without notice and therefore this data Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the data Map have been made subsequent to issue and prior to any works being carried out.
- This data Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) or for the purpose of determining the suitability of a point of connection to discharge.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising from damages of any kind caused to assets by reason of the actual position and/or existence of assets being different from those shown on the data Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent MCC from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

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DATA SCREEN SYMBOLOGY

Bridge

- Good
- Fair
- Poor
- Very Poor
- Unknown

Trash Screen

- Good
- Fair
- Poor
- Very Poor
- Unknown

Culvert Orifice

- Very Good
- Good
- Fair
- Poor
- Very Poor
- Unknown

Culvert Conduit

- CCTV surveyed
- Not CCTV surveyed
- Ordinary Watercourse Conduit
- MCC SuDS
- MCC Flood Incident Points
- MCC Section 19 Report
- MCC Flood Incident Polygons
- MCC Local Authority Boundary

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Supplementary Information where available:

Critical Drainage Area – The Site is within the Conurbation Core CDA.

Flood Incidents –

MCC Flood Incident Polygon:

- At the Site's southern boundary, New Century Park, flooding of underground car park from combined sewer, dated September 2016.

MCC Flood Incident Points (within close proximity to the site):

-All points along Red Bank are from 'loose/rattling gulley/manhole cover' or blocked gullies dated between 2012-2021.

-All points on Roger Street are from blocked gullies, the more Western points are dated 2021 and the Eastern point is dated 2012.

-Points on Crabbe Street are from blocked gullies dated 2019 and 2021.

-Points near bridge (near Roger Street), highlighted as footpath flooding due to not having suitable drainage, dated 2011.

-Majority of points along Dantzic Street highlighted are from blocked gullies, all dated between 2019-2021. The two points furthest North along Dantzic Street are from a 'missing gully cover' dated March 2021 and 'loose/rattling gully/manhole cover' dated 2021.

-Points along Warford Street are highlighted as 'blocked gullies' dated 2020.

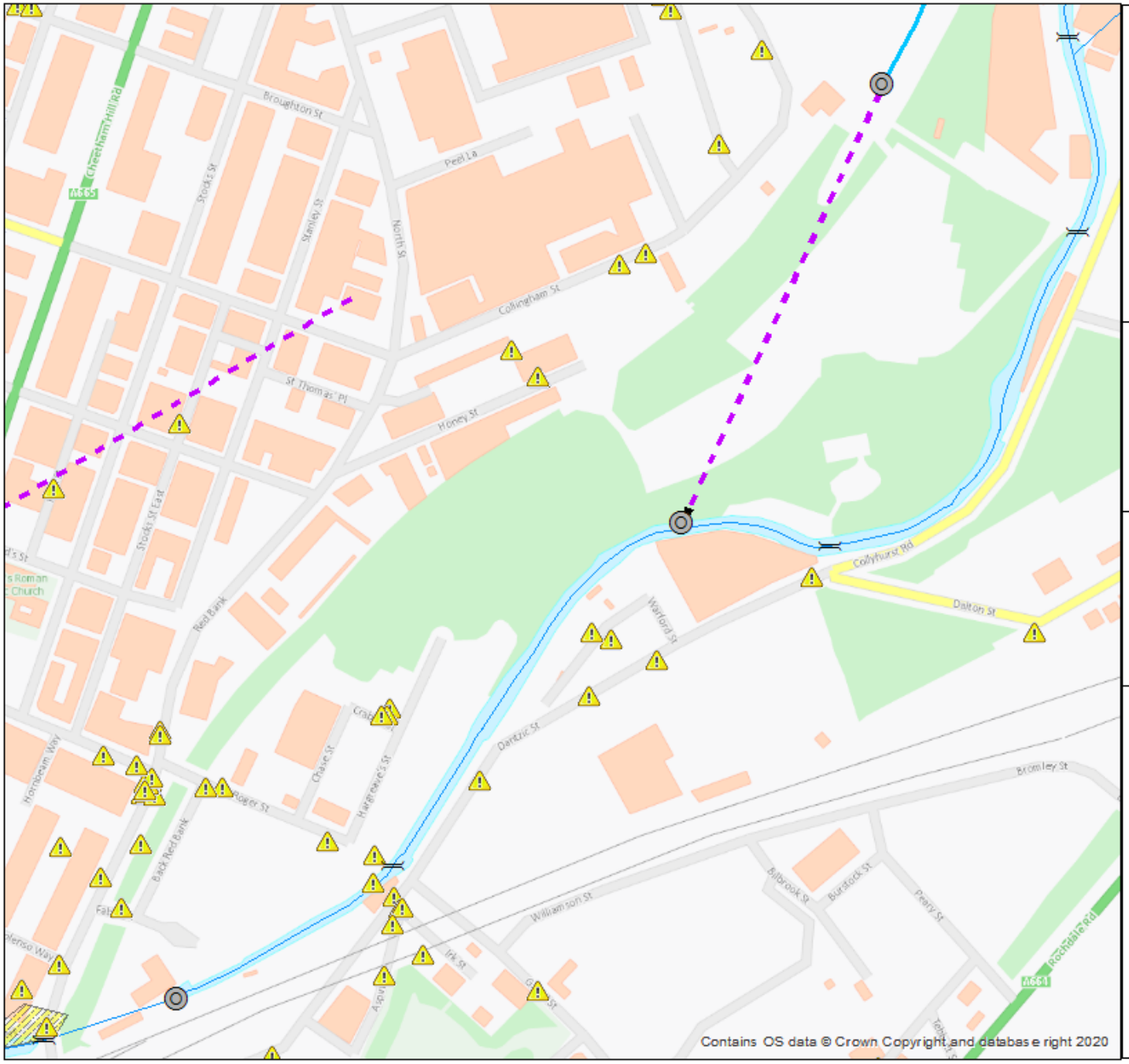
All points shown on Honey Street and Collingham Street are highlighted as 'blocked gullies' dated between 2012–2020.

Culvert Conduits – A culverted ordinary watercourse, the "Cheetham Hill Junction Drain", is indicated to cross the Site. The location of this asset is indicative only and no updates have been made to our asset register while investigations on the asset are ongoing. Requirements for this asset have been included in Conditions applied under 133143/VO/2022 and 132252/VO/2021. The asset is currently being investigated by the applicant under these Planning Applications. It is recommended that any further Planning proposals for this Site consider the requirements and outcomes of the above ongoing planning applications.

Survey and Design Archive – Extract from the 1984 survey of major drainage is included. The indicative culverted watercourse asset is not recorded in the 1984 survey.

Any other information - The Site would also benefit from an assessment of surface water flood risk, main rivers & associated assets, fluvial flood risk, historic events & flood warning areas. We recommend the applicant screens appropriate EA datasets during their investigation and considers whether direct consultation with the Environment Agency or other stakeholders is required.

The Site would benefit from consideration of all drainage/flood matters under Planning Applications 133143/VO/2022 and 132252/VO/2021.



MANCHESTER CITY COUNCIL

LLFA DATA SCREEN

Address/Site Ref:
RED BANK AND DANTZIC STREET

Our Ref: **MCC004/11/2022**

Author: Manchester City Council LLFA
Date: 04/11/2022
Scale: 1:3,512

The position of features shown on this plan is approximate only and is given in accordance with the best information currently available. Manchester City Council will not accept liability for any loss or damage caused by the actual position being different from those shown.

N

0 25 50 100 Meters

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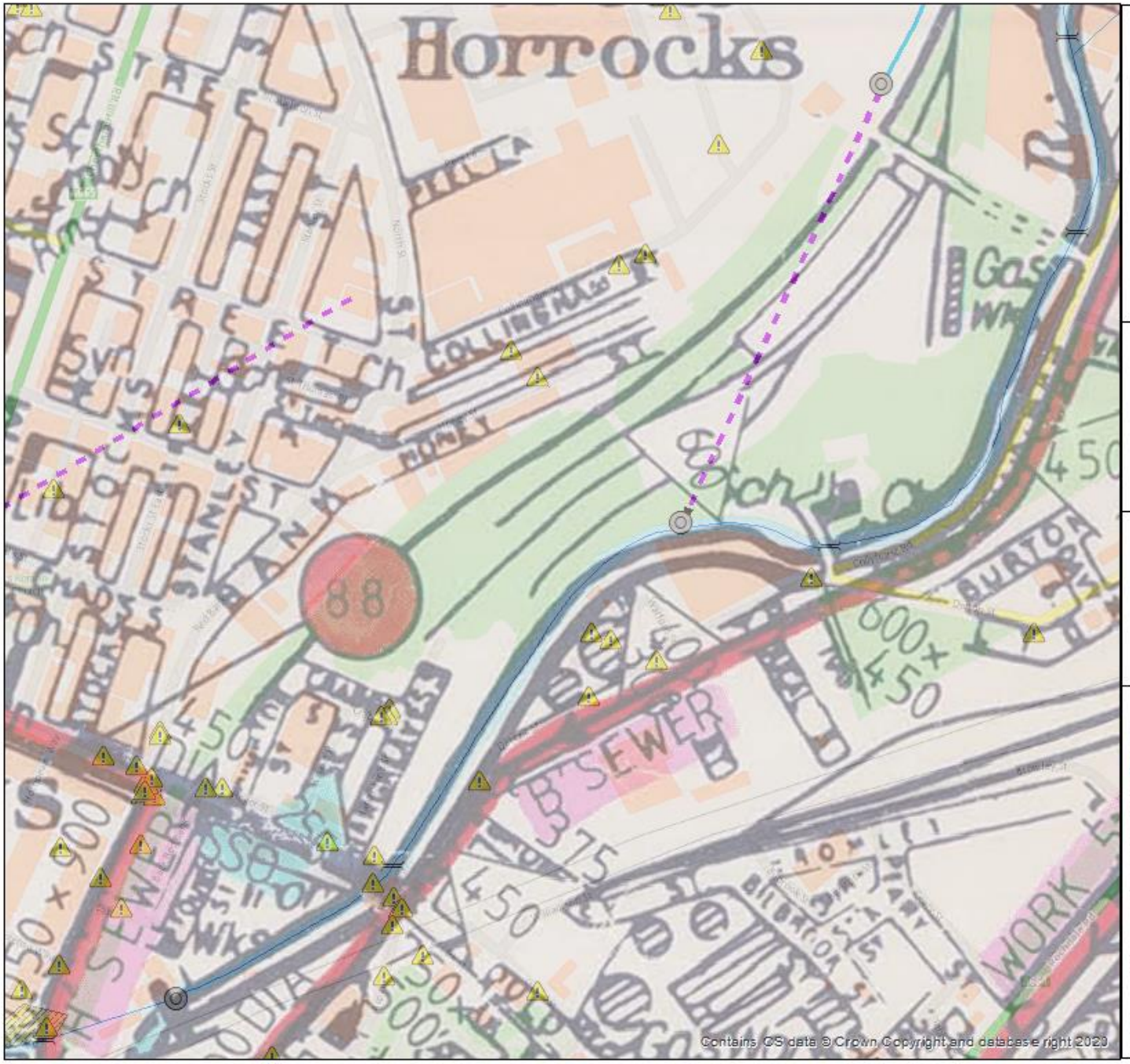

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LLFA DATA SCREEN

Address/Site Ref:
RED BANK AND DANTZIC STREET

Our Ref: **MCC004/11/2022**

Author: Manchester City Council LLFA
Date: 04/11/2022
Scale: 1:3,512

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N

0 25 50 100 Meters

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Brimblecombe, Jack

From: Flood Risk Management <floodriskmanagement@manchester.gov.uk>
Sent: 04 November 2022 12:29
To: Brimblecombe, Jack; Mostyn, Stephen
Cc: Jennifer Atkinson
Subject: RE: Data Screening Service - EF1/601189
Attachments: MCC_004_11_2022_RED BANK AND DANTZIC STREET.pdf

Categories: Red Category

Good afternoon Jack,

I hope you are well, thank you for your commission of our Data Screening service.

Please find attached your Data Screen. Results are from p.4 onwards.

The screening process has highlighted ongoing flood and drainage matters for several active planning applications at this Site. We have included the reference details and I have copied in the overseeing planner so she is aware of this.

Should you have any queries please do not hesitate to contact us.

Kind Regards,
Laura

Laura Peacock
Flood Risk Engineer – LLFA

Highways Service,
Growth and Neighbourhoods Directorate
Manchester City Council
PO Box 532
Town Hall
Manchester
M60 2LA
Web: http://www.manchester.gov.uk
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From: Brimblecombe, Jack <Jack.Brimblecombe@wsp.com>
Sent: 20 October 2022 15:00
To: Flood Risk Management <floodriskmanagement@manchester.gov.uk>
Cc: Mostyn, Stephen <Stephen.Mostyn@wsp.com>
Subject: Data Screening Service - EF1/601189

Dear Sir/Madam,

I have recently purchased the Data Screening Service with reference **EF1/601189.** I attach the supporting documents as required.

I have substituted the requested shapefile/feature class with a DWG file due to availability, I hope this is sufficient.

Kind Regards,

Jack Brimblecombe *MEng (Hons)*
Graduate Engineer

T +44 (0) 161 200 5177

WSP
No 8 First Street
Manchester
M15 4RP

wsp.com

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MEETING NOTES

PROJECT NUMBER	70079268	**MEETING DATE**	12 December 2022
PROJECT NAME	Manchester Victoria North – Redbank Area	**VENUE**	Microsoft Teams
CLIENT	Far East Consortium	**RECORDED BY**	JEB
MEETING SUBJECT	Wastewater Proposals Update		

PRESENT	Jack Brimblecombe, Stephen Mostyn (WSP); John Sherrington, Timea Nisca (FEC); Nicola Hall, Andrew Leyssens, Adam Brennan, Shoaib Tauqeer, John Cartledge (UU)
APOLOGIES	
DISTRIBUTION	As above

UU comments made 09.01.23
UU comments made 23.02.23
Highlighted comment indicates point discussed 20.03.23

ITEM	SUBJECT	ACTION	DUE
1	**Overview – Existing Drainage Regime and Proposed Improvements**		
1.1	Foul and surface water drainage currently drains to existing United Utilities (UU) combined sewers site wide. UU comment – any existing surface water runoff from your site draining to public sewers would need to be evidenced if surface water is considered to drain to the public sewers, but it is understood all surface water is proposed to ultimately drain to the river. All surface water run-off from proposed development to discharge to the River Irk at greenfield run-off rates. UU comment - Noted		
1.2	As part of the HIF infrastructure package a dedicated surface water drainage system is being installed with a proposed discharge into the River Irk. UU comment – Noted this is currently being pursued under S104 application.		
1.3	On plot foul drainage to connect into primary foul water network designed by Arup as part of HIF package which connects on to existing UU combined Sewers. WSP to develop high level foul discharge rate plan. UU comment – Noted, please provide foul discharge rate plan for assessment to be carried out by UU. WSP to provide a foul discharge rate plan for approval as part of forthcoming planning submission (March 2023).	WSP	

	Please ensure this corresponds with Arups design proposals *Foul discharge rate plan applies 4000l/d/dwelling and 0.6l/s/ha for commercial space in parallel with the foul calculations carried out by Arup as part of the HIF Works.*		
2	**Surface Water Discharge Rate and Plot Connection Points**		
2.1	Discharge across the development is to be limited to 22l/s/ha limited to a minimum of 5l/s for each individual plot. On plot attenuation is proposed. UU comment – It is understood all surface water is to ultimately drain to the River, please confirm. 1) The restricted rate for each plot must correspond with the S104 main drainage design which is being carried out by Arup. 2) Any new surface water drainage not part of the HIF package is requested to drain to the river and therefore all discharge rates must be agreed with the LLFA and EA. 3) S104 technical assessment will be required for drainage network to be put forward for adoption. Item 1: Yes, all surface water drainage is to discharge to the River Irk. Item 2: It is proposed that surface water run-off from the plots will discharge into the S104 sewers provided by HIF/Arup at a rate not exceeding 22l/s/ha. This flow rate was agreed by Arup with LLFA and EA as part of the HIF infrastructure planning application. WSP will also seek approval for this discharge rate as part of the outline/detailed planning applications for the plots. Item 3: Noted and agreed. A section 104 has been submitted by HIF/Arup for the primary sitewide foul and surface water drainage infrastructure. Any additional adoptable sewers (i.e Dantzic Street) required to support the development will be identified and a strategy agreed for these prior to the forthcoming outline/detailed planning applications – associated section 104 applications will be progressed following planning approval. UU comment – Understood a full drainage strategy will be submitted in advance of the planning application. *Agreed.*		
2.2	On-plot surface water drainage will connect to the HIF installed new dedicated surface water drainage network which ultimately discharged into the River Irk. FEC team will provide surface water carrier drain for plots NT02 – 04 and RB16 & 17 i.e all plots along Dantzic Street. UU comment – Noted. It is requested any new surface water sewers should also drain to the River and in line with the surface water hierarchy. The new adoptable carrier drain in Dantzic Street and any other new surface water drainage that is required to support the development will discharge to the River Irk. UU comment – Noted please see comment below regarding highway drainage		
2.3	Sustainable Drainage Systems (SuDS) – UU indicated that SuDS should be implemented on the development plots wherever possible.		

	WSP confirmed that as part of the outline planning application the types of SuDS that are appropriate for the development plots will be identified and set out in the drainage strategy report. Future detailed planning applications should then use that as a basis on which to develop the drainage strategies for the individual plots. UU comment – Noted.		
2.4	UU advised that conversations on the adoption of proposed drainage infrastructure should be held as early as possible. FEC to ensure consultations are being held as part of the HIF works. UU comment – Noted and agreed.	FEC	
3	**Dantzic Street Highway Drainage**		
3.1	Currently, road gullies draining dantzic street discharge into the combined sewer the runs beneath it. As it stands, the proposals are to continue as such. UU raised that this could be a lost opportunity to remove surface water discharge from the combined sewer. FEC indicated that they thought that it would be technically difficult to achieve SuDS in Dantzic Street but committed to consider further options. UU comment – all existing highway drainage draining to the combined sewer is requested to be removed as part of the development and new surface water drainage works. Consideration should be made for SuDS features. Consideration of highways drainage to drain to the proposed surface water sewer serving NT02-04 and RB16-17 should be made. Design strategy will be for a carrier drain to accept connections from plot drainage only. Further discussion can then take place to confirm whether to size for Dantzic Street gully connections. We will discuss separately with the EA whether it would be acceptable to discharge the Dantzic Street gullies directly to the River Irk via the carrier drain but would comment that it may not be desirable from a water quality perspective to do this and also that flows from the gullies would discharge to the river unattenuated – both of these points may not be acceptable to the EA. UU comment – Noted – please advise on with the discussions to be had with the EA regarding highway drainage. Could swales be used to permit this? Also spill reduction from CSOs may be sufficient benefit to the EA / LLFA to allow highway drainage discharge? *Current drainage strategy is to provide a new adoptable surface water carrier drain in Dantzic Street to take surface water discharge at 22 l/s/ha from the proposed development plots and also from the proposed SuDS zones in Dantzic Street. The Dantzic Street SuDS zones are currently being designed take runoff from footpaths only and not the carriageway, which will continue to drain as existing to the combined sewer. Swales are not considered to be feasible due to spatial constraints. There is scope to review this strategy in conjunction with UU with a view to re-routing the existing Dantzic Street highway gullies into the carrier drain but this would need a more detailed discussion with UU. EA have indicated that they have no objection in principle to discharge of Dantzic Street carriageway drainage to the new outfall but have requested that attenuation would need to be provided. LLFA have indicated that SuDS (raingarden) could be included within the design*	FEC	

	subject to the necessary approvals as part of a future section 278 agreement. UU advised that the drainage strategy for planning can be submitted based on existing Dantzic Street highway gullies being drained to the existing UU combined sewer in Dantzic Street as per the current arrangements. Further discussions and development of this strategy with a view to rerouting the gully connections to the surface water carrier drain to be progressed following planning submission.		
4	**Dantzic Street Carrier Drain and Outfall to River Irk**		
4.1	Proposed new Surface Water Carrier on Dantzic Street is to take connections from proposed widened portion of highway and also surface water drainage connections from adjacent plots. UU comment – Noted. Please submit for assessment.		
4.2	The surface water carrier drain is likely to be offered for adoption and will discharge to the River Irk via a new outfall. Can UU confirm their minimum requirement for the level of the outfall i.e is there a requirement to set above 30-year river flood level? Type, details and location of outfall structure(s) to be agreed with UU / EA. FEC advised UU that MCC do not now intend to carry out any civils works in the river channel to amend water levels. UU comment – The outfall invert level should be set 300mm above the 30 year river top water level. As part of a S104 technical assessment we would request bed level and surveyed/observed/modelled water levels of watercourse Noted. We will confirm the 30 year river level and work to these requirements where possible and contact UU to agree the way forward if this is not possible. We will seek to obtain the necessary survey information related to the river to support any future section 104 application. UU comment – Noted. Please ensure the river surcharge levels are considered in the drainage strategy. This will likely impact your pass forward flow rate at the outfalls if submerged. *We are currently awaiting modelled 30 yr river level but note that data provided for a neighbouring development indicates that it may be difficult to achieve an outfall level which is above the 30 yr river level without pumping which is not desirable.* WSP confirmed to UU that the outfall to the River Irk at Dantzic Street will be significantly below the 30 year river level. Proposed outfall level is proposed to be 27.227mAOD in line with the neighbouring consented development of Victoria Riverside. Modelled 30 year river level is 30.46mAOD. UU advised that they will comment through the planning process that a surcharged outfall should be modelled at detailed design stage and that any impact on the system is mitigated as required.	UU	
5	**Sewer Diversions, Abandonments and Build Over Agreements**		
5.1	Diversion of existing combined sewer across the Plateau agreed in principle by UU – subject to section 185 application at the time of detailed planning applications.		

	UU comment – The existing combined sewer running north to south around through proposed plots RB04/RB03 is classed a critical sewer and contains a CSO outfall at the north side of the river bank. We are not able to agree any diversion proposals without a S185 application and assessment being carried out. Due to the criticality of the sewer, the S185 diversion proposal would need to be assessed by our engineering team and may require hydraulic modelling to be undertaken. Therefore it is requested that a S185 diversion proposal is submitted as soon as possible to avoid future delays. Noted that the existing combined sewer that crosses plots RB03/RB04 is a critical sewer associated with a local CSO. S185 application to be progressed when these plots are brought forward for development. UU comment – Noted. Please also consider CSO which discharges through the retaining wall on the north bank of the Irk - downstream of the sewer for diversion. *Noted*		
5.2	FEC indicated that they would like to explore possibility of a build over agreement for the existing combined public sewer in Warford Street (Plots RB16 & RB17) due to depth of existing sewer which passes beneath the River Irk and the technical difficulty / limited options for a diversion. UU confirmed that they will consider a build over agreement if this is put forward as a proposal. UU comment – Our expectation would be to divert or amend the site layout to avoid building over or near to the existing public sewers. One factor in considering a build over agreement is the availability of a diversionary route in the event of failure. This location does not appear to have an appropriate diversionary route for use in the event of failure and any diversion would take significant planning and liaison to execute. Due to the nature of the location and constraints such as the depth of the sewer, adjacent watercourse and that the only manhole upstream is across the river; building over this sewer would introduce further constraints to access, repair or excavate down to the sewer which would not be acceptable. You are welcome to submit a build over proposal for consideration, but we would like to set expectations at this stage to highlight that any application to build over or near to the sewer/s is likely to be rejected. Therefore any build over designs/plans etc would likely result as being abortive work. Early discussions on any diversion proposals are requested to be made. If a submission is made and an assessment carried out we would like to highlight that this would not indicate that we accept the principle of building over or near to the sewer, rather be only a basis to review the proposals. It is essential that this process/discussion is carried out prior to planning as it is a material consideration. It is requested that all sewers are surveyed and accurately located through on site investigations carried out by the developer prior to submitting design proposals. Noted – Current development proposals include a no build zone between plots RB16 & 17 to take account of the easement zones associated with the existing public sewers. Therefore we are not going to propose a build over.	FEC/UU	

	A 6 metre easement (from centreline of sewer) has been assumed for both the combined sewer and the CSO overflow pipe, although the actual location of the existing sewers needs to be confirmed by survey. UU to confirm that a 6m easement is acceptable for both the CSO overflow pipe and the deeper combined sewer. UU comment – The sewers should be accurately located and although a minimum 6m standoff easement would be required in all cases, once the depth of the sewers is determined, we may request additional standoff distance in addition to the 6m easement in order to access and maintain the sewers post development. Surveys should be provided to determine the condition of the existing sewers and any construction from buildings nearby would need to take measures to ensure the sewers are protected. *Noted – Surveys will be undertaken following planning approval to accurately locate and determine the level of the sewers prior to establishing the easement requirement in each case.*		
5.3	John S requested as-built information for the existing combined sewer and overflow (CSO) from UU who confirmed that they will check and provide any available information. If this is not available a survey will be required. Following abortive surveys we have requested that MCC highways remove surface dressing which is covering the manholes in this section of Dantzic Street. They have agreed to do this and surveys can then be undertaken. United Utilities will not fund surveys of sewers, however will request that the scheduled cyclic survey be undertaken. Noted. Surveys have not currently progressed in Dantzic Street. We will keep UU informed of any updates on this and will take into account any impact of the surveys on the development masterplan when received. UU comment – Noted.	UU	
5.4	Wetlands and reprofiling of the existing river bank are being proposed on Travis Island. Existing UU assets included overflow pipe from CSO in Dantzic Street to be reviewed to check how they sit in relation to the proposed reprofiling works. Risk that overflow pipe could be daylighted. FEC also raised that a CSO outfall within the wetlands so close to a new residential development may not be appropriate. Strategy for positioning of CSO overflow in Travis Island to be agreed with UU. UU comment – Please submit strategy or initial plans for relocating the overflow pipe and cross section plans where river bank levels are being profiled along with accurate surveyed line and level of the sewer/overflow for further consideration. Sections through Travis Island wetlands and riverbank to be provided as and when they are available. Position of CSO outfall in relation to the residential development to be reviewed when all relevant information (sections, survey information etc is available. UU Comment – Any alterations would need to be assessed through our network team – please provide plans when available. *Noted - Drawings to be provided when available.*		

5.5	There is a further CSO on north bank of River Irk, to the south of plot RB03. UU remind team to not lose sight of this asset due to its vulnerability to a change in levels. UU comment – Please provide plan/sections of river bank changes to understand the impact on existing wastewater assets and CSO overflow outfalls. Any proposals would need to consider protection of this and all assets. Sections through north bank of River Irk to be provided when available. UU Comment – Any alterations would need to be assessed through our network team – please provide plans when available. *Noted - Drawings to be provided when available.*		
5.6	Some river walls on the northern side are to be removed to create terracing as part of the existing consented HIF infrastructure planning application. UU request to be consulted before commencement of this work due to proximity of assets such as the CSO mentioned above. FEC to be cognisant of need to engage with UU on this matter. UU comment – Please provide plans showing proposed works and measures to ensure protection of all existing assets is made. All existing wastewater assets would need to be located accurately through on site investigations. Location of existing UU wastewater assets to be confirmed by survey and impact of proposed works assessed. UU Comment – Consideration should be given for access and maintenance off all CSO during and after development. *Noted*	FEC	
5.7	FEC & WSP to look into rationalising the proposals surrounding CSOs and sewer diversions. UU comment – noted.		
5.8	Can UU confirm the likelihood/frequency of spillages occurring from existing CSOs in the vicinity of the site. UU comment – See comment in email.	UU	
6	**Any Other Business**		

Appendix 10.1

Appendix D - Site Location Plans

© Maccreanor Lavington Ltd.

Do not scale from this drawing. Verify all dimensions on site. Drawing should be read in conjunction with information from all other design consultants and contractors. All drawings in digital format are for reference only, paper copies are available on request.

0 25 75m

Legend:

Project boundary for EIA scoping purposes

Green infrastructure improvement works within St Catherine's Wood permitted through planning application ref. 133143/VO/2022

Rev	Details	Drwn	Chkd	Date
P12.07	S0-Initial Status			20/12/2022
P12.06	S0-Initial Status			14/12/2022

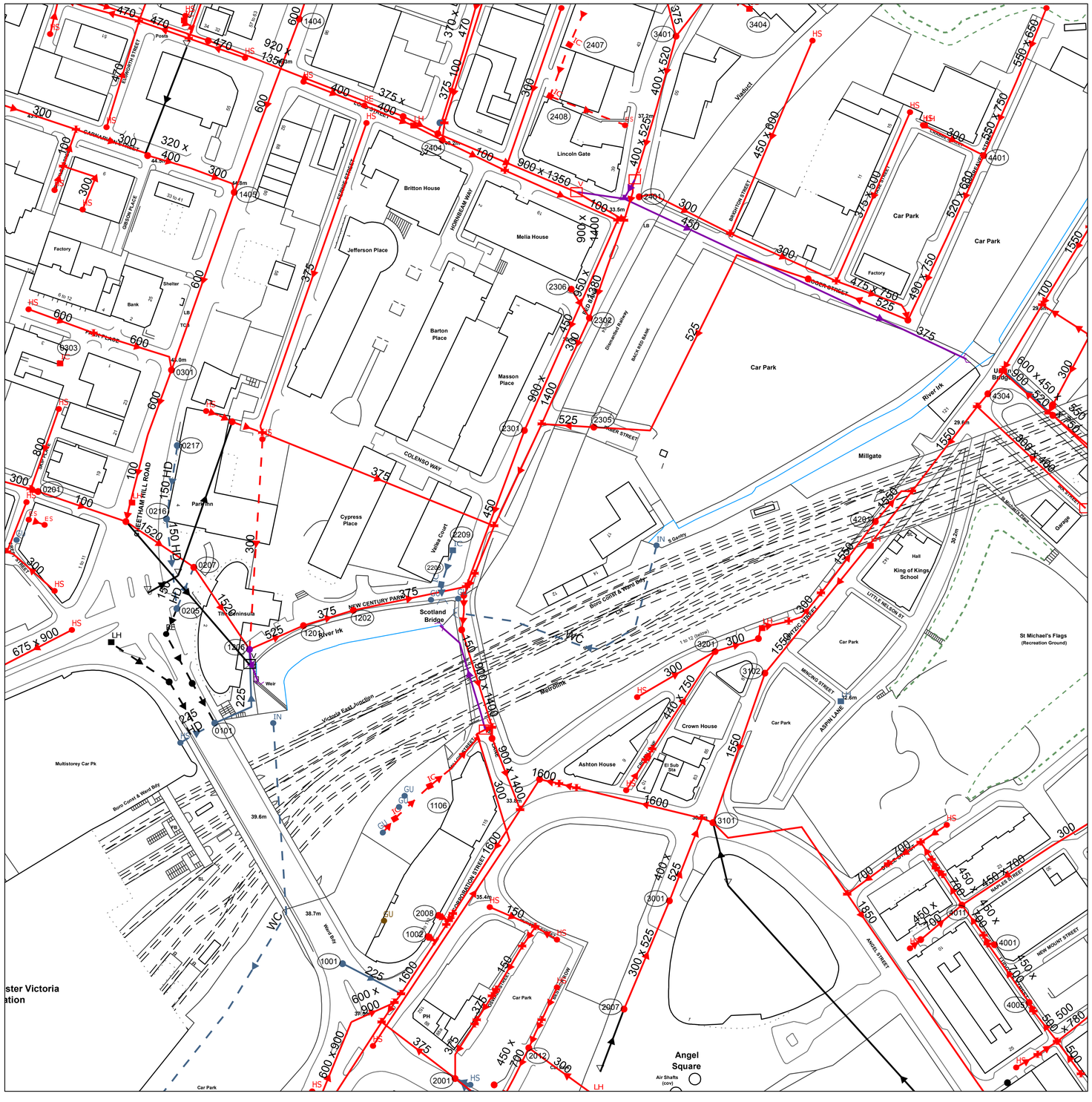
MACCREANOR LAVINGTON

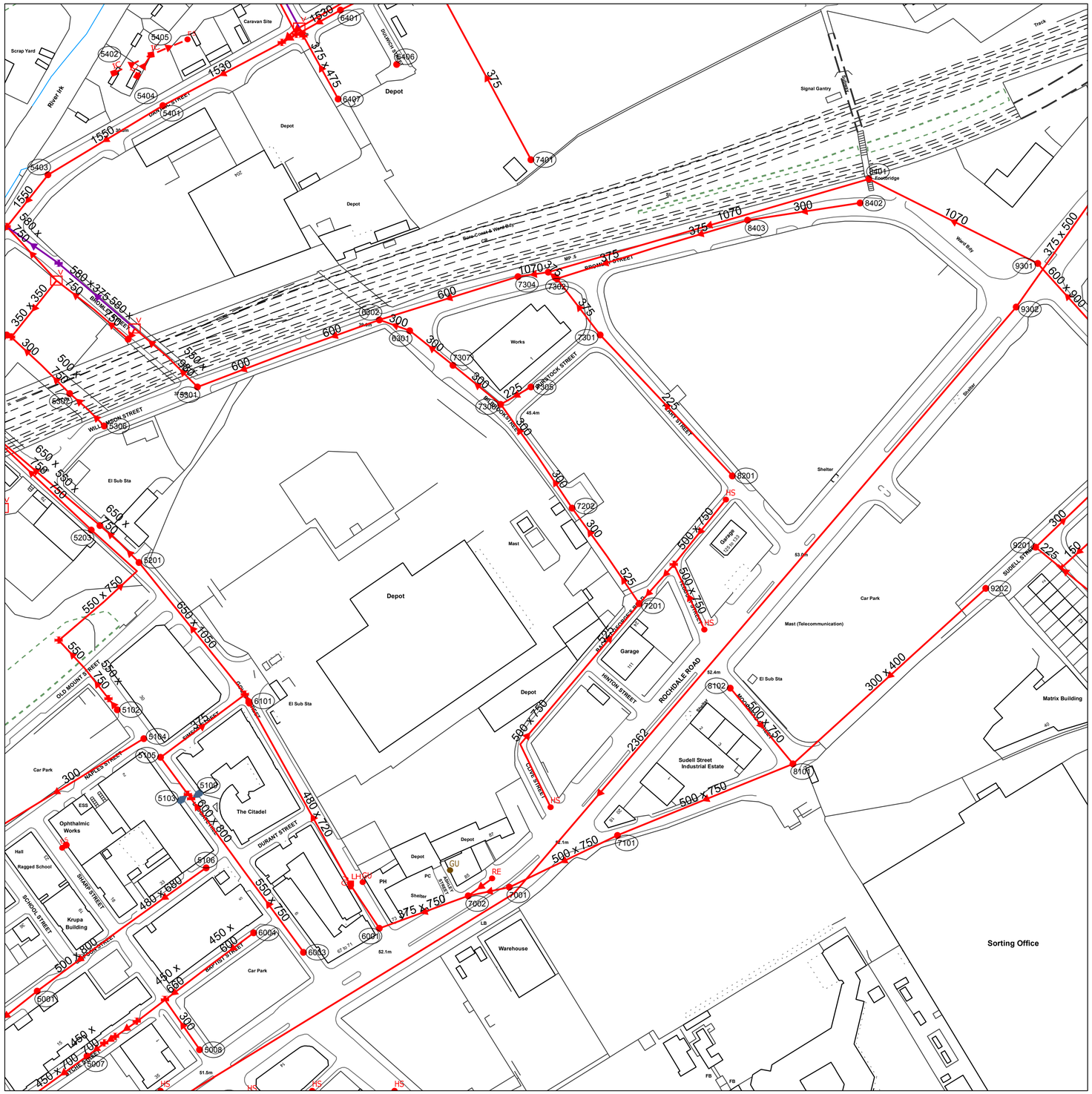
Vijverhofstraat 47
3032 SB Rotterdam
The Netherlands
+31(0)10 443 90 60

Proj. No.: 524
Project: Red Bank Manchester
Status: S0-Initial Status
Sheet Name: EIA Scoping Boundary
Client: FEC
CDE ID: RDB-MLM-DR-AR-009001a
Scale:
Size:
Rev.: P12.07

Appendix 10.1

Appendix E - Public Sewer Records


Britton House
Jefferson Place
Melia House
Barton Place
Masson Place
Cypress Place
Lincoln Gate
Car Park
Factory
Millgate
Scotland Bridge
Ashton House
Crown House
Angel Square
St Michael's Flags (Recreation Ground)
King of Kings School
Multistorey Car Pk
Hall
Garage
Shelter
Bank
Pavilion
Weir
Weir Bay
Boro Const & Ward Bay
Victoria East Junction
Monorail
Viaduct
Dismantled Railway
River Irk
Irk Sub Sta
Elm Sub Sta
Air Shafts (cov)
Car Park
PH
Factory
Posts
Tree
Tree Peninsula
Garage
CARNARVON STREET
ELLESMERE STREET
GROSVENOR PLACE
HORNBEAM WAY
ACONIC STREET
BRIDGE STREET
BRIGHTON STREET
LONGLEAT AVENUE
LINCOLN GATE
COLENSO WAY
STRETFORD ROAD
NEW CENTURY PARK EAST
NEW CENTURY PARK
MILLGATE
MONCRIEFF STREET
MINCING STREET
ASPIN LANE
LITTLE NELSON ST
ANGEL STREET
NEW MOUNT STREET
HARLES STREET
ORMROD STREET
CHAPEL STREET
CHURCH STREET
CHEETHAM HILL ROAD
Car Park
Car Park
Car Park


Scrap Yard
River Irk
Caravan Site
Depot
Signal Gantry
Tunnel
Track
Bolo Culvert & Weed Boy
Bridge
Roadbridge
MP 5
BROOM STREET
WILLOW STREET
Works
Shelter
Mast
El Sub Sta
Garage
Garage 125 to 133
Mast (Telecommunication)
Car Park
Matrix Building
Sorting Office
Warehouse
Sudell Street Industrial Estate
Ophthalmic Works
Hall
Ragged School
Krupa Building
The Citadel
Ambulance Station
Ambulance Station Car Park
Car Park
Depot
PH
Shelter
PC
Toilets
LS
FB
SUDELL STREET
ROCHDALE ROAD
INTON STREET
DURANT STREET
NAPLES STREET
SHARP STREET
SCHOOL STREET
OLD MOUNT STREET
DRY STREET
CHAPEL WALK
STORE STREET
DRURY LANE
GUNNERY STREET
TOVE STREET
ABBEY STREET
ABBOTT STREET
PENROCK STREET
MARY STREET
WEST BANK
Track
Shelter
Shelter
Shelter

Refno	Cover	Func	Invert	Size x	Size y	Shape	Mati	Length	Grad
0501	43.96	CO	34.98	950	1350	EG	BR	98.03	654
0502	46.3	CO							
0603	45.44	CO							
0701	48.96	CO							
0703	48.57	SW	0	450		CI	VC	7.28	
0704		CO							
0801	49.61	CO	46.44	300		CI	VC	16.76	
0803	49.42	CO	46.14	300		CI	VC	27.51	
0804	50.9	CO							
0807	49.39	SW	0	300		CI	VC	2.24	
0811	49.67	CO							
0812		CO	0	150		CI	VC	3.61	
0901	51.58	CO							
0902	50.88	CO	48.05	225		CI	VC	33.53	
0903		SW							
0905		SW							
0908		CO							
0909		CO							
0910		CO							
0911		CO							
0912		CO		150		CI	VC	8.04	
1501	47.27	CO							
1502	48.23	CO							
1508		CO		150		CI	VC	25.74	
1509		CO							
1601	49.61	CO	45.27	320	400	EG	VC	18.97	41
1604	49.63	CO	44.33	600		CI	CO	81.27	52
1606	47.98	CO							
1702	51.25	CO	47.86	300		CI	VC	70.87	41
1703	51.14	CO	43.46	600		CI	VC	66.41	89
1802	52.22	CO	44.32	600		CI	VC	68.95	82
1902	52.92	CO							
2501	46.7	CO							
2502	46.78	CO	38.82	600		CI	VC	58.27	
2504	46.78	CO	40.97	380	500	EG	VC	39.46	50
2509		CO							
2510		CO							
2601	50.16	CO							
2602	49.35	CO							
2603	48.95	CO	40.19	600		CI	VC	106.04	80
2604	48.74	CO	44.8	400	520	EG	VC	91.42	52
2701	51	CO	42.48	600		CI	VC	70.88	76
2702	50.84	CO	44.77	400	470	EG	VC	6.08	
2704	51.17	CO							
2706		FO							
2800	52.08	CO	46.73	600		CI	CO	70.84	76
2801	52.78	CO							
2803		CO							
2901	53.14	CO							
2903	53.08	CO							
2904	53.1	CO	45.29	600		CI	VC	69.89	74
2905	53.43	CO							
3501	45.71	SW	41.52	300		CI	VC	3.61	
3502	46.91	CO	40.08	375		CI	VC	32.02	12
3505		CO							
3601	48.72	CO	43.09	400	520	EG	VC	46.57	
3602	48.81	CO							
3603		CO		225		CI	VC	9.92	
3609		CO							
3702		CO							
3703	50.83	CO							
3704	49	CO							
3713	49.11	CO							
3801	53.27	CO	47.9	340	470	EG	BR	83.57	56
3806		CO							
3901	54.41	SW							
3905	54.55	CO	49.92	375		CI	VC	70.59	84
3906		CO							
3907		CO		150		CI	VC	4.28	
4601	51.1	CO	48.79	300		CI	VC	55.95	108
4602	51.26	CO							
4603	49.33	CO	44.46	300		CI	VC	60.01	46
4604		SW		100		CI	VC	4.93	
4701	52.46	CO							
4702		CO		150		CI	VC	11.46	
4703		CO		150		CI	VC	29.48	
4801	52.89	CO							
4901	53.85	CO							
4902	54.7	FO	52.1	150		CI	VC	3.93	16
4903	54.6	CO	51.85	375		CI	CO	13.27	7
4904	54.65	FO	52.42	150		CI	VC	44.18	138
4905	54.65	SW	52.6	375		CI	CO	39.59	53
0506		CO	0	470		CI	VC	16.16	
0507		CO	0	470		CI	VC	67.07	
0509		CO	0	150		CI	VC	112.95	
0604		CO	0	950	1380	EG	BR	43.45	
0605		CO	0	100		CI	VC	53.76	
0606		CO							
0607		CO							
0608		CO							
0702		CO	0	450		CI	VC	3.16	
0708		CO	0	300		CI	VC	53.76	
0710		CO	0	300	420	OV	VC	94.24	
0836		CO	0	300		CI	VC	21.19	
0906		SW							
0906		SW							
0907		SW							
0907		SW							
1503		CO	0	330	450	OV	VC	22.14	
1505		CO	0	470		CI	VC	53.62	
1506		CO	0	470		CI	VC	7.07	
1507		CO	0	470		CI	VC	69.89	
1602		CO	0	300		CI	VC	12.65	
1607		CO	0	470		CI	VC	49.98	
1608		CO	0	300	370	OV	VC	21.19	
1615		CO	44.81	300	400	OV	VC	18.97	41
1616		CO	0	320	400	EG	VC	2.24	
1617		CO							
1710		CO	0	375		CI	VC	90.48	
1712		CO	0	300		CI	VC	13.6	
1714		CO	0	300		CI	VC	54.08	
2506		CO	44.57	370	530	EG	VC	55.36	13
2507		CO	0	380	520	EG	VC	19.92	
2508		CO							
2605		CO	0	300	380	EG	VC	8.25	
2606		CO							
2607		CO							
2608		CO							
2705		CO	44.89	400	550	EG	VC	51.34	
2707		CO							
2802		CO		150		CI	VC	2.03	
2907		CO	0	330	410	UN	VC	15.81	
2908		CO							
3504		CO	0	375		CI	VC	24.49	
3506		CO	0	300	380	EG	VC	47.6	
3507		CO							
3508		CO							
3509		CO	0	400	520	EG	VC	40.61	
3590		CO	0	380	490	EG	VC	19.92	
3604		CO	0	300	370	UN	VC	11.7	
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3701		CO	46.25	360	500	EG	VC	68.62	31
3708		CO							
3709		CO	0	300		CI	VC	28.46	
3710		CO	0	300		CI	VC	25.63	
3711		CO	0	300		CI	VC	8.25	
3802		CO	0	600		CI	VC	40.5	
3803		CO	0	450		CI	VC	59.77	
3804		CO	0	300		CI	VC	97.08	
3805		CO							
3807		SW							
3903		CO	0	550		CI	VC	2	
3904		CO	0	550		CI	VC	2.24	
4605		CO	0	300		CI	VC	37.34	

Refno	Cover	Func	Invert	Size x	Size y	Shape	Mati	Length	Grad
4607		CO	0	300	400	UN	VC	54.63	
4608		CO	0	500		CI	VC	29.73	
4609		CO							
4611		CO							
4612		CO	0	380	480	OV	VC	155.53	
4613		CO	0	400	500	EG	VC	11.4	
4614		CO	0	380	480	EG	VC	27.83	
4708		CO							
4802		CO	0	450		CI	VC	28.79	
0502		CO							
0505		CO	0	470		CI	VC	74.67	
0508		CO							
0602		CO							
0705		CO							
0706		CO	0	450		CI	VC	47.17	
0707		CO	0	450		CI	VC	17.46	
0709		CO							
0805		CO							
0806		CO							
0810		CO							
0824		CO	0	300		CI	VC	5.39	
0825		CO	0	300		CI	VC	15.81	
0826		CO	0	300		CI	VC	6.08	
0827		CO							
0828		CO							
0830		CO							
0834		CO	0	300		CI	VC	8.25	
0835		CO	0	300		CI	VC	17.09	
0890		CO							
0903		CO							
0904		CO	0	225		CI	VC	3.61	
0905		CO							
0913		CO							
1504		CO							
1603		CO							
1610		CO	0	300		CI	VC	21.6	
1611		CO	0	300		CI	VC	11.7	
1613		CO	0	300	420	OV	VC	19.03	
1614		CO	0	300	420	OV	VC	2	
1707		CO							
1708		CO							
1711		CO							
1713		CO	0	300		CI	VC	2.24	
1805		CO	0	300		CI	VC	18.97	
1806		CO	0	300		CI	VC	12.65	
1807		CO	0	300		CI	VC	26.57	
1903		CO							
1904		CO							
2505		CO							
2690		CO							
2703		CO							
2805		CO							
2902		CO							
2906		CO							
3503		CO							
3510		CO							
3706		CO							
3707		CO	0	300		CI	VC	3.16	
3712		CO							
3902		CO	0	330	550	EG	BR	62.3	
4610		CO							
4704		CO							
4709		CO							
4710		CO							
4803		CO							
4804		CO							
2503	46.12	CO							

WASTE WATER SYMBOLOGY

Foul Surface Combined Overflow

Manhole
Manhole, Side Entry
MainSewer, Public
MainSewer, Private
MainSewer, S104
Rising Main, Public
Rising Main, Private
Rising Main, S104
Highway Drain, Private

Foul Surface Combined

WW Site Termination
Air Valve
Cascade
Non Return Valve
Extent of Survey
Flow Meter
Gulley
Hatch Box
Head of System
Hydrobrake / Vortex
Inlet
Inspection Chamber
Bifurcation
Catchpit
Contaminated Surface Water
WW Pumping Station
Sludge Pumping Station
Sewer Overflow
TJunction/Saddle
LampHole
OilInterceptor
PenStock
Pump
RoddingEye
Soakaway
Summit
Valve
Valve Chamber
Washout Chamber
DropShaft
WW Treatment Works
Septic Tank
Vent Column
Network Storage Tank
Orifice Plate
Vortex Chamber
Penstock Chamber
Blind Manhole

Foul Surface Combined Overflow

Screen Chamber
Discharge Point
Outfall

Control Kiosk
Unspecified

Sludge Main, Public
Sludge Main, Private
Sludge Main, S104

ABANDONED PIPE

MainSewer
Rising Main
Highway Drain
Sludge Main

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.
Crown copyright and database rights [2016] Ordnance Survey 100022432.

OS Sheet No: SJ8499NW
Scale: 1:1250 Date: 28/12/2016
217 Nodes
Sheet 1 of 1

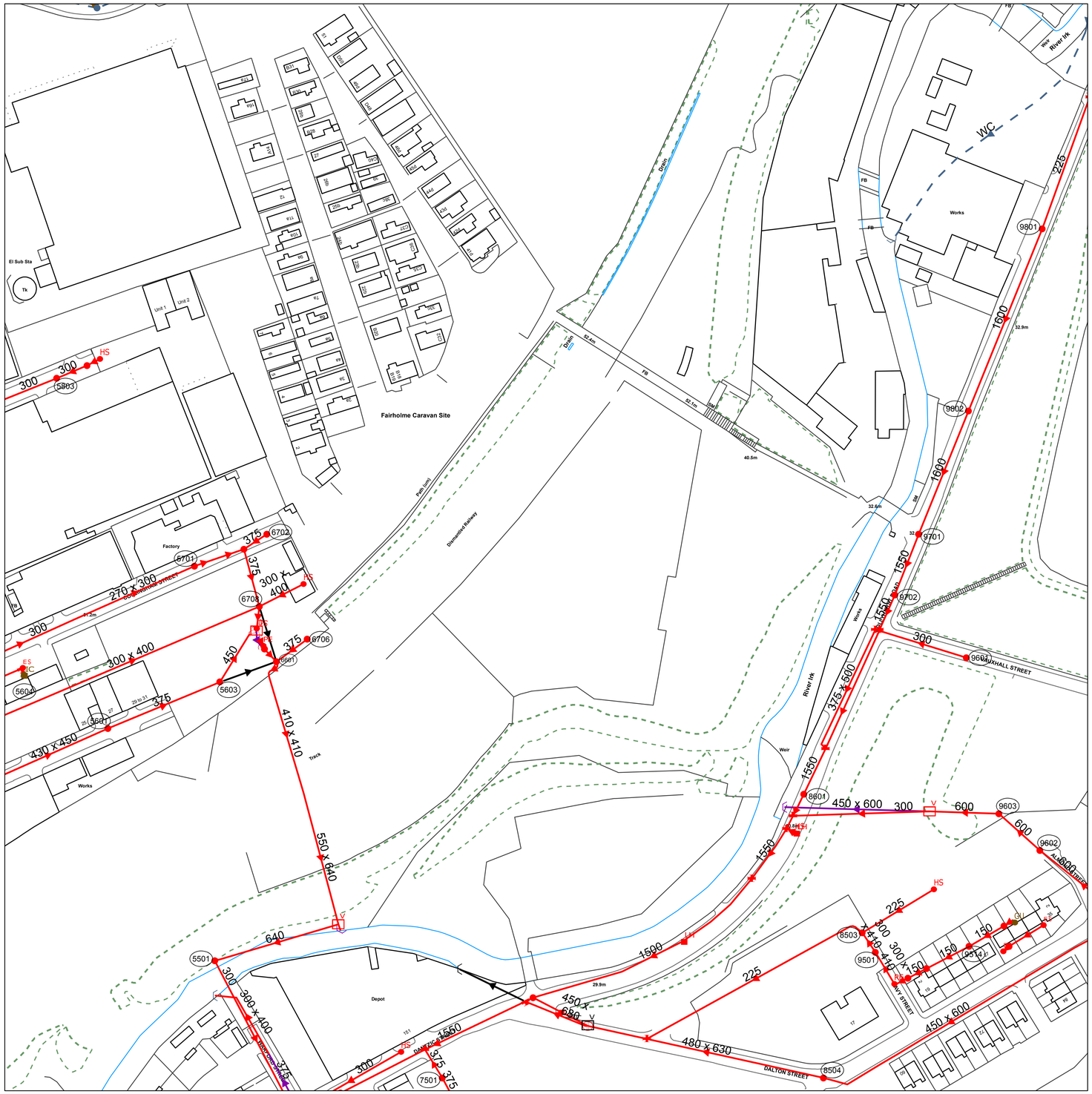
United Utilities
helping life flow smoothly

SEWER RECORDS

Printed By: Property Searches

OS Sheet No: SJ8499NW

Scale: 1:1250 Date: 28/12/2016


Fairholme Caravan Site
Works
Factory
Depot
Track
Drain
Weir
River Irk
Dismantled Railway
Path (unfi
DALTON STREET
WALKLEY STREET
WALKHALL STREET
El Sub Sta
Tk
Unit 1
Unit 2
HS
ES
FB
WC
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6702
6701
270 x 300
375
6708
300 x 400
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Appendix 10.1

Appendix F - Sewer Diversion Plans

DO NOT SCALE

KEY:

- UNITED UTILITIES SEWER
- ABANDON REQUIRED
- MAJOR DIVERSION REQUIRED
- RETAINED EXISITNG SEWER
- PLOT BOUNDARY
- SITE BOUNDARY

3F RB05A 0.36ha
3G RB05B 0.33ha
3E RB05C 0.34ha
3D RB04 0.37ha
3C RB03 0.29ha
3B RB02 0.29ha
3H RB12B 0.19ha
3A RB01 0.18ha
D001
D001A
D002
2G RB17 0.16ha
2E RB16 0.16ha
2D NT04 0.61ha
D003
2C NT03 0.54ha
1C RB06 0.22ha
D004
1D RB07 0.32ha
2B NT02 0.23ha
1B RB18 0.40ha
1A RB10 0.09ha

EXTRACT FROM UTILITIES DIVERSION SCHEDULE

			Asset Information						
Ref No.	Utility	Asset Owner	Further Info Reqired	Location	Description	Size/Material	Length Affected (m)	Approx. Depth (m)	Works Required
D001	Drainage	UU	GPR survey required to confirm location and depth	Through plot RB04	Combined Sewer	410x410 to 550x640 MAC		5	Diversion
D001A	Drainage	UU	GPR survey required to confirm location and depth	Warford Street	Combined Sewer	410x410 to 550x640 MAC		5	
D002	Drainage	UU	GPR survey required to confirm location and depth	Warford Street	Overflow	300x400	69		Abandon
D003	Drainage	UU	GPR survey required to confirm location and depth	South of Dantzic Street. East of Dulwich Street (Waste Processing Facility)	Combined Sewer	375	102	2	Abandon
D004	Drainage	UU	GPR survey required to confirm location and depth	Hargreaves Street through Crabbe Street	Combined Sewer	490x750 to 520x680 to 550x750 to 550x650	155	3	Abandon

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	31/01/2023	UB	FIRST ISSUE	SM	SM

DRAWING STATUS: S2 - FOR INFORMATION

wsp
8 First Street, Manchester, M15 4GU, UK
T+ 44 (0) 161 200 5000
wsp.com

CLIENT: FEC

ARCHITECT: MLM

SITE/PROJECT: RED BANK AND DANTZIC STREET

TITLE: EXISTING UTILITIES DIVERSION/ABANDONMENT PLAN UNITED UTILITIES SEWER

SCALE @ A1:	CHECKED:	APPROVED:	
1:1250	SM	SM	
PROJECT NO: 70079268	DESIGNED: UB	DRAWN: UB	DATE: January 2023

DRAWING No: RDB-WSP-00-XX-DR-UT-005 REV: P01

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File name: \\UK.WSPGROUP.COM\CENTRAL DATA\PROJECTS\70079XX\70079268 - REDBANK & DANTZIC STREET MASTERPLAN\03 WIP\DR DRAINAGE ENGINEER\RAWINGS\RDB\WSP-00-XX-DR-UT-005_RECOVER.DWG, printed on 31 March 2023 11:56:46, by Brimblecombe, Jack

Appendix 10.1

Appendix G - WSP Flood Modelling Report

TECHNICAL NOTE 1

DATE:	20 March 2023	**CONFIDENTIALITY:**	Confidential
SUBJECT:	FEC Red Bank Hydraulic Modelling		
PROJECT:	Red Bank	**AUTHOR:**	Julia Chambers
REVIEWER:	Lee Garratt	**APPROVER:**	Lee Garratt

INTRODUCTION

Overview

WSP have been commissioned by FEC to undertake flood modelling for the Red Bank development in Manchester. As part of Housing Infrastructure Fund (HIF) works, Arup developed a baseline model of the River Irk, which flows through the development site. Full details of the baseline model developed by Arup are provided in the technical note[1] that accompanies the baseline model, which is provided in Appendix A. The Arup baseline model was approved by the Environment Agency (EA) in November 2022. WSP have used the Arup baseline model as the basis for the flood modelling associated with the Red Bank development, which will support the two planning applications being submitted by FEC in March 2023. This technical note describes the hydraulic modelling undertaken to inform both planning applications.

The EA have done an initial review of the models used to inform both planning applications in January and February 2023 and subsequently, where necessary, the models have been updated as well as this modelling technical note based on the EA review.

FEC Detailed Planning Application (Application 5)

FEC are seeking detailed planning permission from Manchester City Council (MCC) for plots NT02, NT03 and NT04 (hereafter referred to as 'application 5') within the Red Bank area as shown on **Error! Reference source not found.**. The detailed plans for the proposed development within 'application 5' are provided in Appendix B, planning permission is being sought for the design as shown on these plans and therefore the development as shown on the plans has been tested within a hydraulic model to understand the impact on flood risk, inform emergency access and egress plans for the development and set Finished Floor Levels (FFLs) of buildings within the development. The Red Line Boundary (RLB) of the 'application 5' development has been provided in shapefile format within Appendix B.

The flood design event for 'application 5' is the 1% Annual Exceedance Probability (AEP) + 35% climate change allowance in line with the latest guidance for flood risk assessment[2]. The proposed development is a residential lead mixed use development comprising of a mid to high rise buildings with a variety of uses at ground floor level and mainly residential uses at first floor level and above. Therefore, although the development mainly has 'less vulnerable' uses at ground floor level it is considered to be a 'more vulnerable' development due to its residential nature, therefore applying the central climate change allowance for the 2080s to the 1% AEP event is appropriate. The River Irk is within the Irwell Management Catchment, the central climate change allowance for the 2080s is 35%, the higher central allowance for the

[1] Victoria North Rivers. 2022 Hydraulic Modelling Update – Rev 5. Job No. 281943-28. File ref. 4-05-02. Date: 17th November 2022

[2] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#when-to-use-climate-change-allowances

2080s is 46% and the upper end allowance for the 2080s is 75%. The flood risk with the development in place has also been tested for the 1% AEP event plus 75% climate change allowance (upper end) in the hydraulic model as well as the following events; 20% AEP, 3.33% AEP, 1% AEP and 0.1% event to understand the full picture of risk with the development in place.

FEC Outline Planning Application (Application 4)

An outline planning application will also be submitted by FEC in March 2023 to Manchester City Council (MCC). The outline application (hereafter referred to as 'application 4') includes several plots labelled as 'RB' (Red Bank) where residential lead development is planned as well as public realm areas throughout the Red Bank area where landscaping is proposed. A number of the 'RB' plots sit on an area known as the plateau, which is approximately 10m higher than the floodplain of the River Irk and therefore not at flood risk. Five of the proposed 'RB' plots do sit within the floodplain; RB06, RB07, RB10, RB16 and RB17, these are shown on Figure 1. As 'application 4' is an outline application, there are not detailed design drawings for this development yet. Planning application is being sought based on the parameter plans for this development, the parameter plans are provided in Appendix C, the building footprints in Plan 1 have been used to assess the impact of the proposed building on flood risk within the area. The hydraulic model represents the maximum potential development footprint of the 'application 4' development.

An illustrative masterplan for 'application 4' has been developed but planning permission is not being sought for this within the outline application. However, it should be noted that potential flood mitigation options to offset the impact of the buildings within the floodplain are based on the illustrative masterplan and this has been used to inform ground levels of the proposed mitigation within the hydraulic model to enable the development public realm levels to tie in with building levels and existing surrounding ground levels. The illustrative masterplan is provided in Appendix C.

The flood design event for 'application 4' is the 1% Annual Exceedance Probability (AEP) + 35% climate change allowance in line with the latest guidance for flood risk assessment[2]. The proposed development is a residential lead mixed use development comprising of a mid to high rise buildings with a variety of uses at ground floor level and mainly residential uses at first floor level and above. Therefore, although the development mainly has 'less vulnerable' uses at ground floor level it is considered to be a 'more vulnerable' development due to its residential nature, therefore applying the central climate change allowance for the 2080s to the 1% AEP event is appropriate. The River Irk is within the Irwell Management Catchment, the central climate change allowance for the 2080s is 35%, the higher central allowance for the 2080s is 46% and the upper end allowance for the 2080s is 75%. The flood risk with the development in place has also been tested for the 1% AEP event plus 75% climate change allowance (upper end) in the hydraulic model as well as the following events; 20% AEP, 3.33% AEP, 1% AEP and 0.1% event to understand the full picture of risk with the development in place.

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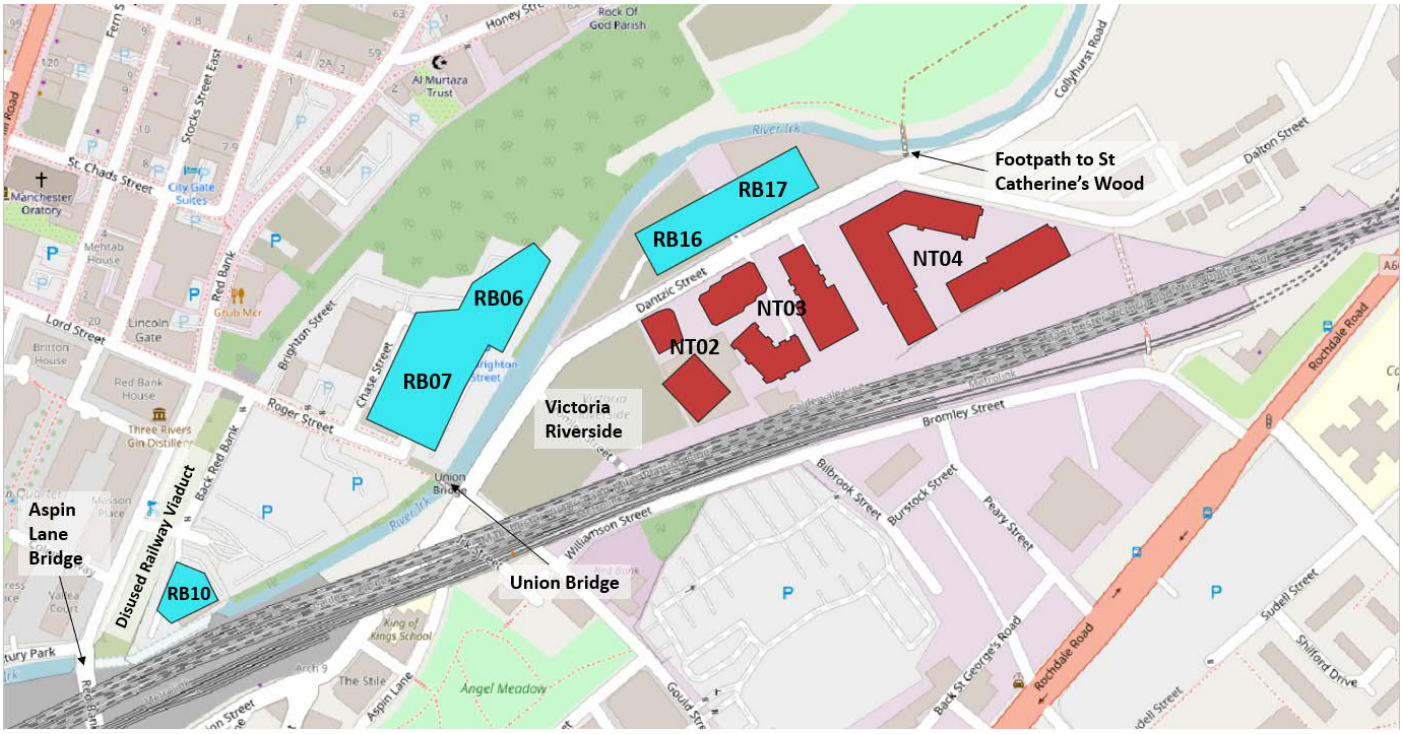

Figure 1 Development plot locations

DATA COLLECTION

Data Collected

Table 1 shows the data collected to inform the hydraulic modelling for both the 'application 4' and 'application 5' developments. No watercourse topographic data was collected as part of this assessment as topographic data of the River Irk was collected in January 2022 and used by Arup to update their Baseline model. The topographic survey in 2022 included a significant number of cross-sections on the River Irk through the reach of interest in this assessment. There were no recommendations made by the EA to undertake any additional topographic survey following their review and approval of the Arup Baseline model.

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Table 1 Data Collected

Data	Source
Arup Baseline model of River Irk and Moston Brook, 2022	Environment Agency
Existing site topographic data (*PS-2158-TS-00.dwg*)	Schulze + Grassov (landscape architects for 'application 4' development)
Parameter plans for 'application 4' development	Maccreanor Lavington (masterplanners for 'application 4' development)
Design drawings for 'application 5' development	Maccreanor Lavington (designers for plot NT04) and Hawkins Brown (designers for plots NT02 and NT03)
Victoria Riverside design drawings	Arcadis
Illustrative masterplan for 'application 4' development	Maccreanor Lavington

Review of data

Topographic survey of the existing ground levels across the site supplied by Schulze + Grassov (provided in Appendix D) was checked against LiDAR levels. A good correlation was found between the topographic survey of ground levels and the levels in the LiDAR data; therefore, it was deemed suitable to use the LiDAR data to represent the floodplain within the model.

The Arup Baseline model was reviewed by WSP during its development prior to the sign off of the model by the EA. Therefore, once the Arup Baseline model had been approved by the EA, no further review was undertaken by WSP before using the model in this assessment. As part of the HIF works on behalf of Manchester City Council (MCC), Arup updated an existing 1D-2D coupled FMP-TUFLOW model of the River Irk through Manchester. Additional topographic survey was undertaken to add more detail into the model, particularly around the Red Bank area as it was the main focus for MCC. Arup updated the hydrology within the model and undertook a full calibration exercise for flows within the model using gauge data from Collyhurst Weir, which is approximately 166m upstream of the footbridge to St Catherine's Wood (shown on Figure 1). Arup also improved the stability of the model and ran the model for a range of flood design events, including climate change scenarios. The EA reviewed and approved the Arup model, which represents the existing flood risk from the River Irk, in November 2022.

The Arup Baseline model shows a small part of the NT04 plot to flood during the design flood event but no flooding is shown to plots NT02 or NT03. In terms of the RB plots, plots RB16, RB17, RB06, RB07 and RB10 are predicted to flood during the design flood event. The other RB plots that form part of the

'application 4' development are not predicted to flood and are on much higher ground, away from the floodplain.

It should be noted that there are issues with the dVol values in the Arup 2022 Baseline model, which propagate from Moston Brook. Moston Brook is upstream of the area of interest for this study and the instabilities at this location do not have a bearing on the results in the Red Bank area. Therefore, WSP has not sought to improve stability on the Moston Brook reach of the model as it is outside the scope of these works. As such, the issues with the dVol values are present within the FEC versions of the model that are discussed below but there is no impact of these on the results at Red Bank. There are five checks recorded by TUFLOW prior to the simulation for the Arup Baseline model, all are the same check, '2099 – Ignored repeat application of boundary to 2D cell. BC Type = HX'. These checks do not have an impact on model results. There are no warnings pre-simulation in the Arup Baseline model and no warnings or checks during the simulation. The Arup 2022 Baseline model is sufficiently stable through the Red Bank area to produce reasonable results and is appropriate to use in this assessment to inform both 'application 4' and application 5'.

METHODOLOGY

Model Updates

The Arup Baseline model has been used as the basis for the flood modelling undertaken by WSP to determine the impact on flood risk of both the 'application 4' and 'application 5' developments. It should be noted that for the model scenarios developed by WSP, changes were only made to the model within the Red Bank area between the footpath to St Catherine's Wood and Aspin Lane Bridge on the River Irk (both shown on Figure 1). No changes have been made to the model outside of this area in any of the scenarios developed by WSP.

In order to inform the FEC planning applications, WSP have developed three flood models, all based on the Arup Baseline model. Details of each of these models is provided in the sections below, the three scenarios are:

1. **FEC Baseline**
2. **'Application 5' Model (NT02-04 plots – detailed planning application)**
3. **'Application 4' Model (RB plots – outline planning application)**

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1. FEC Baseline

The FEC Baseline differs from the Arup Baseline model as it includes representation of the Victoria Riverside development which is currently in construction. It is assumed that by the time the NT02-04 and RB plots are developed that the Victoria Riverside development will be built. Therefore, it has been included in the baseline for this assessment. The layout and levels of the Victoria Riverside development were provided by Arcadis in September 2022 (see Appendix E) and have been incorporated into the model using z-shape layers to create the FEC Baseline.

The FEC Baseline model also includes a minor update to the inactive code layer (2d_code_inactive_FMT_NorthernGateway_2021_014_R) and the 2d_bc layer (2d_bc_links_FMT_NorthernGateway_2021_014_L) adjacent to the RB10 plot. The model has been updated with minor changes close to RB10 to more closely represent the 1D/2D interaction. A small adjustment has been made to the inactive code layer to include the full channel width to the culvert inlet, which was not included in the Arup 2022 Baseline model and the inactive code layer has also been extended to include the slipway from the RB10 plot into the river just upstream of the culvert. The 2d_bc layer has been adjusted to match with the updated inactive code layer to allow water to spill out of the 1D river channel into 2D at the correct location and at the correct elevation. The elevation for the bank levels has been set using the channel survey collected by Arup to build the Arup 2022 Baseline model and checked against site topographic drawings provided by Schulze + Grassov. The updated schematisation on the River Irk adjacent to RB10 is shown in Figure 2; The hatched area is the updated inactive code layer and the red line is the updated 2d_bc layer, the dashed black line represents the schematisation of the inactive code layer and 2d_bc layer in the Arup 2022 Baseline model.

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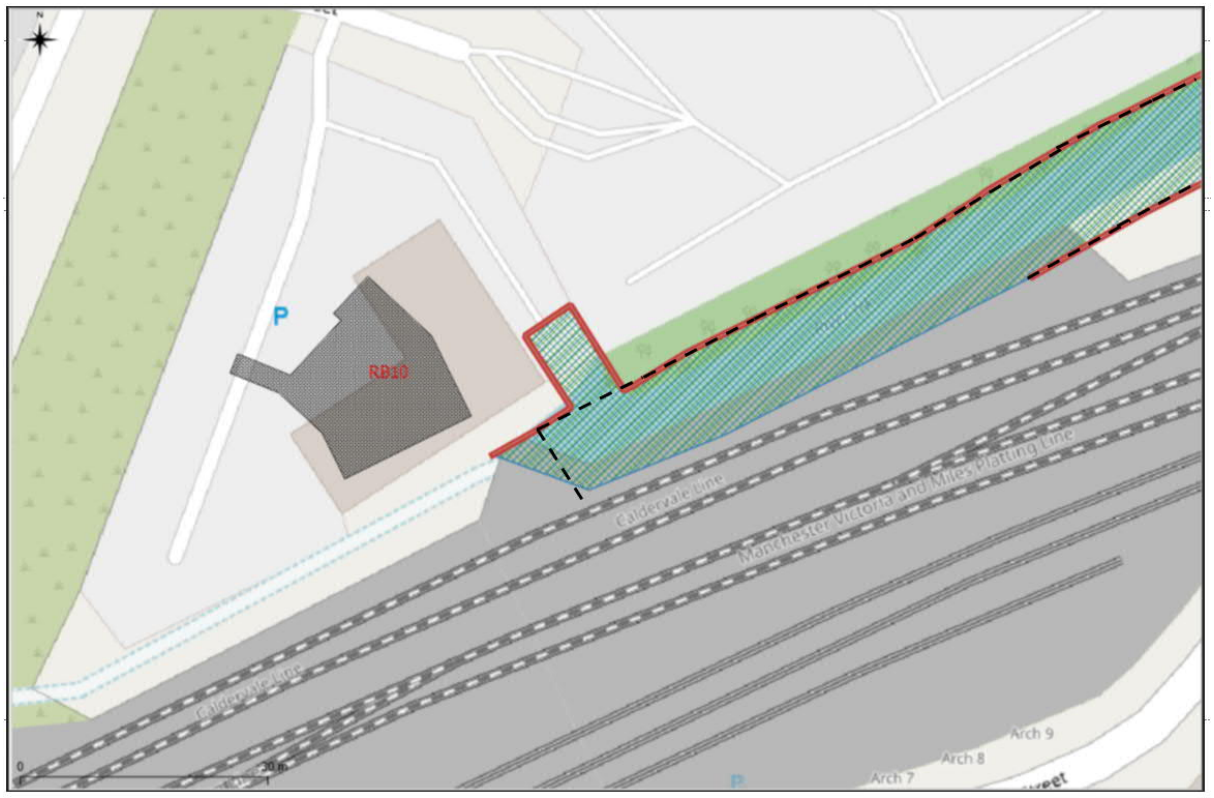

Figure 2 River Irk schematisation update at RB10

A comparison was undertaken between the Arup Baseline model and the FEC Baseline model for reference purposes only. The comparison showed only negligible differences in flood levels across the 2D domain between the two baseline models. The car park at the Victoria Riverside development has been designed as flood compensatory storage, therefore the area is shown as flooded in the FEC Baseline where it wasn't in the Arup Baseline model as shown in Drawing 79268-MR1-001-A in Appendix F.

2. 'Application 5' Model (NT02-04 plots – detailed planning application)

In order to inform the detailed planning application for the 'application 5' development, the FEC baseline model was updated to include representation of the development planned on plots NT02-04 as per the design (see Appendix B for drawings). This includes buildings plus changes to the public realm including on Dantzic Street including road, pavement and cycleway levels. The proposed buildings on plots NT02 and NT03 were set to their FFLs as these are above the design flood level (1% AEP + 35% climate change). The FFL of the building on plot NT04 that fronts onto Dantzic Street is lower than the design flood level. Flood resistance and resilience measures are proposed at this building to prevent it flooding during the design flood event, the building level within

the model has been set to the top level of flood resistance and resilience measures as shown on the drawings in Appendix B. The public realm and road levels were also set using z shapes set to the levels provided by the design team (as shown in Appendix B). No other changes were made to the model to represent the 'application 5' development.

3. 'Application 4' Model (RB plots – outline planning application)

Outline planning permission is being sought for the RB plots, this includes all 'RB' plots that are part of the proposed development including five plots that shown as at flood risk in the FEC Baseline model (RB06, RB07, RB10, RB16 and RB17). It should be noted that the 'application 5' development is not included in the outline planning application. The results of the 'application 4' model have been compared to the FEC Baseline model; therefore, it has not been assumed that the 'application 5' development will be built before the 'application 4' development. As planning permission has not been granted for 'application 5' yet, this development cannot be included in the baseline used to test the impact of the 'application 4' development.

The 'application 4' model includes representation of the plots shown on the parameter plan (Appendix C) that lie within the floodplain, this is split into three main areas as follows (see Figure 1 for plot locations):

- Plots RB16-17 (on an area known as Travis Island)
- Plots RB06-07
- Plot RB10

The FEC Baseline model was updated to represent the maximum possible building footprints as shown on the parameter plan in each of these areas. Initial modelling showed that as the buildings on the plots listed above displaced flood water, mitigation was required to ensure that flood risk was not increased elsewhere as a result of the 'application 4' development. The representation of the 'application 4' development (including flood mitigation) within the model in the three areas listed above is described in the sections below.

Plots RB16-17 (Travis Island)

The masterplan ambition for Travis Island is to create terraced wetlands along the river, the terracing has been designed to provide compensatory flood storage and offset the impact of the buildings within the floodplain at this location. The FEC Baseline model shows flooding mainly to the eastern side of Travis Island, the buildings on plots RB16 and RB17 will displace floodplain volume. The illustrative masterplan that has been used to inform the flood mitigation modelled includes terracing all the way around the river meander at Travis Island as shown on the illustrative masterplan drawing in Appendix C.

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The buildings on plots RB16 and RB17 were represented as a z shape with an elevation specified. The buildings will be designed to not flood during the design event (1% AEP +35% climate change) and have been set at a level of 31.67mAOD in the model, which is the maximum flood level around the RB16 and RB17 plots plus 300mm freeboard. The terracing on plots RB16 and RB17 has been represented using a number of z shapes, each set to a different level representing the steps up from the River Irk to the plot buildings. Figure 3 shows the z shapes that have been used to represent the terracing and the levels they are set to. As part of the proposed works, the riverbank along Travis Island is to be lowered to allow water onto the floodplain earlier on during a flood event, the lower bank has been represented in both 1D and 2D within the model.

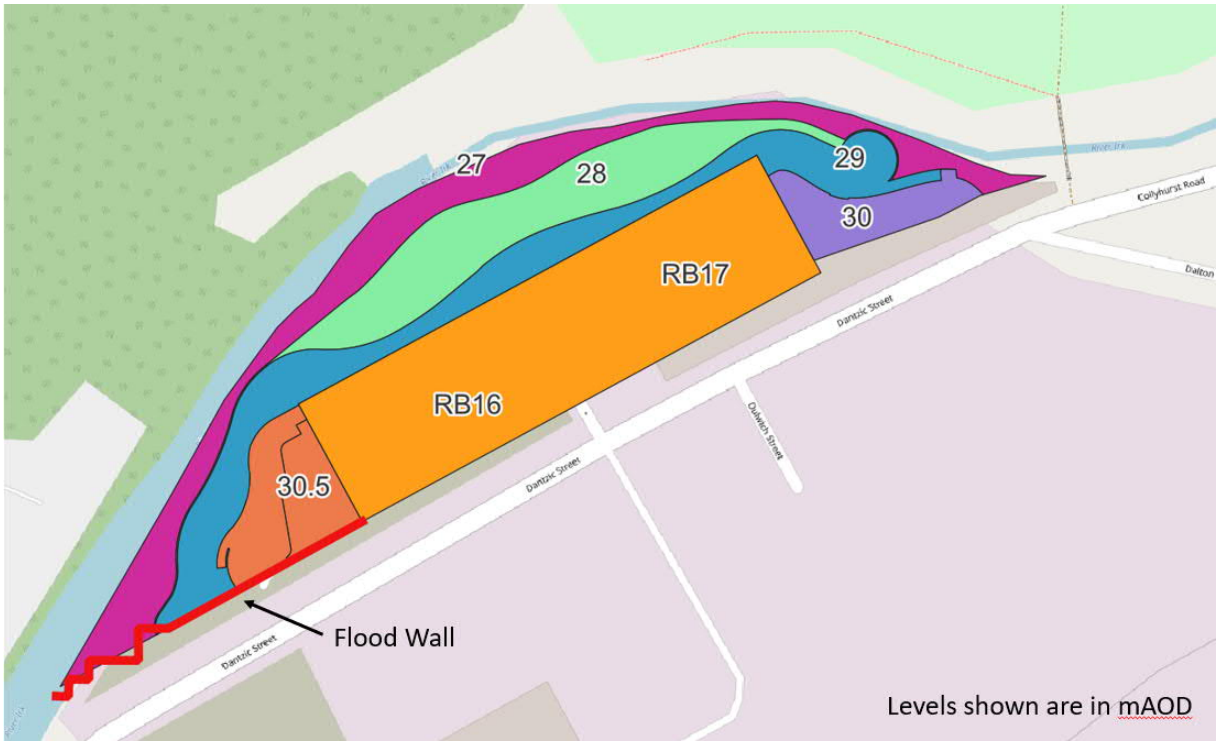

Figure 3 Proposed changes at RB16 and RB17

It was found that allowing more water out of the river at this location led to an increase in flooding on the western side of Dantzic Street as water flowed around the western side of RB16 off Travis Island and onto Dantzic Street. In order to prevent this happening and to maximise the storage provided on Travis Island during a flood event, a wall is proposed along the edge of plot RB16 parallel to Dantzic Street to contain water within Travis Island during a flood event. The wall has been represented with a z line in the model set to 90mAOD to ensure water cannot transfer between Travis Island and Dantzic Street at this location, this is above the water level predicted at this location for the design flood event. The location of the wall is shown in Figure 3.

It should be noted that a wall at this location with the terracing in place could be subject to significant hydraulic loading during a flood event. At the detailed design stage, the height of the proposed wall should be derived based on the maximum flood level plus freeboard (calculated using the residual uncertainty guidance[3]) and breach analysis should be undertaken to understand the risk should a failure of the flood wall occur.

Plots RB06-07

Plots RB06 and RB07 lie on the northern bank of the River Irk downstream of Travis Island. The buildings on plots RB06 and RB07 were represented as a z shape with an elevation specified. The buildings will be designed to not flood during the design event (1% AEP +35% climate change) and have been set at a level of 31.32mAOD in the model, which is the maximum flood level around the RB16 and RB17 plots plus 300mm freeboard. Both plots are within the floodplain as shown by the results of the FEC Baseline modelling. Terracing in front of the buildings on these plots is proposed within the illustrative masterplan (Appendix C) to connect the river to the public realm areas of these plots. The riverbank has been lowered and terraced and is designed to flood in front of the buildings. The 1D model has been widened in this area to represent the detail of the terracing as it steps up from the river as this could not be represented accurately in 2D due to the 4m cell size. The area immediately in front of the buildings has been set to 30mAOD within the 2D model. Figure 4 shows a typical 1D section within the reach of the River Irk in front of the RB06/07 plots and Figure 5 shows the changes that have been applied within the 2D model on these plots.

It should be noted that no changes to Union Bridge (shown on Figure 5) have been made as part of the ‘application 4’ model but the river section at the upstream face of the bridge has been widened to include the terracing on the right bank within the 1D. The spill over the structure is represented in 2D using a HX line across the face of the bridge, in the ‘application 4’ model the HX line has been widened compared to that in the Arup Baseline model to match the increased width of the 1D river section at the upstream face of the bridge. An additional 1D cross-section has been added to the ‘application 4’ model upstream of Union Bridge – IRK01_0957. It was noted that there was a slight increase in flow fluctuations through the reach of the River Irk in front of plots RB06 and RB07 in the ‘application 4’ model compared to the Arup Baseline model. The additional section (IRK01_0957) was added to smooth flows through the reach as they approached Union Bridge.

[3] Accounting for residual uncertainty: an update to the fluvial freeboard guide. Report – SC120014. Environment Agency, 2017.

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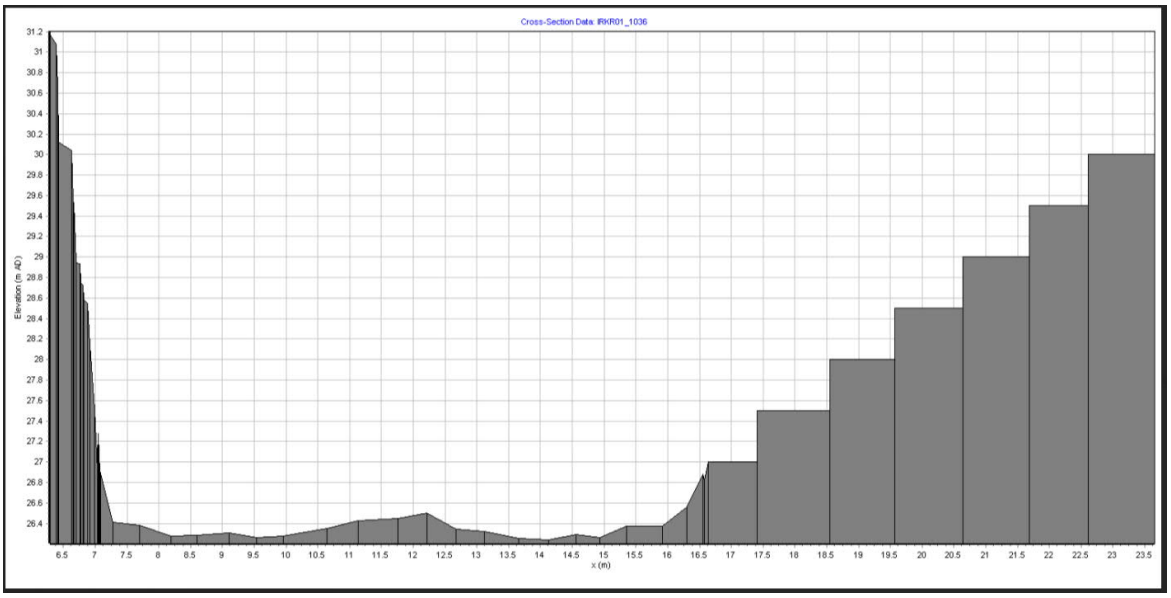

Figure 4 Typical section through 1D model alongside RB06 and RB07 plots

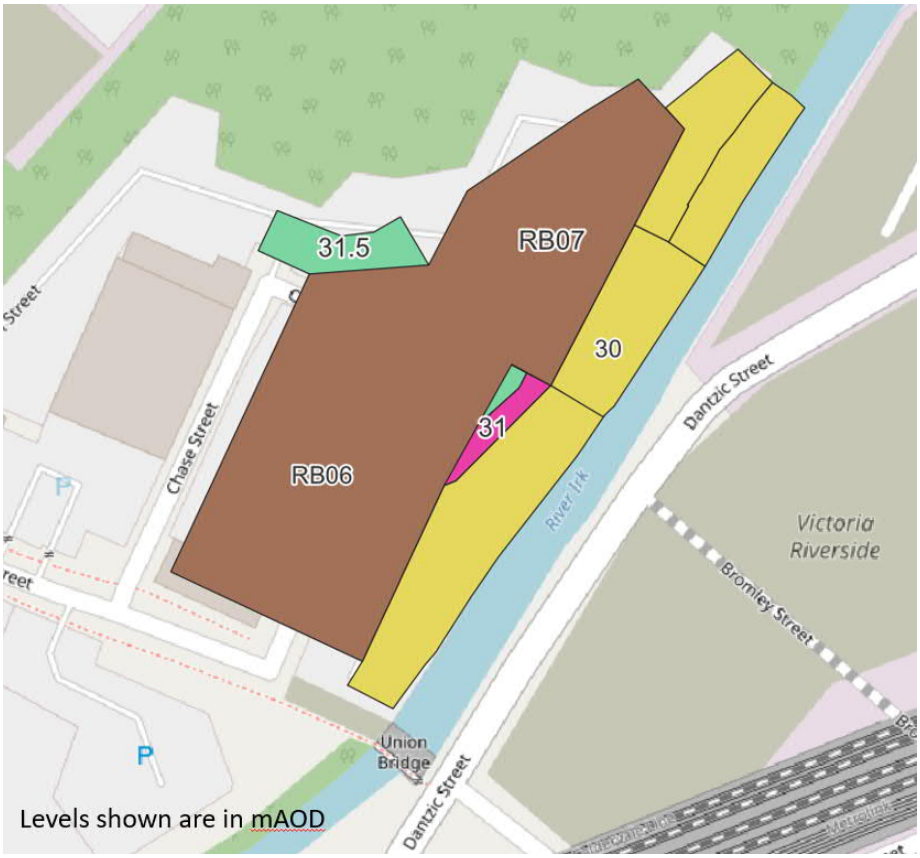

Figure 5 Proposed changes at RB06 and RB07

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Plot RB10

Plot RB10 is further downstream than RB06 and RB07 where the disused railway viaduct meets the live railway viaduct. The building on plot RB10 (shown on Figure 6) was represented as a z shape with an elevation specified. The building will be designed to not flood during the design event (1% AEP +35% climate change) and has been set at a level of 30.74mAOD in the model, which is the maximum flood level around the RB10 plot plus 300mm freeboard. No other changes were made at plot RB10 within the 'application 4' model.

Figure 6 Proposed changes at RB10

Hydrology

The hydrology has not been changed from that used in the Arup Baseline Model as Arup completed their hydrological assessment, which included calibration of flows on the River Irk using data at Collyhurst Weir approximately 166m upstream of the Red Bank area in 2022. Therefore, the hydrology within the model is up to date and uses the latest methods and data available. Future users of the model should consider how long ago the hydrological assessment was undertaken when they come to use the model and whether newer methods and data are available and therefore whether an updated assessment is necessary.

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Inflow files (ieds) for the following return periods were supplied with the Arup Baseline Model; 20% AEP, 10% AEP, 5% AEP, 3.33% AEP, 1% AEP, 1% AEP + 35% climate change allowance and 0.1% AEP. There are seven inflows to the model, on the Irk there is an upstream inflow and three intervening inflows along the modelled length of the watercourse. There is an upstream inflow on Moston Brook and two intervening inflows along the rest of the brook. The location of each inflow and the peak flow at each inflow for the design event is shown in Table 2.

The downstream boundary of the model is at the confluence of the River Irk with the River Irwell and a Head-Time Boundary (HTBDY) has been used to represent levels on the River Irwell at the downstream extent of the River Irk within the model. The following comment is provided within the downstream boundary node of the model as provided by Arup:

D/S HT boundary shape taken at Irk/Irwell confluence from "LowerIrwell_SALF_2ndBasin_PostScheme_v310817.DAT" obtained from the EA on 07/05/2019. HT taken from node "IRW1_3072Ju" from "POST3_Def_Q100" results. Peak 10 hrs taken to match 10hr simulation of the Irk. 13/12/2021 - Shape of previous boundary retained. Duration changed to ~16 hours to match updated hydrology for HIF. Peak shifted to 10hrs to match peak at the downstream boundary on the Irk. Peak taken as the Defended level at node IRWZ1_2170 for 100yr - 26.03mAOD on the 2018 Ship Canal model.

The downstream boundary has not been altered for the modelling undertaken on behalf of FEC.

The ‘application 4’ and ‘application 5’ models have been run for the following events: 20% AEP, 3.33% AEP, 1% AEP, 1% AEP + 35% climate change allowance, 1% AEP + 75% climate change allowance and 0.1% AEP.

Table 3 shows the inflows and downstream boundary conditions used within the models (same for both) and their sources.

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Table 2 Inflow locations and peak flows for 100 year + 35% climate change allowance design event (inflow location descriptions and Easting/Northing values are taken from Arup Flood Estimation Report[4])

Inflow name (model node)	Inflow Location	Easting, Northing	20% AEP Peak Flow (m3/s)	3.33% AEP Peak Flow (m3/s)	1% AEP Peak Flow (m3/s)	1% AEP + 35% CC Peak Flow (m3/s)	1% AEP + 75% CC Peak Flow (m3/s)	0.1% AEP Peak Flow (m3/s)
Irk_005	Upstream extent of River Irk	383400, 401800	24.50	34.60	40.51	55.83	70.88	69.53
Irk_001_int	Intervening catchment between downstream extent and Collyhurst weir	383850, 398900	1.85	2.62	3.06	4.22	5.36	5.19
Irk_003_int	Intervening catchment between Collyhurst weir and Moston confluence	383850, 399700	1.48	2.10	2.45	3.37	4.28	4.10
Irk_004_int	Intervening catchment between confluence and upstream model extent	385300, 400500	3.88	5.48	6.38	8.79	11.16	10.79
Most_002	Upstream extent of Moston Brook	388000, 401150	6.49	9.28	10.88	14.99	19.03	18.33
Most_003	Additional area	385000, 399900	1.32	1.89	2.24	3.08	3.91	3.82
Most_001_int	Intervening catchment between upper Moston Brook and confluence	383350, 400450	4.87	6.97	8.21	11.31	14.36	13.93

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Table 3 Event configuration for FEC modelling

Event	Inflows	Downstream Boundary
20% AEP	VICTORIA_NORTH_5YR_Arup_9pt5_v5.ied (as supplied with Arup Baseline model)	Irwell_DSBDY_20yr_v3.IED (as supplied with Arup Baseline model, no lower return period downstream boundary files provided)
3.33% AEP	VICTORIA_NORTH_30YR_Arup_9pt5_v5.ied (as supplied with Arup Baseline model)	Irwell_DSBDY_20yr_v3.IED* (as supplied with Arup Baseline model, closest return period downstream boundary file provided, no 30yr downstream boundary file supplied)
1% AEP	VICTORIA_NORTH_100YR_Arup_9pt5_v5.ied (as supplied with Arup Baseline model)	Irwell_DSBDY_100yr_v3.IED (as supplied with Arup Baseline model)
1% AEP + 35% climate change allowance	VICTORIA_NORTH_100YR_CC2080_Arup_9pt5_v5.ied (as supplied with Arup Baseline model)	Irwell_DSBDY_100yr_CC2080_v3.IED (as supplied with Arup Baseline model)
1% AEP + 75% climate change allowance	VICTORIA_NORTH_100YR_CC2080_upper_end_Arup_9pt5_v5.ied (created by WSP by scaling up flows in VICTORIA_NORTH_100YR_Arup_9pt5_v5.ied by 1.75)	Irwell_DSBDY_1000yr_v3.IED** (as supplied with Arup Baseline model, 1% AEP + 75% climate change allowance inflows close to 0.1% AEP inflows)
0.1% AEP	VICTORIA_NORTH_1000YR_Arup_9pt5_v5.ied (as supplied with Arup Baseline model)	Irwell_DSBDY_1000yr_v3.IED (as supplied with Arup Baseline model)

*The Irwell_DSBDY_20yr_v3.IED was used as the downstream boundary for the 3.33% AEP model runs as a 30 year (or 3.33%) downstream boundary IED was not supplied with the Arup Baseline model.

**Table 2 shows that the 1% AEP event plus 75% climate change allowance inflows are very similar to the 0.1% AEP inflows, therefore it was deemed appropriate to use the Irwell_DSBDY_1000yr_v3.IED as the downstream boundary condition for the 1% AEP event plus 75% climate change allowance runs.

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MODEL PERFORMANCE

Warning and Checks

The five 2D checks (all '2099 – Ignored repeat application of boundary to 2D cell. BC Type = HX') prior to simulation present in the Arup Baseline model also occur in the three models developed for this assessment.

For the FEC Baseline model, there are an additional two checks pre-simulation (2x CHECK 2370 – Ignoring coincident point found in Z Shape Layer) and three warnings pre-simulation (3x WARNING 2073 – Null Shape object ignored. Only Regions, Lines, Polylines & Multiple Polylines used). CHECK 2370 occurs where there are two points within a model cell and the value of only one of them is used to assign an elevation to the cell as part of a z shape layer, these relate to where design information for the Victoria Riverside development has been read into the model and the resolution of elevation points within the z shapes is higher than that of the model grid. The representation of Victoria Riverside has been checked within the model and is appropriate, therefore the coincident points flagged by TUFLOW are not impacting on the representation of the Victoria Riverside development. WARNING 2073 relates to "None" or "Null" objects, which GIS software may add to the layer to indicate deleted objects (particularly if using the shapefile format) – these objects are ignored by TUFLOW and do not influence the model set up or results. There are no checks or warnings during the FEC Baseline simulation.

For the 'application 5' model, there are eight additional checks pre-simulation as well as those already present in the Arup Baseline model. 8x 'CHECK 2370 – Ignoring coincident point found in Z Shape Layer' occur. Three of these relate to the Victoria Riverside development as they are also present in the FEC Baseline model, the additional five are due to the representation of the 'application 5' model itself within the model using elevation points at a higher resolution than the 4m cell size. There are 643 warnings pre-simulation for the 'application 5' model, these are all 'WARNING 2073 – Null Shape object ignored. Only Regions, Lines, Polylines & Multiple Polylines used'. As explained above, warning 2073 has no impact on the model and relates to objects that have been deleted from GIS shapefiles. There are no checks or warnings during the 'application 5' simulation.

For the 'application 4' model, there are an additional two checks pre-simulation (2x CHECK 2370 – Ignoring coincident point found in Z Shape Layer) associated with the Victoria Riverside development and 238 warnings pre-simulation (238x WARNING 2073 – Null Shape object ignored. Only Regions, Lines, Polylines & Multiple Polylines used) relating to objects that have been deleted from shapefiles within the model, this has no impact on the model.

Model Stability

A number of model outputs were checked to understand the model stability and ultimately the reliability of the model results, particularly through the Red Bank area. The 1D runtime plots for the FEC Baseline

model, 'application 5' model and 'application 4' model are shown on Figure 7, Figure 8 and Figure 9 respectively. Each runtime plot shows only minor poor convergence throughout the model run showing that the 1D model is generally stable.

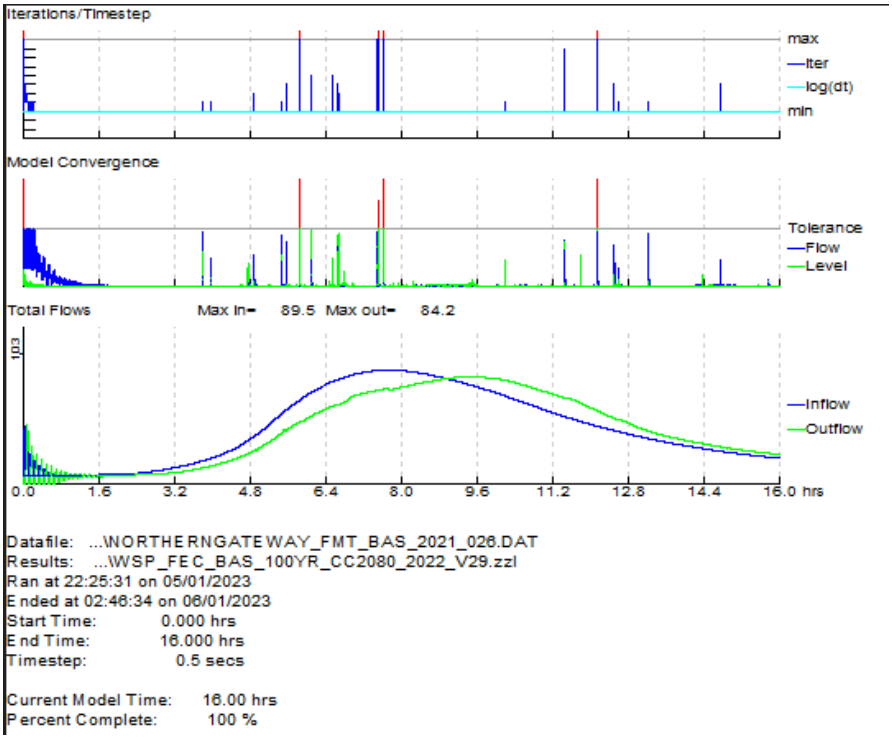

Figure 7 1D runtime plot FEC Baseline model

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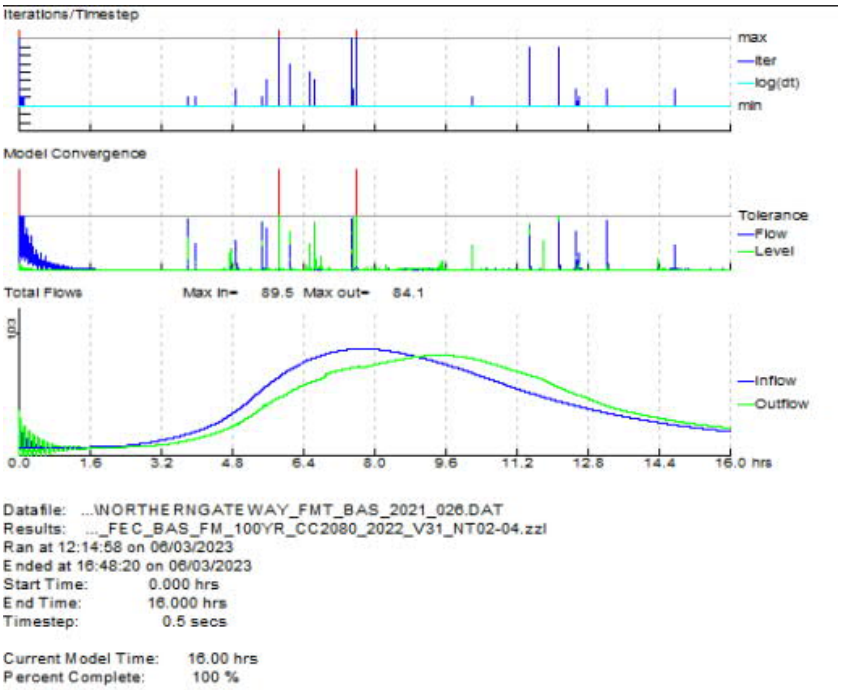

Figure 8 1D runtime plot 'application 5' model

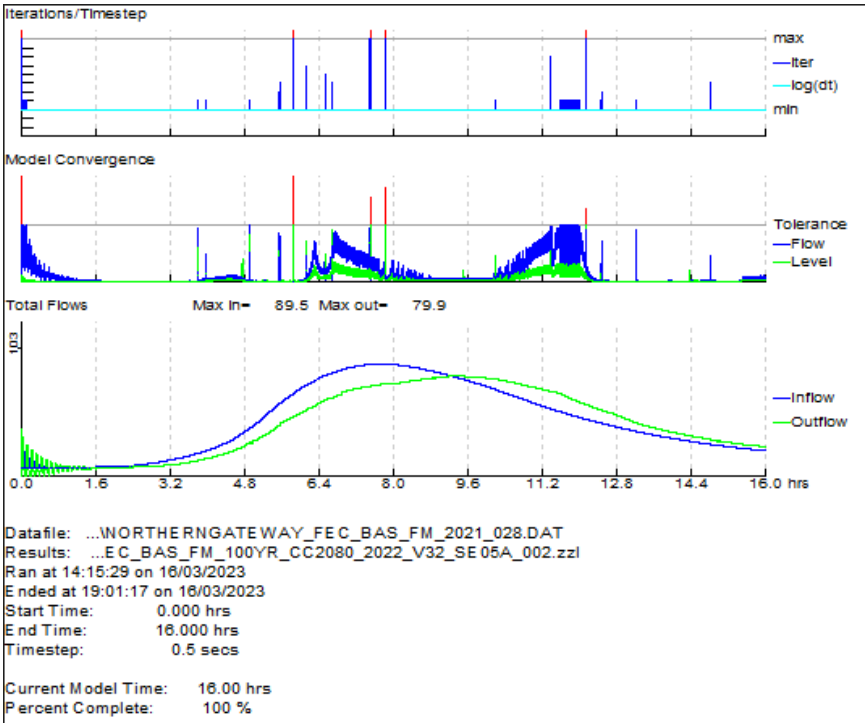

Figure 9 1D runtime plot 'application 4' model

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In the initial EA review of the ‘application 4’ model, it was noted that the model was more unstable in the 1D throughout the reach of the ‘application 4’ development than the FEC Baseline model. The 1D ‘application 4’ model has been updated following the EA review to reconcile the 1D bank heights on the right bank adjacent to plots RB06 and RB07 with the 2D bank heights (both are now set to 30mAOD). Unfortunately, there is some instability in the flows approaching the peak and after the peak through this reach for the 'application 4' model. WSP did look to improve this but couldn’t find a solution to smooth the flows, the instability is related to the large exchange of water between 1D and 2D as the revised banks are overtopped in the 'application 4' model. This phenomenon does not affect the peak water levels predicted in the 1D and does not cause 2D instabilities. Therefore, the impact on model results is negligible. The difference in flows at node IRKR01_1081 between the FEC Baseline model and the ‘application 4’ model is shown on Figure 10. The difference in stage between the two models is shown in Figure 11.

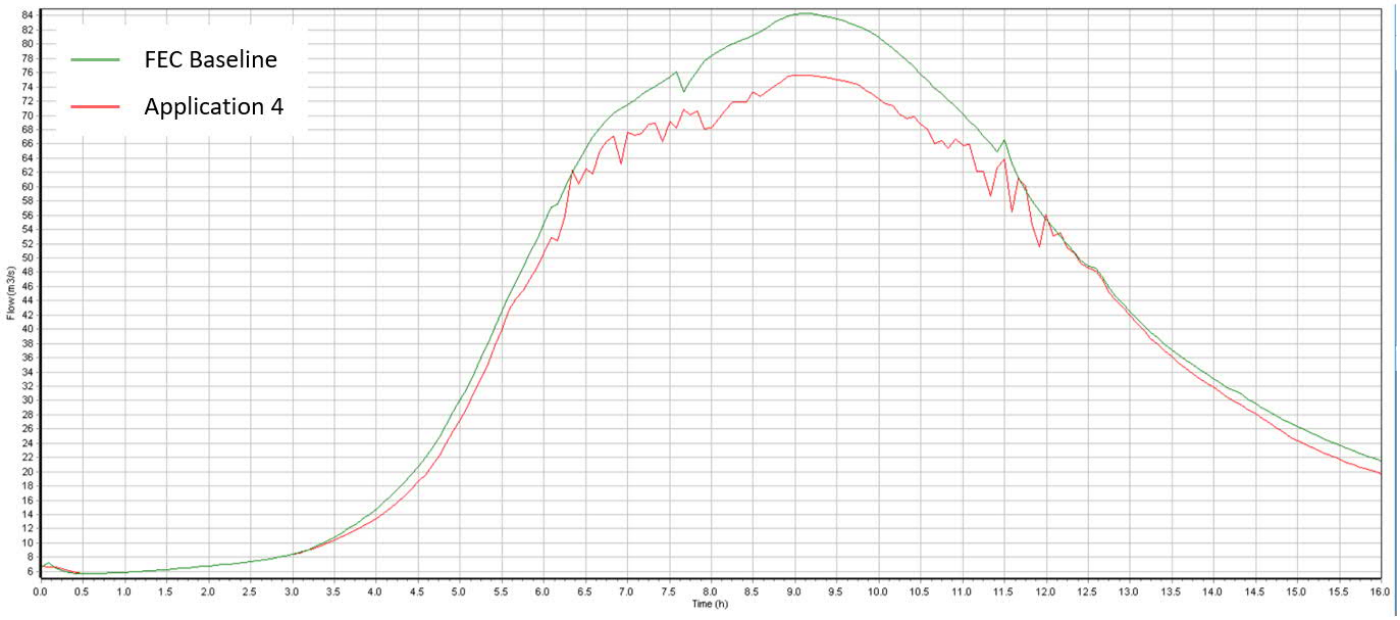

Figure 10 Comparison of flow variability at model node IRKR01_1081 adjacent to plot RB07 and the western end of Travis Island

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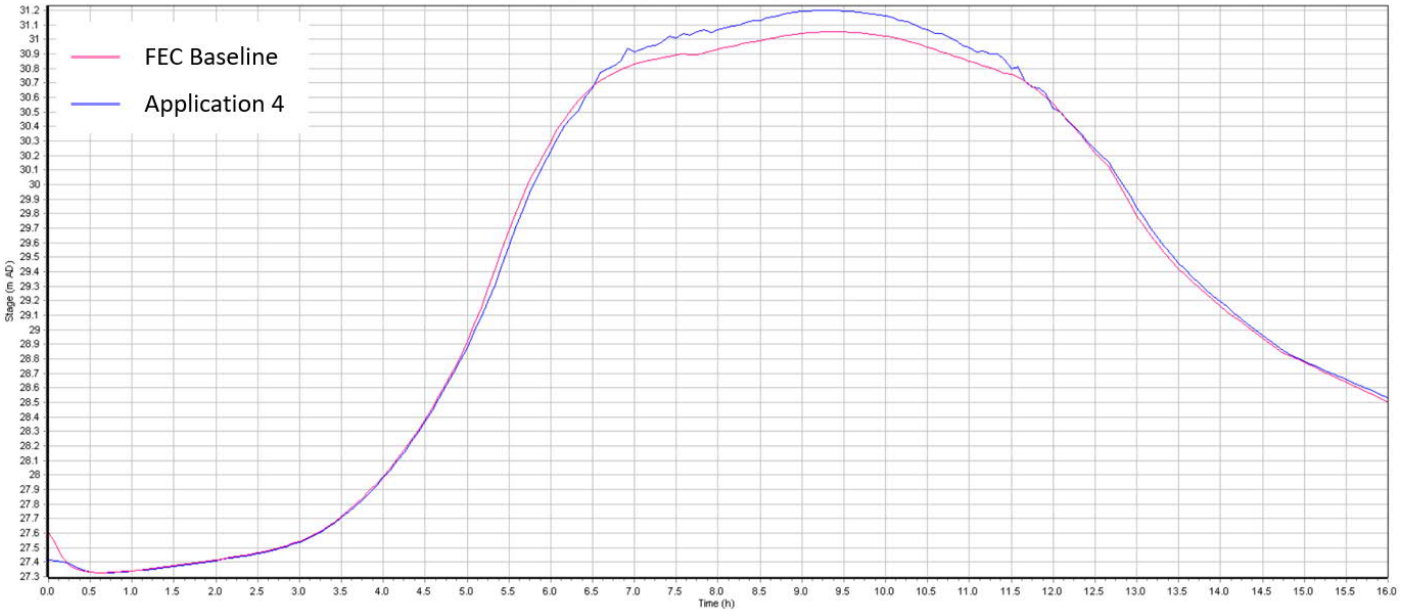

Figure 11 Comparison of stage at model node IRK01_1081

The change in volume between 1D and 2D (dVol) for each model for the design event (1% AEP + 35% climate change) has been plotted and is shown in Figure 12 for the FEC Baseline, Figure 13 for 'application 5' and Figure 14 for 'application 4'. As stated in the Data Collection section, it should be noted that there are issues with the dVol values in the Arup 2022 Baseline model, which propagate from Moston Brook. Moston Brook is upstream of the area of interest for this study and the instabilities at this location do not have a bearing on the results in the Red Bank area. Therefore, WSP has not sought to improve stability on the Moston Brook reach of the model as it is outside the scope of these works. As such, the issues with the dVol values are present within the FEC versions of the model presented in this report but there is no impact of these on the results at Red Bank. In Figure 12, the FEC Baseline dVol plot has been compared to the Arup 2022 Baseline dVol plot (for the 1% AEP event +35% climate change) to show the negligible difference between the two models.

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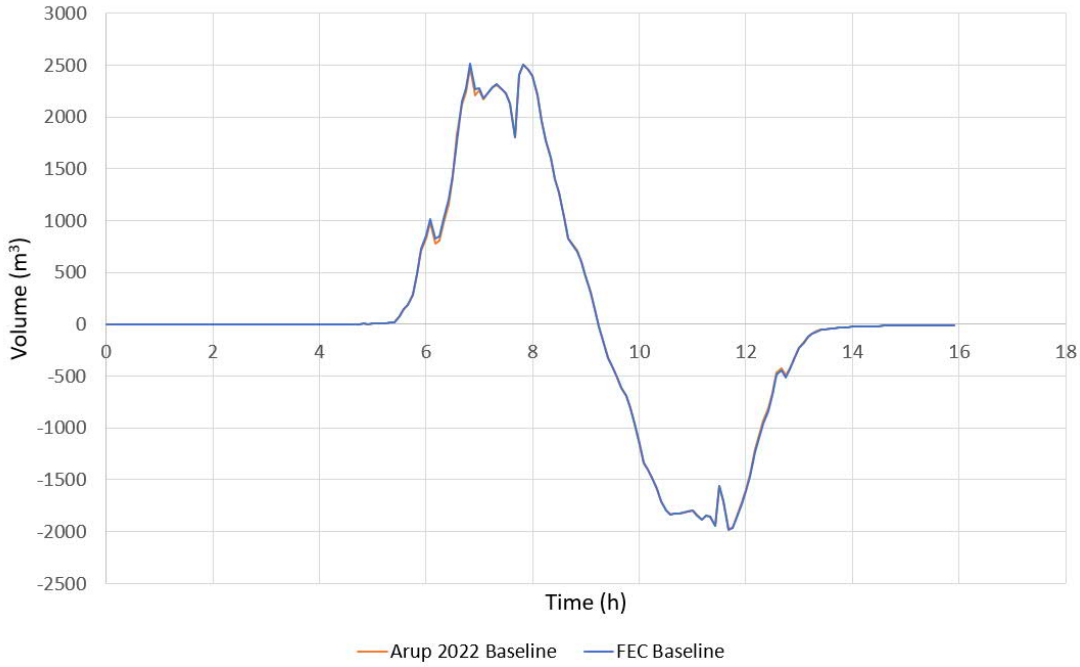

Figure 12 FEC Baseline dVol plot and comparison with Arup 2022 Baseline dVol plot

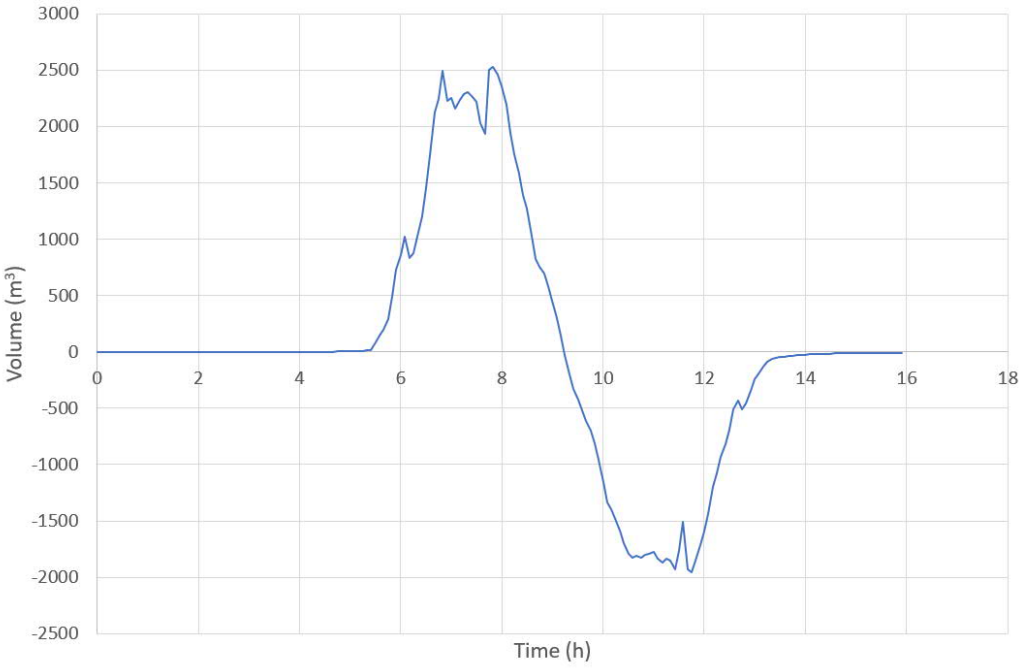

Figure 13 'Application 5' dVol plot

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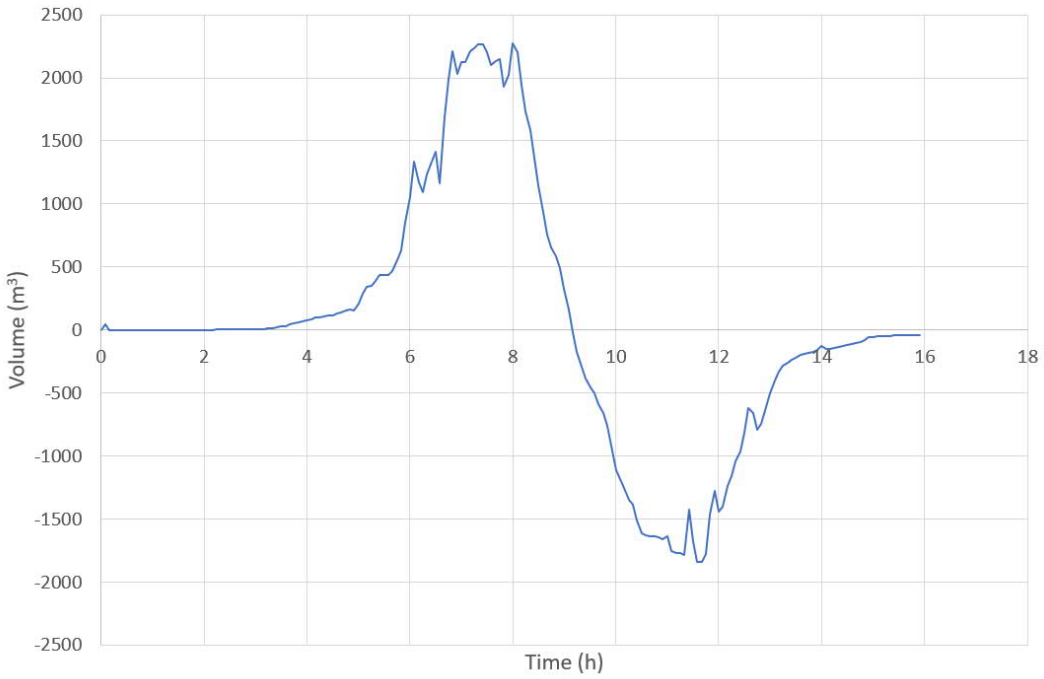

Figure 14 'Application 4' dVol plot

TUFLOW advise that the mass balance error within models should not exceed +/- 1% for significant periods. The cumulative mass balance error for each model was plotted for the design event as an additional model stability check and is shown in Figure 15, Figure 16 and Figure 17. There are spikes of mass error beyond -1% around 5 hours into both the FEC Baseline and ‘application 5’ model runs; however the mass error is not outside of the optimum range for a significant period of time. The mass error during the ‘application 4’ model run is within +/- 1%. This suggests that the 2D model is generally stable.

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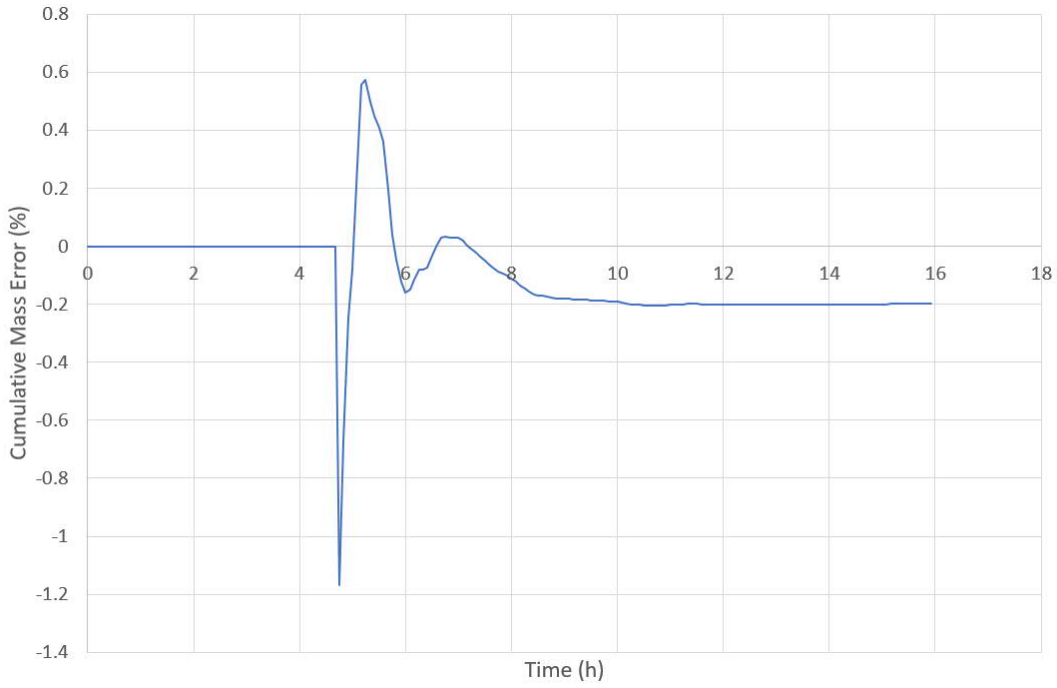

Figure 15 FEC Baseline cumulative mass error 1% AEP event + 35% climate change

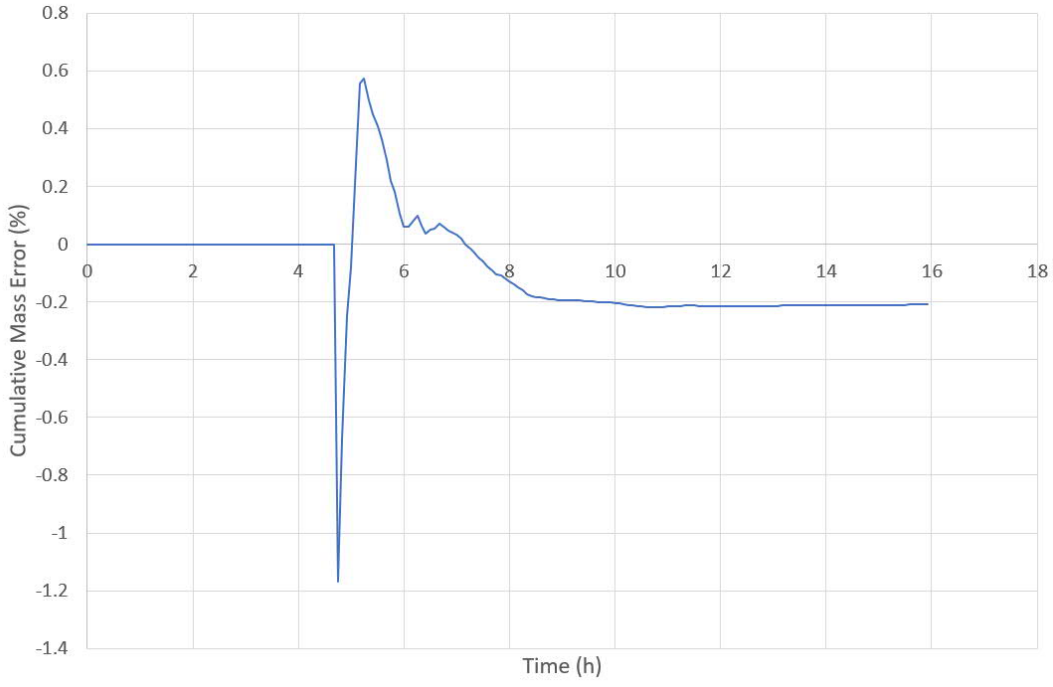

Figure 16 'Application 5' cumulative mass error 1% AEP event + 35% climate change

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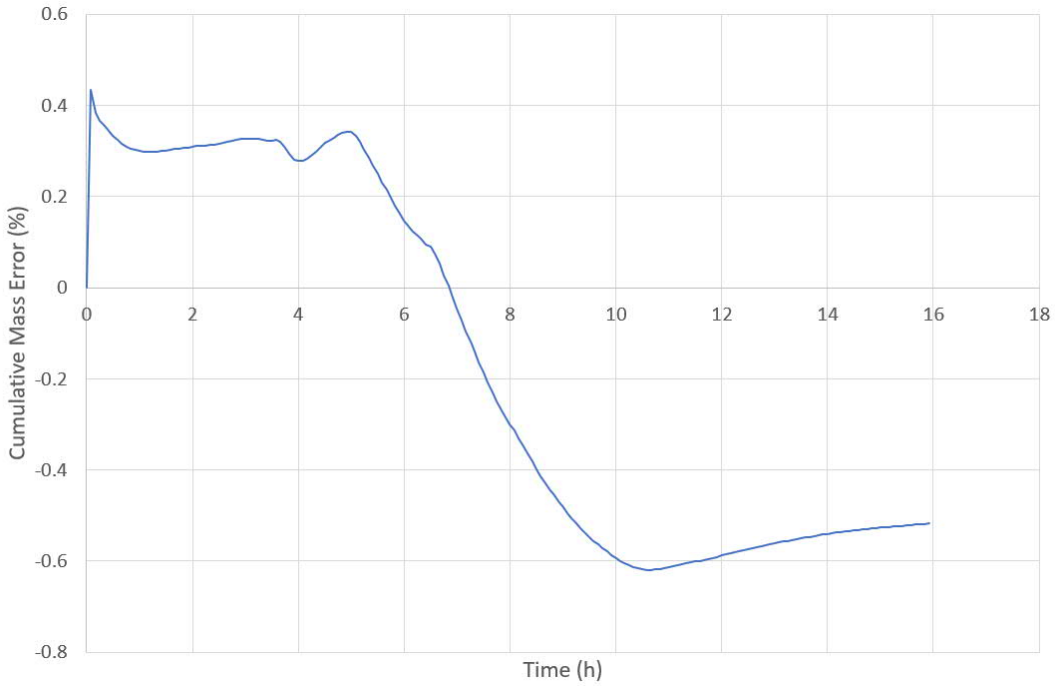

Figure 17 'Application 4' cumulative mass error 1% AEP event + 35% climate change

MODEL RESULTS

Overview

Both the ‘application 4’ and ‘application 5’ models have been run for six events, the flood depth and extent predicted by each model for each event is shown on the maps provided in Appendix G. The FEC Baseline model has been run for the 1% AEP event plus 35% climate change allowance to determine the impact of each of the developments on flood risk for the design event. The flood depth and extent predicted by the FEC Baseline model for the 1% AEP event plus 35% climate change allowance are presented in Appendix G. The FEC Baseline model shows that the ‘application 5’ development is at low flood risk with only a small area of plot NT04 predicted to flood. The RB plots that form part of the ‘application 4’ development are at much greater flood risk and therefore displace a greater volume of flood water. The following section discusses the impact of both ‘application 4’ and ‘application 5’ on flood extent, water levels and flood mechanisms. The models have been used to determine the FFLs for each development as discussed in the Flood Risk Assessment.

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Assessment of Development Impact

The FEC Baseline model has been used to test the impact of the 'application 5' and 'application 4' developments. The flood extent and water level results of the model scenarios representing the two developments have been compared to that of the FEC Baseline model for the 1% AEP event plus 35% climate change (the design event) to determine the impact of the developments in terms of flood risk. The model results have also been interrogated to determine the impact of each development on flood mechanisms and flow routes.

The difference in maximum water level between the FEC Baseline and the 'application 5' and 'application 4' model scenarios has been assessed and is presented as "impact" on the drawings in Appendix F comparing the results using thematic mapping. The thematic maps have been banded using the Flood Risk Magnitude Criteria outlined in Table 3.71 "Estimating the magnitude of an impact on an attribute" of LA 113 Road Drainage and the Water Environment (formerly HD 45/09) Revision 1[5] and is summarised in Table 4 below.

An additional two categories have been used for the thematic maps to show the areas benefiting from measures (i.e. no longer flooding) and areas that are newly flooded (adversely impacted), refer to Table 5.

Table 4 Flood Risk Magnitude Criteria

Magnitude	Change in peak flood level
Major Adverse	>100mm
Moderate Adverse	>50mm
Minor adverse	>10mm
Negligible	±10mm
Minor beneficial	>-10mm
Moderate beneficial	>-50mm
Major beneficial	>-100mm

[5] Design Manual for Roads and Bridges, LA 113 Road Drainage and the Water Environment (formerly HD 45/09) Revision 1

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Table 5 Areas Benefiting or Newly Affected

Description	Legend
Area benefitting	Was wet now dry
Area adversely impacted	Was dry now wet

FLOOD EXTENT

The difference in flood extent between the 'application 5' model results and FEC Baseline model results is minimal as only a small amount of flood water (<2m^3) is displaced by the 'application 5' development (as one of the buildings on plot NT04 just encroaches onto the floodplain). This is shown by the minimal black area on drawing 79268-MR1-002 in Appendix F showing the area that 'was wet now dry'.

There is more of a difference in flood extent between the 'application 4' model results and FEC Baseline model results as the RB plots displace more water on the floodplain. The areas where water is displaced by the buildings on plots RB10, RB06, RB07 and RB16 show in pink (was wet now dry) on drawing 79268-MR1-003 in Appendix F. There are additional areas of pink on drawing 79268-MR1-003 too, most notably on the south side of the live railway viaduct where a significant area of flood risk is shown to be removed in the 'application 4' model. There are also areas shown in black (was wet now dry) on drawing 79268-MR1-003 associated with the proposed terracing on Travis Island and in front of plots RB06 and RB07 where water is being stored during flood events.

WATER LEVELS

The impact of the 'application 4' and 'application 5' models compared to the FEC Baseline model is also shown on the drawings in Appendix F. Drawing 79268-MR1-002 shows that in general the impact of the 'application 5' model on water levels compared to the FEC Baseline model is negligible.

In terms of water level changes as a result of the 'application 4' development, there are generally decreases in water level through the development area as well as upstream and downstream as shown by the green areas on drawing 79268-MR1-003 in Appendix F. On Collyhurst Road and Dantzic Street, peak flood levels for the 1% AEP event plus 35% climate change allowance are reduced by more than 0.1m (major beneficial). Water levels upstream of the footbridge to St Catherine's Wood on Collyhurst Road up to Collyhurst Weir are reduced by more than 0.1m. On the eastern side of Dantzic Street, water levels are reduced by up to 0.15m. On the western side of Danztic Street, water levels are reduced by up to 0.24m. There is also a significant reduction in water levels on the RB10 plot and to the north of this with water levels reducing by up to 0.12m (major beneficial). Between the RB10 and RB06/07 development plots, in the area including and surrounding RB09 (owned by a different developer) there is also a reduction in flood levels of up to 0.029m (minor beneficial).

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A significant increase in water levels through the 'application 4' development reach alongside Travis Island and in front of RB06/07 is shown in channel as a result of the 'application 4' development. This is where the buildings in the 'application 4' development are displacing water and causing levels to increase in the channel. There are also significant increases in water level where the terracing is proposed in front of plots RB06/07 as this area is being used for flood storage during the design event.

The maximum depth of water predicted against the flood wall on Travis Island is approximately 3m as shown on Figure 18, this depth of water is predicted along the most western 21m of the proposed flood wall. It may be that the terracing levels could be raised for the most western end of Travis Island as part of the detailed design for this area to prevent such high flood depths against the wall. It is unlikely that raising the terrace levels on the western end of Travis Island where the high depths occur will significantly reduce the flood storage provided at Travis Island to mitigate for the 'application 4' development. It should also be noted that high flood depths (~3m) are predicted on the terracing at the back of the buildings on plots RB16 and RB17 (between the buildings and the River Irk) as shown on Figure 18. Careful consideration of flood hazard and public safety during flood events will be required at detailed design stage for this area.

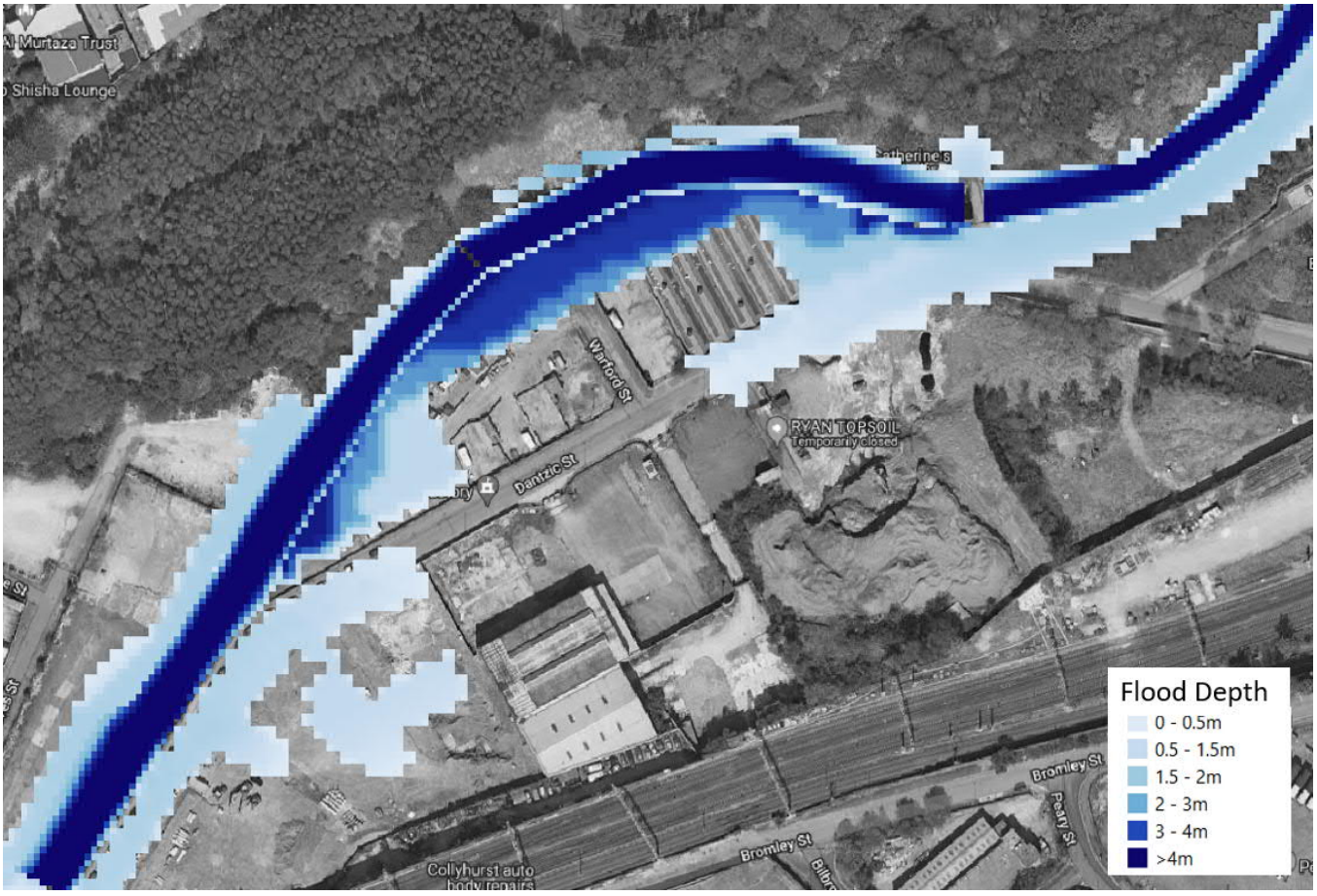

Figure 18 Predicted flood depths on Travis Island for 1% AEP event plus 35% climate change allowance

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Outside of the 'application 4' development, there is either a reduction in water levels or a negligible impact on water levels as shown on drawing 79268-MR1-003.

FLOOD MECHANISMS

The FEC Baseline model shows that the main existing flood mechanisms into the Red Bank area are:

1) *Water overtopping the left bank of the River Irk upstream of Collyhurst Weir and flowing along Collyhurst Road onto Dantzic Street*
2) *Water overtopping the left bank of the River Irk onto Travis Island directly*
3) *Water overtopping the right bank of the River Irk upstream of Union Bridge (flooding the area proposed for plots RB06 and RB07)*
4) *Water overtopping the right bank of the River Irk downstream of Union Bridge (flooding plot RB10 and surrounding areas)*
5) *Water flowing from the right bank of the River Irk over Union Bridge and onto Dantzic Street plus through gaps in the live railway viaduct on the south side of the River Irk*

Due to the minimal impact of the 'application 5' development on the floodplain, there is a negligible impact on flood mechanisms as a result of this development.

The 'application 4' model has the following impacts on each flood mechanism:

1) *Water overtopping the left bank of the River Irk upstream of Collyhurst Weir and flowing along Collyhurst Road onto Dantzic Street* – no impact on this flood mechanism
2) *Water overtopping the left bank of the River Irk onto Travis Island directly* – the presence of the buildings on Travis Island means that a large area on the eastern side of Travis Island is no longer flooded. However, due to the terracing proposed and lowering of the riverbanks, additional water overtops onto the western side of Travis Island and without inclusion of the flood wall, this would cause an increase in water levels on the western side of Dantzic Street.
3) *Water overtopping the right bank of the River Irk upstream of Union Bridge (flooding the area proposed for plots RB06 and RB07)* – Instead of flooding the area proposed for buildings on RB06 and RB07 (which are raised above the flood level), flooding at this location is concentrated on the terracing proposed as part of 'application 4'.
4) *Water overtopping the right bank of the River Irk downstream of Union Bridge (flooding plot RB10 and surrounding areas)* – There is little impact on this flood mechanism, however the proposed building on plot RB10 does displace water.
5) *Water flowing from the right bank of the River Irk over Union Bridge and onto Dantzic Street plus through gaps in the live railway viaduct on the south side of the River Irk* – This flood mechanism still occurs with the 'application 4' development in place but the volumes of flood water flowing

across Union Bridge and onto Dantzic Street are less. A significant area to the south of the live railway viaduct is removed from the floodplain with the 'application 4' development in place as shown on drawing 79268-MR1-003 in Appendix F.

RECOMMENDATIONS

'Application 4' is an outline planning application; additional flood modelling and assessment is likely to be required at the detailed design stage to support the detailed application(s) for the development plots included in 'application 4'. The following recommendations for the detailed design stage are made:

- Additional flood events to those modelled for 'application 4' may be required at detailed design stage to finalise design of scheme elements including the proposed terracing and the flood wall on Travis Island.
- Further consideration of the flood wall on Travis Island will be required at detailed design stage, there is potential for considerable hydraulic loading on the western end of the wall as it is currently proposed. It is likely that breach modelling will be required at detailed design stage to understand the risk associated with a failure of this flood defence. At detailed design stage, the flood wall should be designated a realistic height within the model including freeboard (using the residual uncertainty allowance guidance[3]) above the 1% AEP event plus 35% climate change allowance peak water level.
- Terracing levels on Travis Island should ideally be revised to reduce the depth of water against the western end of the flood wall.
- Consideration should be given to flood hazard and public safety during a flood event given the predicted high flood depths on Travis Island.
- At detailed design stage, a sensitivity test using a 2m cell size within the model may be required to model smaller flow routes in detail.

General recommendations:

- It was not deemed necessary for this assessment as it is out of the area of interest, but future users of the model may wish to improve stability on Moston Brook as this is the source of the dVol instability within the model. This will be particularly important if future studies require accurate results on Moston Brook.

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SUMMARY

WSP were commissioned by FEC to understand the impacts of the 'application 5' development and 'application 4' development on flood risk within the Red Bank area. Detailed planning permission is being sought for 'Application 5' and outline planning permission is being sought for 'Application 4'. The Arup 2022 Baseline model (approved by the EA in October 2022) was used as the basis for the flood modelling. A FEC Baseline version of the model has been created to include representation of the Victoria Riverside development, which is currently being constructed and therefore has consent. It is assumed that the Victoria Riverside development will be built by the time either the 'application 5' or 'application 4' developments are built. A small update to the 1D-2D linking adjacent to development plot RB10 was also made within the FEC Baseline model to represent the spillway into the river on plot RB10 and the full width of the river upstream of the culvert under the railway viaduct at this location.

A version of the model to represent the 'application 5' development was then created and the results of this model compared to the FEC Baseline model, the impact mapping shows a negligible impact on flood risk elsewhere as a result of the NT02-04 development.

A version of the model was also created to represent the 'application 4' development, which includes the buildings on the RB plots that are within the floodplain (and therefore displace flood waters) and the mitigation measures included as part of the development to offset its impact of flood risk. Terracing of the riverbanks and floodplain is proposed in front of plots RB16/17 and plots RB06/07 to provide storage during flood events. The impact mapping shows that the 'application 4' development including the mitigation measures does not have an adverse impact on flood risk elsewhere and in fact a betterment is seen over a large area including a reduction in flood extent on the south bank of the River Irk near to the live railway viaduct.

As discussed, there are known stability issues within the Arup 2022 Baseline model on Moston Brook, these have not been addressed as part of this work as Moston Brook is outside of the area of interest for this study and the instabilities do not have an impact on results in the Red Bank area and WSP are confident in the results of the modelling explained in this note.

Recommendations have been made for further modelling work and considerations required at the detailed design stage of the 'application 4' development.

APPLICATION 4 – FFL STRATEGY:

THE STANDARD EA GUIDANCE FOR SETTING OF PROPOSED FINISHED FLOOR LEVEL'S (FFL'S) FOR BUILDINGS WHICH ARE AT RISK OF FLUVIAL FLOODING IS THAT THEY SHOULD BE SET AT OR ABOVE THE DESIGN FLOOD LEVEL (100 YEAR PLUS 35% CLIMATE CHANGE EVENT PLUS A 300mm ALLOWANCE FOR FREEBOARD). IT HAS NOT BEEN POSSIBLE TO ACHIEVE THIS WHILST MAINTAINING THE ACTIVE FRONTAGES TO THE PROPOSED BUILDINGS WHICH ARE AN IMPORTANT FEATURE OF THE DESIGN. WHERE THE EA REQUIREMENTS HAVE NOT BEEN ABLE TO BE ACHIEVED THE EA HAVE BEEN CONSULTED AT THE PRE-APPLICATION STAGE. FOR PLANNING APPLICATION 4 (OUTLINE), THE APPROACH AGREED WITH THE EA IS THAT THERE WILL BE NO VULNERABLE USES AT GROUND FLOOR LEVEL WHICH ARE SET BELOW THE DESIGN FLOOD LEVEL. FLOOD RESISTANCE AND RESILIENCE MEASURES ARE TO BE PROVIDED TO 600mm ABOVE THE DESIGN FLOOD LEVEL. SAFE ACCESS AND EGRESS ROUTES ARE PROVIDED ABOVE THE DESIGN FLOOD LEVEL TO ALL PLOTS.

RB05A

RB05B

RB05C

RB04

RB03

RB02

RB12B

RB01

RB17

RB17
MIN. FFL 31.36
(100 YR +35%)
MIN. FFL 31.62
(1000 YR)

RB16

RB16
MIN. FFL 31.36
(100 YR +35%)
MIN. FFL 31.62
(1000 YR)

RB06

RB06
MIN. FFL 31.20
(100 YR +35%)
MIN. FFL 31.43
(1000 YR)

RB07

RB07
MIN. FFL 31.20
(100 YR +35%)
MIN. FFL 31.43
(1000 YR)

RB10

RB10
MIN. FFL 30.34
(100 YR +35%)
MIN. FFL 30.87
(1000 YR)

Signal Gantry

DO NOT SCALE

KEY:

- SITE BOUNDARY
- FLOOD EXTENT 100 yr CC
- FLOOD EXTENT 1000 yr

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	28/03/2023	UB	FIRST ISSUE	SM	SM

DRAWING STATUS: S2 - FOR INFORMATION

wsp

8 First Street, Manchester, M15 4GU, UK
T+ 44 (0) 161 200 5000
wsp.com

CLIENT: FEC

ARCHITECT: MLM

SITE/PROJECT: RED BANK AND DANTZIC STREET

TITLE: APPLICATION 4 - MINIMUM FINISHED FLOOR LEVELS AND DESIGN FLOOD EXTENTS

SCALE @ A1:	CHECKED:	APPROVED:
1:1250	SM	SM

PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70079268	UB	UB	March 23

DRAWING No: RDB-WSP-XX-XX-DR-C-0016 REV: P01

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APPLICATION 5 – FFL STRATEGY:

THE STANDARD EA GUIDANCE FOR SETTING OF PROPOSED FINISHED FLOOR LEVEL'S (FFL'S) FOR BUILDINGS WHICH ARE AT RISK OF FLUVIAL FLOODING IS THAT THEY SHOULD BE SET AT OR ABOVE THE DESIGN FLOOD LEVEL (100 YEAR PLUS 35% CLIMATE CHANGE EVENT). IT HAS NOT BEEN POSSIBLE TO ACHIEVE THIS WHILST MAINTAINING THE ACTIVE FRONTAGES TO THE PROPOSED BUILDINGS WHICH ARE AN IMPORTANT FEATURE OF THE DESIGN. WHERE THE EA REQUIREMENTS HAVE NOT BEEN ABLE TO BE ACHIEVED THE EA HAVE BEEN CONSULTED AT THE PRE–APPLICATION STAGE. FOR PLANNING APPLICATION 5 (DETAILED).
PLOTS NT02 & NT03 ARE SET ABOVE THE DESIGN FLOOD LEVEL PLUS 300mm.
THE APPROACH FOR NT04 IS TO HAVE THE FFL SET BELOW THE DESIGN FLOOD LEVEL. THE DESIGN FLOOD LEVEL IS 31.55m AOD. THE PROPOSED FFL IS 30.955m AOD. FLOOD RESISTANT CONSTRUCTION WILL BE PROVIDE TO 600mm ABOVE FFL WHICH IS 31.555m AOD. FLOOD RESILIENCE WILL BE PROVIDED TO THE 100YR FLOOD LEVEL WHICH IS 31.84m AOD.

RB01
RB02
RB03
RB04
RB05A
RB05B
RB05C
RB06
RB07
RB10
RB12B
RB16
RB17

PLOT NT04
DESIGN FLOOD LEVEL – 31.56m AOD
PROPOSED FFL – 30.955m AOD
FLOOD RESISTANCE UPTO 610mm
ABOVE FFL – 31.56mm AOD
FLOOD RESILIENCE MEASURES UP TO
1000 YR FLOOD LEVEL – 31.93m AOD

PLOT NT03
FFL – 32.00m AOD
(THIS PLOT IS SET ABOVE
THE DESIGN FLOOD LEVEL
PLUS 300mm FREEBOARD)

PLOT NT02
FFL – 31.55m AOD
(THIS PLOT IS SET ABOVE
THE DESIGN FLOOD LEVEL
PLUS 300mm FREEBOARD)

DO NOT SCALE

KEY:

- SITE BOUNDARY
- FLOOD EXTENT 100 yr CC
- NT02–NT04 BOUNDARY
- FLOOD EXTENT 1000 YR

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	31/03/2023	UB	FIRST ISSUE	SM	SM

DRAWING STATUS: S2 - FOR INFORMATION

wsp
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T+ 44 (0) 161 200 5000
wsp.com

CLIENT: FEC

ARCHITECT: MLM

SITE/PROJECT: RED BANK AND DANTZIC STREET

TITLE: APPLICATION 5 - MINIMUM FINISHED FLOOR LEVELS AND DESIGN FLOOD EXTENTS

SCALE @ A1:	CHECKED:		APPROVED:
Custom	SM		SM
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70079268	UB	UB	March 23

DRAWING No: RDB-WSP-XX-XX-DR-C-0017 REV: P01

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NOTE:

THIS DRAWING SHOWS THE EXTENTS OF FLOODING FOR THE 100 YEAR AND 1000 YEAR EVENTS USING FEC BASELINE MODEL.
THE FEC BASELINE MODEL REPRESENTS CURRENT FLOOD RISK TO THE SITE FROM THE RIVER IRK PRIOR TO DEVELOPMENT.

RB01
RB02
RB03
RB04
RB05A
RB05B
RB05C
RB06
RB07
RB10
RB12B
RB16
RB17
NT02
NT03
NT04

DO NOT SCALE

KEY:

- SITE BOUNDARY
- FLOOD EXTENT 100 yr CC
- FLOOD EXTENT 1000 yr

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	28/03/2023	UB	FIRST ISSUE	SM	SM

DRAWING STATUS: S0 - WORK IN PROGRESS

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8 First Street, Manchester, M15 4GU, UK
T+ 44 (0) 161 200 5000
wsp.com

CLIENT: FEC

ARCHITECT: MLM

SITE/PROJECT: RED BANK AND DANTZIC STREET

TITLE: FEC BASELINE MODEL 100 YEAR AND 1000 YEAR FLOOD EXTENTS

SCALE @ A1:	CHECKED:	APPROVED:
1:1250	SM	SM

PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70079268	UB	UB	March 23

DRAWING No:	REV:
RDB-WSP-XX-XX-DR-C-0018	P01

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Appendix 10.1

Appendix H - Flood Mitigation

384100 384350 384600 384850 385100 385350 385600

400250 400000 399750 399500 399250 399000

0 100 200 300 400 m

KEY

Hazard Value

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

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	22/03/23	KF	FIRST ISSUE	JC	LG

STATUS: FOR INFORMATION ONLY

wsp
Matrix House, Basing View,
Basingstoke, HANTS, RG21 4HJ
Tel: +44 (0) 1256 318 800
Fax: +44 (0) 1256 318 70
www.wsp.com

CLIENT: FEC NORTHERN GATEWAY DEVELOPMENT LIMITED

ARCHITECT: -

PROJECT: REDBANK & DANTZIC

TITLE: FEC Baseline model flood hazard 1% AEP + 35% climate change allowance

DRAWN:	CHECKED:	APPROVED:
KF	JC	LG
QGIS FILE:	SCALE @A3: 1:5,000	DATE: 24/03/23

PROJECT No:	DRAWING No:	REV:
70079268	79268-MR1-016	A

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384100 384350 384600 384850 385100 385350 385600

400250 400000 399750 399500 399250 399000

NT04
NT03
NT02

0 100 200 300 400 m

KEY

Hazard Value

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

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	22/03/23	KF	FIRST ISSUE	JC	LG

STATUS: FOR INFORMATION ONLY

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Matrix House, Basing View,
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www.wsp.com

CLIENT: FEC NORTHERN GATEWAY DEVELOPMENT LIMITED

ARCHITECT: -

PROJECT: REDBANK & DANTZIC

TITLE: 'Application 5' model flood hazard 1% AEP +35% climate change allowance

DRAWN:	CHECKED:	APPROVED:
KF	JC	LG

QGIS FILE:	SCALE @A3:	DATE:
	1:5,000	27/03/23

PROJECT No:	DRAWING No:	REV:
70079268	79268-MR1-017	A

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384100 384350 384600 384850 385100 385350 385600

400250 400000 399750 399500 399250 399000

RB06 and RB07

RB16 and RB17

RB10

0 100 200 300 400 m

KEY

Hazard Value

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

REV	DATE	DRW	DESCRIPTION	CHK	APP
A	22/03/23	KF	FIRST ISSUE	JC	LG

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www.wsp.com

CLIENT: FEC NORTHERN GATEWAY DEVELOPMENT LIMITED

ARCHITECT: -

PROJECT: REDBANK & DANTZIC

TITLE: 'Application 4' model flood hazard 1% AEP + 35% climate change allowance

DRAWN:	CHECKED:	APPROVED:
KF	JC	LG

QGIS FILE:	SCALE @A3:	DATE:
	1:5,000	24/03/23

PROJECT No:	DRAWING No:	REV:
70079268	79268-MR1-018	A

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Appendix 10.1

Appendix I - Overland Flow Plan

DO NOT SCALE

KEY:

ROUTE OF SURFACE WATER EXCEEDANCE FLOW

APPLICATION BOUNDARY

SITE LOCAL LOW/HIGH POINTS

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	29/03/2023	JEB	ISSUED FOR PLANNING	SM	SM

DRAWING STATUS:
S2 - FOR INFORMATION

wsp

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T+ 44 (0) 161 200 5000
wsp.com

CLIENT:
FAR EAST CONSORTIUM

ARCHITECT:
HAWKINS BROWN/MACREANOR LAVINGTON

SITE/PROJECT:
REDBANK & DANTZIC STREET

TITLE:
APPLICATION 5
EXCEEDANCE - OVERLAND FLOW ROUTES

SCALE @ A1:	CHECKED:		APPROVED:
1:500	SM		SM
PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70079268	JEB	JEB	March 23

DRAWING No:	REV:
RDB-WSP-00-XX-DR-CV-00200	P01

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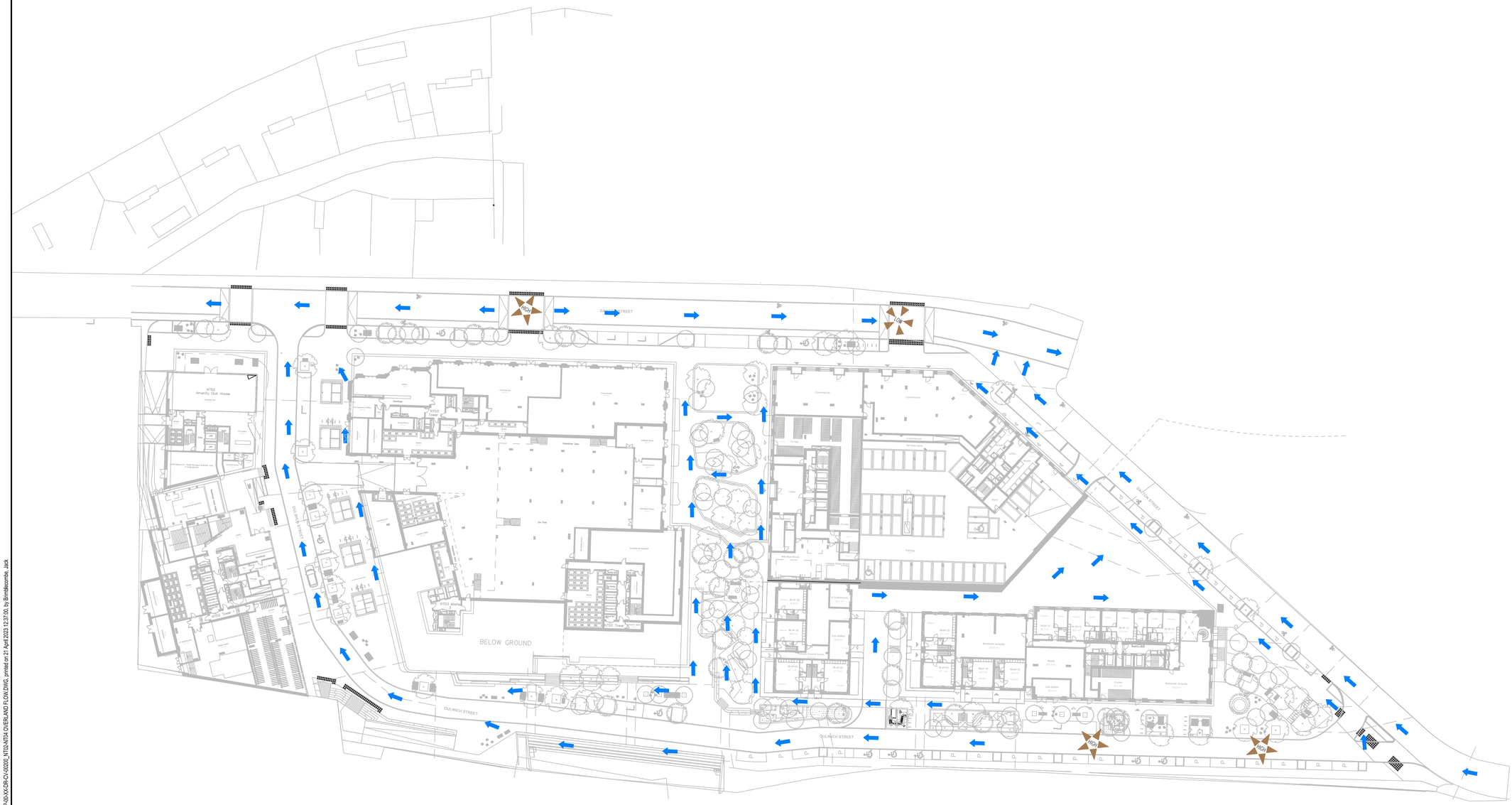
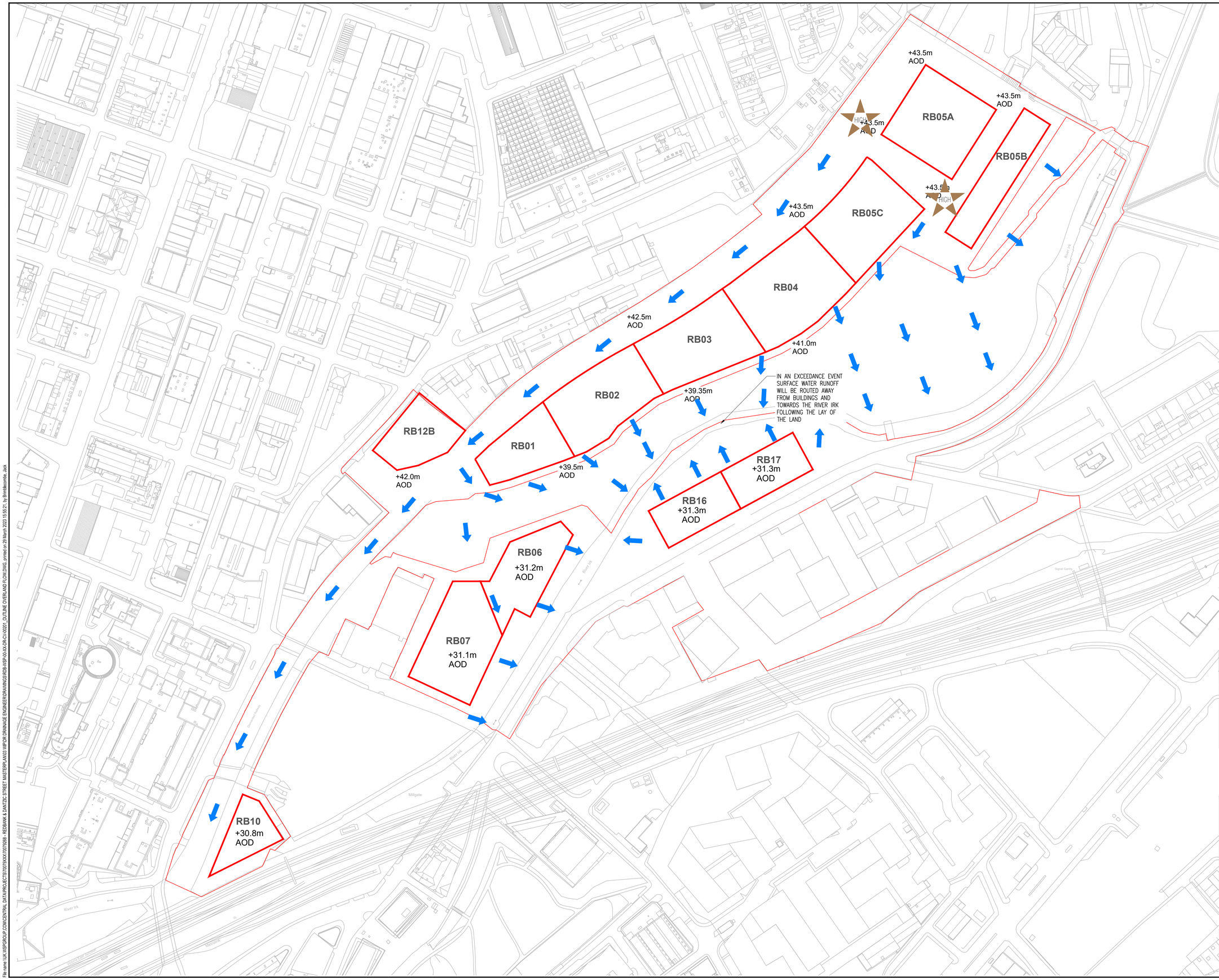

DULWICH STREET
DULWICH STREET
DULWICH STREET
DULWICH STREET
HIGH
LOW
HIGH
HIGH
N102 Amenity Club House
N103 Tower
N103 Mews
BELOW GROUND
Pedestrian Zone
Hot Pool
Commercial
Residential Amenity
Parking
Plant
Retail
Gym
Studio
Creche
Residential Lobby
Commercial Lobby
Service core
Residential Amenity
Residential Amenity
Residential Amenity



DO NOT SCALE

KEY:

- ROUTE OF SURFACE WATER EXCEEDANCE FLOW
- PLOT BOUNDARY
- APPLICATION BOUNDARY
- SITE LOCAL LOW/HIGH POINTS

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REV	DATE	BY	DESCRIPTION	CHK	APP
P01	31/03/2023	JEB	ISSUED FOR PLANNING	SM	SM

DRAWING STATUS: S2 - FOR INFORMATION

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8 First Street, Manchester, M15 4GU, UK
T+ 44 (0) 161 200 5000
wsp.com

CLIENT: FAR EAST CONSORTIUM

ARCHITECT: MACREANOR LAVINGTON

SITE/PROJECT: REDBANK & DANTZIC STREET

TITLE: APPLICATION 4
EXCEEDANCE - OVERLAND FLOW ROUTES

SCALE @ A1:	CHECKED:	APPROVED:
1:1250	SM	SM

PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70079268	JEB	JEB	March 23

DRAWING No: RDB-WSP-00-XX-DR-CV-00201 REV: P01

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Appendix 10.1

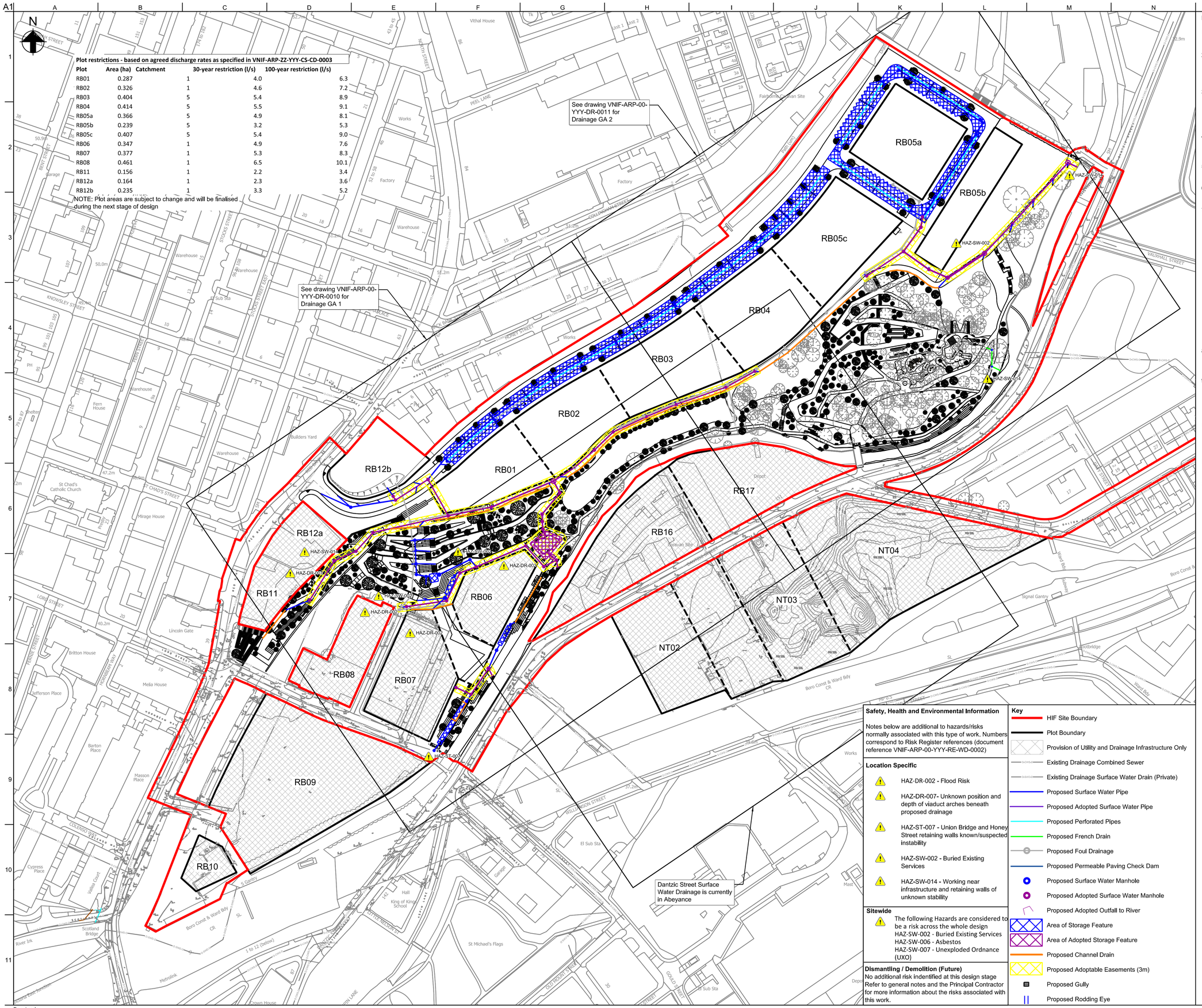
Appendix J - HIF Drainage Proposals

A1

Plot restrictions - based on agreed discharge rates as specified in VNIF-ARP-ZZ-YYY-CS-CD-0003

Plot	Area (ha)	Catchment	30-year restriction (l/s)	100-year restriction (l/s)
RB01	0.287	1	4.0	6.3
RB02	0.326	1	4.6	7.2
RB03	0.404	5	5.4	8.9
RB04	0.414	5	5.5	9.1
RB05a	0.366	5	4.9	8.1
RB05b	0.239	5	3.2	5.3
RB05c	0.407	5	5.4	9.0
RB06	0.347	1	4.9	7.6
RB07	0.377	1	5.3	8.3
RB08	0.461	1	6.5	10.1
RB11	0.156	1	2.2	3.4
RB12a	0.164	1	2.3	3.6
RB12b	0.235	1	3.3	5.2

NOTE: Plot areas are subject to change and will be finalised during the next stage of design



Safety, Health and Environmental Information

Notes below are additional to hazards/risks normally associated with this type of work. Numbers correspond to Risk Register references (document reference VNIF-ARP-00-YYY-RE-WD-0002)

Location Specific

- HAZ-DR-002 - Flood Risk
- HAZ-DR-007- Unknown position and depth of viaduct arches beneath proposed drainage
- HAZ-ST-007 - Union Bridge and Honey Street retaining walls known/suspected instability
- HAZ-SW-002 - Buried Existing Services
- HAZ-SW-014 - Working near infrastructure and retaining walls of unknown stability

Sitewide

The following Hazards are considered to be a risk across the whole design
HAZ-SW-002 - Buried Existing Services
HAZ-SW-006 - Asbestos
HAZ-SW-007 - Unexploded Ordnance (UXO)

Dismantling / Demolition (Future)

No additional risk indentified at this design stage
Refer to general notes and the Principal Contractor for more information about the risks associated with this work.

Key

- HIF Site Boundary
- Plot Boundary
- Provision of Utility and Drainage Infrastructure Only
- Existing Drainage Combined Sewer
- Existing Drainage Surface Water Drain (Private)
- Proposed Surface Water Pipe
- Proposed Adopted Surface Water Pipe
- Proposed Perforated Pipes
- Proposed French Drain
- Proposed Foul Drainage
- Proposed Permeable Paving Check Dam
- Proposed Surface Water Manhole
- Proposed Adopted Surface Water Manhole
- Proposed Adopted Outfall to River
- Area of Storage Feature
- Area of Adopted Storage Feature
- Proposed Channel Drain
- Proposed Adoptable Easements (3m)
- Proposed Gully
- Proposed Rodding Eye

Notes

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3. Layout is based on:
   - Landscape Architect masterplan drawing VNIF-PLA-ZZ-YYY-DR-L-1011 Rev P06 received 04/08/2022 by Planit.
   - Topographical Survey drawing PS-2158-TS by Paragon Surveys dated September 2021.
4. Existing Drainage layout based on the following information:
   - Utility Search Map drawing 97079 undertaken by Atkins dated 24/06/2021.
5. For the Infrastructure Specification refer to VNIF-ARP-ZZ-YYY-SP-C-0001.
6. This drawing should be read with reference to Arup's full WS4 drawings and specifications.
7. Utilities have been drawn to PAS128 standard. The Located Service Classification table below gives a brief overview. For further details refer to document 'PAS 128:2014 Specification for underground utility detection, verification and location'.

Located Service Classification	Certainty/Risk
Type A Verification + Visual Identification	A
Type B Detection + Typically GPR and EML techniques are used	B
Type C Site reconnaissance + Physical surface features identified	C
Type D Desktop utility records search	D

Despite Arup's best efforts to accurately display all information, the information is provided for general guidance only and, prior to any construction works being undertaken, site investigation works shall be carried out.

8. A connection point has been provided for each plot within the HIF Boundary at a minimum depth of 2.0m to plot level (assuming FFL will be 0.5m above plot levels) as agreed with WSP.
9. Drainage construction materials:
   - Drainage pipes - Polypropylene and PVC in accordance with BS 13476
   - Manholes - Precast Concrete
   - Inspection Chambers - Polypropylene in accordance with BS 7158
10. As RB09/10 are outside the HIF Red Line Boundary, it has been agreed that a connection to the River Irk will be provided/constructed as part of the Plot construction. Discharge rates have been agreed as part of the HIF delivery.
11. For all schedules, refer to drawings VNIF-ARP-00-YYY-DR-CD-0009 and VNIF-ARP-00-YYY-DR-CD-0054.
12. For pipe abandonments and diversions, refer to drawing VNIF-ARP-00-YYY-DR-CU-1010 - 12 and schedule VNIF-ARP-ZZ-YYY-SH-CU-0001.

Rev	Date	Description	By	Chkd	Appd	Auth
P03	01/02/22		DH	RG	RG	---
P04	17/02/22	Amended for Planning Comments	DH	DH	RG	---
P05	28/02/22		DH	DH	RG	---
P06	21/03/22	Updated for Costing	ES	RG	RG	---
P07	04/04/22	Updated for Costing	DH	DH	RG	---
P08	14/07/22	WS4 Issue to BAM	DH	DH	RG	---
P09	08/08/22	Issued for Technical Approval	ES	DH	RG	---
P10	10/10/22	Full WS4 Issue	ES	DH	RG	---
P11	20/10/22	Issued for Full WS4	ES	DH	RG	---
C01	31/10/22	Issued for Full WS4	ES	DH	RG	HG

ARUP

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www.arup.com

Client

MANCHESTER CITY COUNCIL

bam nuttall

Project Title

Victoria North HIF Infrastructure & Enabling Works

Drawing Title

Proposed Site Wide Surface Water Drainage General Arrangement

Scale at A1	1:1250	Arup Job No	282022-00
Role	Civil - Drainage		
Suitability	A - Fit for Construction		

Rev	By	Chkd	Appd	
C01	ES	DH	RG	HG
	Date 19/10/22	Date 20/10/22	Date 20/10/22	31/10/22

Name

VNIF	- ARP -	00	- YYY -	DR	- CD -	0002
Project	Originator	Volume	Location	Type	Role	Number

Do not scale

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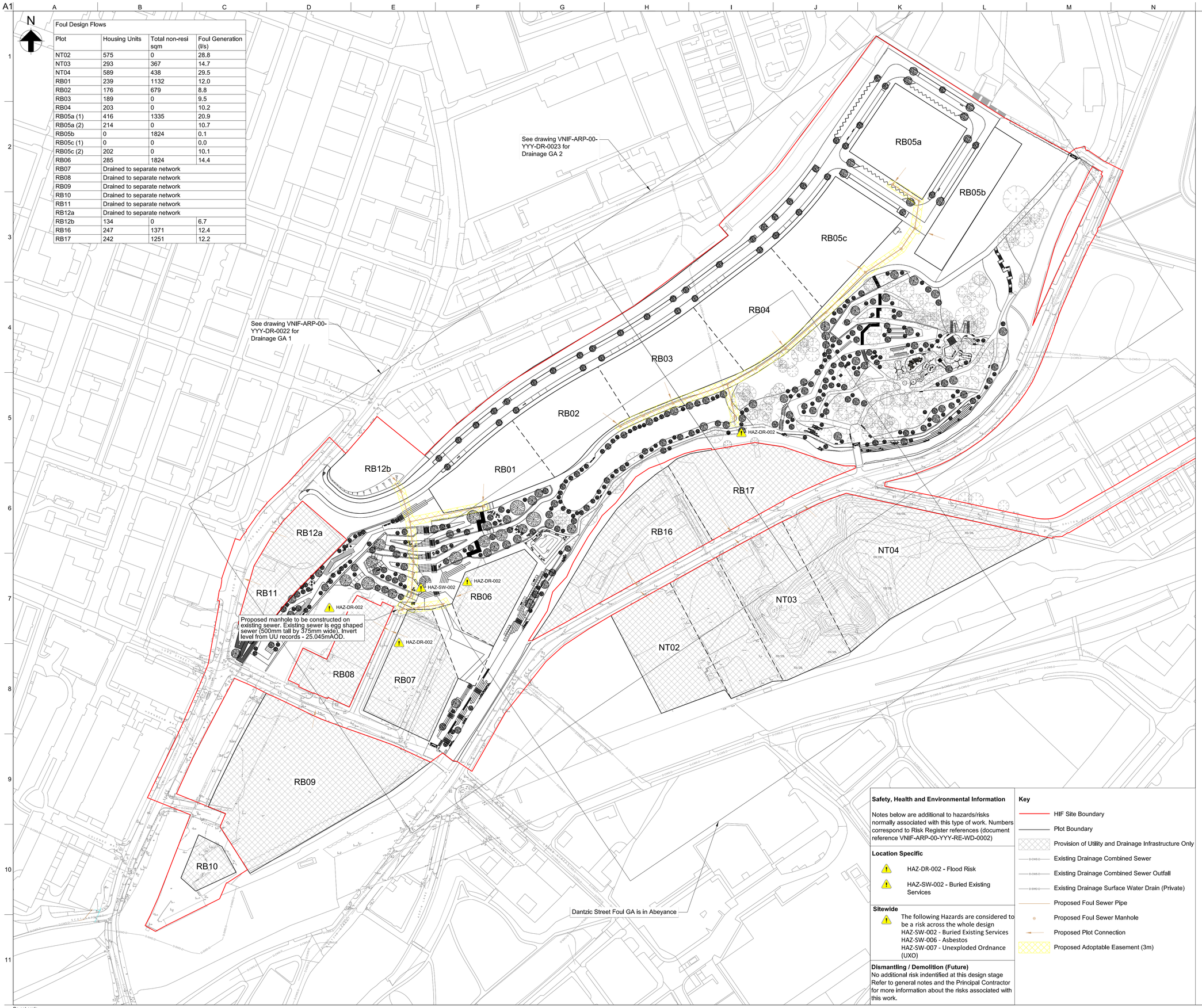
A1

Foul Design Flows			
Plot	Housing Units	Total non-resi sqm	Foul Generation (l/s)
NT02	575	0	28.8
NT03	293	367	14.7
NT04	589	438	29.5
RB01	239	1132	12.0
RB02	176	679	8.8
RB03	189	0	9,5
RB04	203	0	10.2
RB05a (1)	416	1335	20.9
RB05a (2)	214	0	10.7
RB05b	0	1824	0.1
RB05c (1)	0	0	0.0
RB05c (2)	202	0	10.1
RB06	285	1824	14.4
RB07	Drained to separate network		
RB08	Drained to separate network		
RB09	Drained to separate network		
RB10	Drained to separate network		
RB11	Drained to separate network		
RB12a	Drained to separate network		
RB12b	134	0	6.7
RB16	247	1371	12.4
RB17	242	1251	12.2



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   • Topographical Survey drawing PS-2158-TS by Paragon Surveys dated September 2021.
4. Existing Drainage layout based on the following information:
   - Utility Search Map drawing 97079 undertaken by Atkins dated 24/06/2021.
5. For the Infrastructure Specification refer to VNIF-ARP-ZZ-YYY-SP-C-0001.
6. This drawing should be read with reference to Arup's full WS4 drawings and specifications.
7. Utilities have been drawn to PAS128 standard. The Located Service Classification table below gives a brief overview. For further details refer to document 'PAS 128:2014 Specification for underground utility detection, verification and location'.

Located Service Classification	Certainty/Risk ↓
Type A Verification + Visual identification	
Type B Detection + Typically GPR and EML techniques are used	Class ↓
Type C Site reconnaissance + Physical surface features identified	
Type D Desktop utility records search	

Despite Arup's best efforts to accurately display all information, the information is provided for general guidance only and, prior to any construction works being undertaken, site investigation works shall be carried out.

8. A connection point for foul water has been provided for each plot within the HIF Boundary at a minimum depth of 1.5m to plot level (assuming FFL will be 0.5m above plot level) as agreed with WSP.
9. Drainage construction materials:
   - Drainage pipes - Vitrified Clay in accordance with BS EN 295
   - Manholes - Precast Concrete
   - Inspection Chambers - Polypropylene in accordance with BS 7158
10. For pipe abandonments and diversions, refer to drawing VNIF-ARP-00-YYY-DR-CU-1010 - 12 and schedule VNIF-ARP-ZZ-YYY-SH-CU-0001.
11. For all schedules, refer to drawing VNIF-ARP-00-YYY-DR-CD-0017.
12. Foul rates and pipe sizing has been based upon FEC document "Redbank - Incoming Water Flowrates" - dated 12-05-22
13. Foul drainage runs have been designed to not exceed 75% capacity as stated in the DCG to provide capacity for further future provisions.

Safety, Health and Environmental Information

Notes below are additional to hazards/risks normally associated with this type of work. Numbers correspond to Risk Register references (document reference VNIF-ARP-00-YYY-RE-WD-0002)

Location Specific

HAZ-DR-002 - Flood Risk

HAZ-SW-002 - Buried Existing Services

Sitewide

The following Hazards are considered to be a risk across the whole design
HAZ-SW-002 - Buried Existing Services
HAZ-SW-006 - Asbestos
HAZ-SW-007 - Unexploded Ordnance (UXO)

Dismantling / Demolition (Future)

No additional risk indentified at this design stage
Refer to general notes and the Principal Contractor for more information about the risks associated with this work.

Key

- HIF Site Boundary
- Plot Boundary
- Provision of Utility and Drainage Infrastructure Only
- Existing Drainage Combined Sewer
- Existing Drainage Combined Sewer Outfall
- Existing Drainage Surface Water Drain (Private)
- Proposed Foul Sewer Pipe
- Proposed Foul Sewer Manhole
- Proposed Plot Connection
- Proposed Adoptable Easement (3m)

Rev	Date	Description	By	Chkd	Appd	Auth
P01	26/08/21		AS	AS	AS	—
P02	17/12/21		DH	RG	RG	—
P03	01/02/22		DH	RG	RG	—
P04	17/02/22	Amended for Planning Comments	DH	DH	RG	—
P05	04/04/22	Updated for Costing	DH	DH	RG	—
P06	14/07/22	WS4 Issue to BAM	DH	DH	RG	—
P07	08/08/22	Issued for Technical Approval	ES	DH	RG	—
P08	10/10/22	Full WS4 Issue	ES	DH	RG	—
P09	20/10/22	Issued for Full WS4	ES	DH	RG	—
C01	31/10/22	Issued for Full WS4	ES	DH	RG	HG

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Client

MANCHESTER CITY COUNCIL

bam nuttall

Project Title

Victoria North HIF Infrastructure & Enabling Works

Drawing Title

Proposed Foul Drainage General Arrangement

Scale at A1	Arup Job No
1:1250	282022-00

Role: Civil - Drainage

Suitability: A - Fit for Construction

Rev	By	Chkd	Appd	
C01	ES	DH	RG	HG
	Date 19/10/22	Date 20/10/22	Date 20/10/22	31/10/22

Name: VNIF - ARP - 00 - YYY - DR - CD - 0003
(Project | Originator | Volume | Location | Type | Role | Number)

Do not scale

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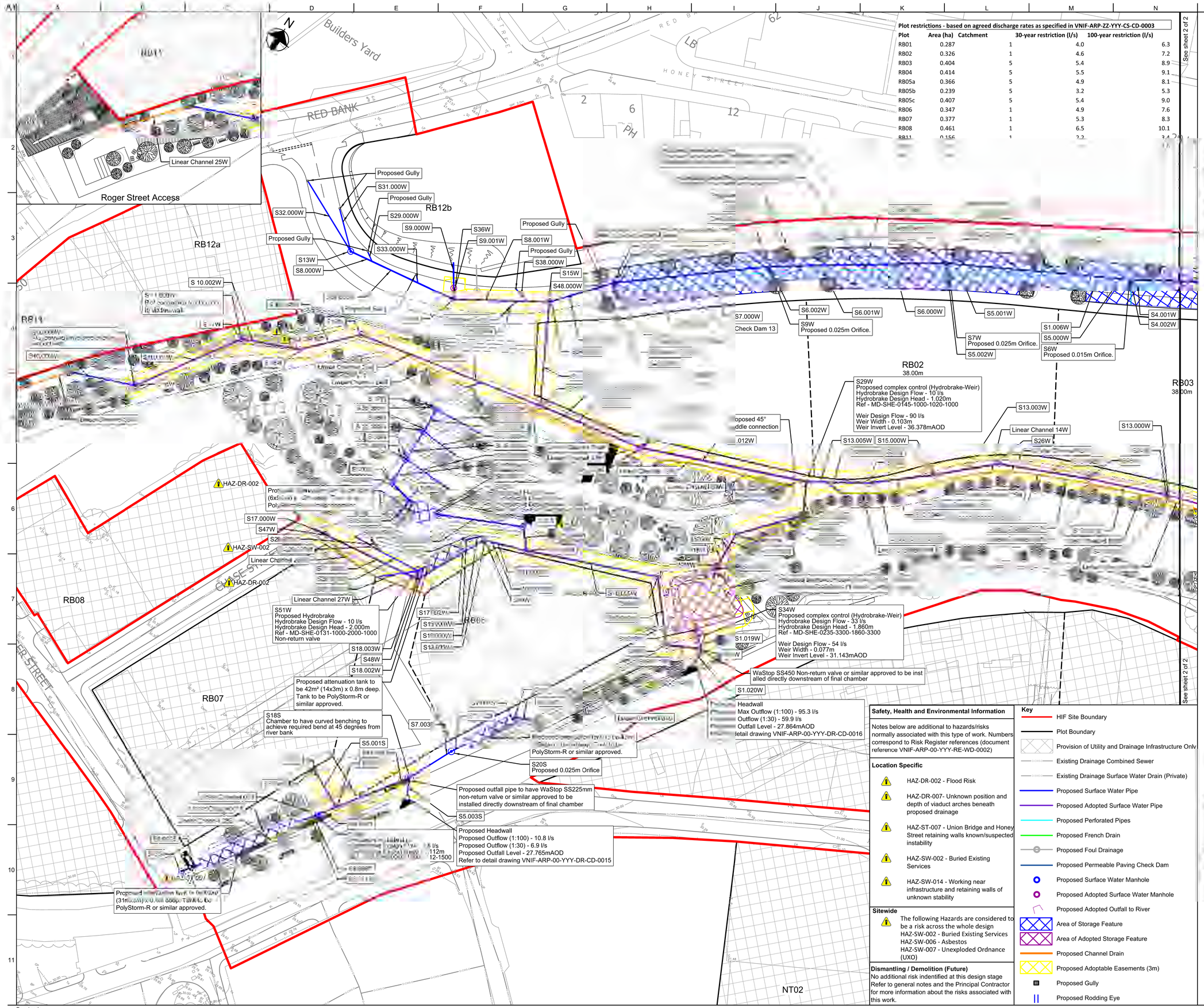

Plot restrictions - based on agreed discharge rates as specified in VNIF-ARP-ZZ-YYY-CS-CD-0003

Plot	Area (ha)	Catchment	30-year restriction (l/s)	100-year restriction (l/s)
RB01	0.287	1	4.0	6.3
RB02	0.326	1	4.6	7.2
RB03	0.404	5	5.4	8.9
RB04	0.414	5	5.5	9.1
RB05a	0.366	5	4.9	8.1
RB05b	0.239	5	3.2	5.3
RB05c	0.407	5	5.4	9.0
RB06	0.347	1	4.9	7.6
RB07	0.377	1	5.3	8.3
RB08	0.461	1	6.5	10.1
RB11	0.156	1	2.2	3.4

Safety, Health and Environmental Information

Notes below are additional to hazards/risks normally associated with this type of work. Numbers correspond to Risk Register references (document reference VNIF-ARP-00-YYY-RE-WD-0002)

Location Specific

- HAZ-DR-002 - Flood Risk
- HAZ-DR-007- Unknown position and depth of viaduct arches beneath proposed drainage
- HAZ-ST-007 - Union Bridge and Honey Street retaining walls known/suspected instability
- HAZ-SW-002 - Buried Existing Services
- HAZ-SW-014 - Working near infrastructure and retaining walls of unknown stability

Sitewide

The following Hazards are considered to be a risk across the whole design
HAZ-SW-002 - Buried Existing Services
HAZ-SW-006 - Asbestos
HAZ-SW-007 - Unexploded Ordnance (UXO)

Dismantling / Demolition (Future)

No additional risk indentified at this design stage
Refer to general notes and the Principal Contractor for more information about the risks associated with this work.

Key

- HIF Site Boundary
- Plot Boundary
- Provision of Utility and Drainage Infrastructure Only
- Existing Drainage Combined Sewer
- Existing Drainage Surface Water Drain (Private)
- Proposed Surface Water Pipe
- Proposed Adopted Surface Water Pipe
- Proposed Perforated Pipes
- Proposed French Drain
- Proposed Foul Drainage
- Proposed Permeable Paving Check Dam
- Proposed Surface Water Manhole
- Proposed Adopted Surface Water Manhole
- Proposed Adopted Outfall to River
- Area of Storage Feature
- Area of Adopted Storage Feature
- Proposed Channel Drain
- Proposed Adoptable Easements (3m)
- Proposed Gully
- Proposed Rodding Eye

Notes

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   - Landscape Architect masterplan drawing VNIF-PLA-ZZ-YYY-DR-L-1011 Rev P06 received 04/08/2022 by Planit.
   - Topographical Survey drawing PS-2158-TS by Paragon Surveys dated September 2021.
4. [illegible] information: [illegible] by Atkins dated [illegible]
5. [illegible] ARP-ZZ-YYY-SP-C-[illegible]
6. [illegible] p's full WS4 [illegible]
7. [illegible] the Located Service [illegible] For further details [illegible] r underground utility [illegible]

Despite Arup's best efforts to accurately display all information, the information is provided for general guidance only and, prior to any construction works being undertaken, site investigation works shall be carried out.

8. A connection point has been provided for each plot within the HIF Boundary at a minimum depth of 2.0m to plot level (assuming FFL will be 0.5m above plot levels) as agreed with WSP.
9. Drainage construction materials:
   - Drainage pipes - Polypropylene and PVC in accordance with BS 13476
   - Manholes - Precast Concrete
   - Inspection Chambers - Polypropylene in accordance with BS 7158
10. As RB09/10 are outside the HIF Red Line Boundary, it has been agreed that a connection to the River Irk will be provided/constructed as part of the Plot construction. Discharge rates have been agreed as part of the HIF delivery.
11. For all schedules, refer to drawings VNIF-ARP-00-YYY-DR-CD-0009 and VNIF-ARP-00-YYY-DR-CD-0054.
12. For pipe abandonments and diversions, refer to drawing VNIF-ARP-00-YYY-DR-CU-1010 - 12 and schedule VNIF-ARP-ZZ-YYY-SH-CU-0001.

Rev	Date	Description	By	Chkd	Appd	Auth
P02	01/02/22		DH	RG	RG	---
P03	17/02/22	Amended for Planning Comments	DH	DH	RG	---
P04	28/02/22		DH	DH	RG	---
P05	21/03/22	Updated for Costing	ES	RG	RG	---
P06	05/04/22	Updated for Costing	DH	DH	RG	---
P07	14/07/22	WS4 Issue to BAM	DH	DH	RG	---
P08	08/08/22	Issued for Technical Approval	ES	DH	RG	---
P09	10/10/22	Full WS4 Issue	ES	DH	RG	---
P10	20/10/22	Issued for Full WS4	ES	DH	RG	---
C01	31/10/22	Issued for Full WS4	ES	DH	RG	HG

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Client

[redacted]

Scale at A1 1:500 | Arup Job No 282022-00

Role: Civil - Drainage

Suitability: A - Fit for Construction

Rev	By	Chkd	Appd	
C01	ES	DH	RG	HG
	Date 19/10/22	Date 20/10/22	Date 20/10/22	31/10/22

Name: VNIF - ARP - 00 - YYY - DR - CD - 0010
(Project - Originator - Volume - Location - Type - Role - Number)

Do not scale

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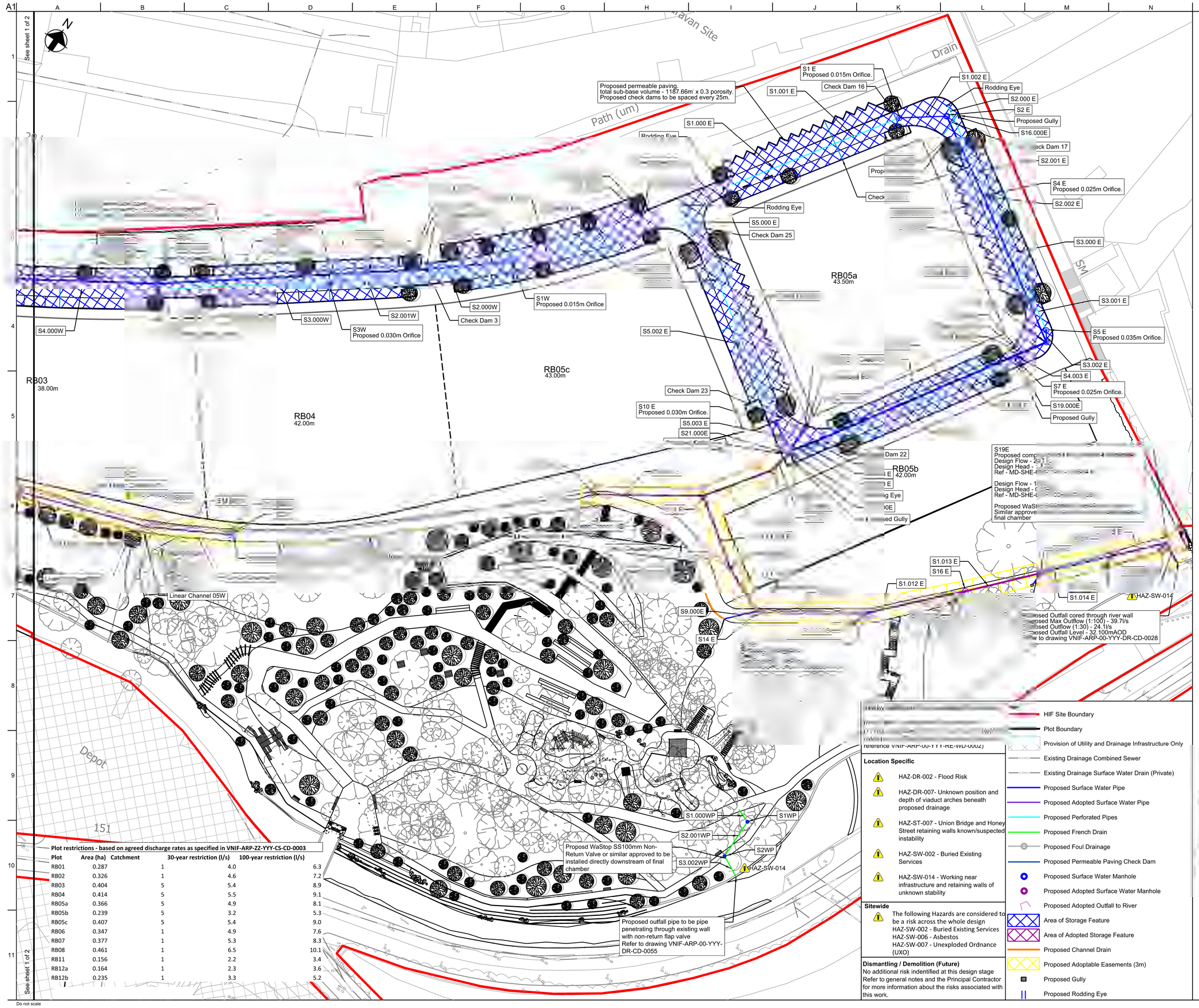
A1



Plot restrictions - based on agreed discharge rates as specified in VNIF-ARP-ZZ-YYY-CS-CD-0003

Plot	Area (ha)	Catchment	30-year restriction (l/s)	100-year restriction (l/s)
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RB03	0.404	5	5.4	8.9
RB04	0.414	5	5.5	9.1
RB05a	0.366	5	4.9	8.1
RB05b	0.239	5	3.2	5.3
RB05c	0.407	5	5.4	9.0
RB06	0.347	1	4.9	7.6
RB07	0.377	1	5.3	8.3
RB08	0.461	1	6.5	10.1
RB11	0.156	1	2.2	3.4
RB12a	0.164	1	2.3	3.6
RB12b	0.235	1	3.3	5.2

Location Specific

- HAZ-DR-002 - Flood Risk
- HAZ-DR-007- Unknown position and depth of viaduct arches beneath proposed drainage
- HAZ-ST-007 - Union Bridge and Honey Street retaining walls known/suspected instability
- HAZ-SW-002 - Buried Existing Services
- HAZ-SW-014 - Working near infrastructure and retaining walls of unknown stability

Sitewide

The following Hazards are considered to be a risk across the whole design
HAZ-SW-002 - Buried Existing Services
HAZ-SW-006 - Asbestos
HAZ-SW-007 - Unexploded Ordnance (UXO)

Dismantling / Demolition (Future)

No additional risk indentified at this design stage
Refer to general notes and the Principal Contractor for more information about the risks associated with this work.

- HIF Site Boundary
- Plot Boundary
- Provision of Utility and Drainage Infrastructure Only
- Existing Drainage Combined Sewer
- Existing Drainage Surface Water Drain (Private)
- Proposed Surface Water Pipe
- Proposed Adopted Surface Water Pipe
- Proposed Perforated Pipes
- Proposed French Drain
- Proposed Foul Drainage
- Proposed Permeable Paving Check Dam
- Proposed Surface Water Manhole
- Proposed Adopted Surface Water Manhole
- Proposed Adopted Outfall to River
- Area of Storage Feature
- Area of Adopted Storage Feature
- Proposed Channel Drain
- Proposed Adoptable Easements (3m)
- Proposed Gully
- Proposed Rodding Eye

Notes

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   • Topographical Survey drawing PS-2158-TS by Paragon Surveys dated September 2021.
4. Existing Drainage layout based on the following information:
   - Utility Search Map drawing 97079 undertaken by Atkins dated 24/06/2021.
5. For the Standard Drainage Specification refer to the "Design and Construction Guidance for foul and surface water sewers offered for adoption" - Rev 2.1 - dated 25th May 2021.
6. This drawing should be read with reference to Arup's full WS4 drawings and specifications.
7. Utilities have been drawn to PAS128 standard. The Located Service Classification table below gives a brief overview. For further details refer to document 'PAS 128:2014 Specification for underground utility detection, verification and location'.

Located Service Classification	Certainty/Risk
Type A Verification – Visual identification	
Type B Detection - Typically GPR and EML techniques are used	Quality
Type C Site reconnaissance - Physical surface features identified	
Type D Desktop utility records search	

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8. A connection point has been provided for each plot within the HIF Boundary at a minimum depth of 2.0m to plot level (assuming FFL will be 0.5m above plot levels) as agreed with WSP.
9. Drainage construction materials:
   - Drainage pipes - Polypropylene and PVC in accordance with BS 13476
   - Manholes - Precast Concrete
   - Inspection Chambers - Polypropylene in accordance with BS 7158
10. As RB09/10 are outside the HIF Red Line Boundary, it has been agreed that a connection to the River Irk will be provided/constructed as part of the Plot construction. Discharge rates have been agreed as part of the HIF delivery.
11. For all schedules, refer to drawings VNIF-ARP-00-YYY-DR-CD-0009 and VNIF-ARP-00-YYY-DR-CD-0054.
12. For pipe abandonments and diversions, refer to drawing VNIF-ARP-00-YYY-DR-CU-1010 - 12 and schedule VNIF-ARP-ZZ-YYY-SH-CU-0001.

Rev	Date	Description	By	Chkd	Appd	Auth
P02	01/02/22		DH	RG	RG	---
P03	17/02/22	Amended for Planning Comments	DH	DH	RG	---
P04	28/02/22		DH	DH	RG	---
P05	21/03/22	Updated for Costing	ES	RG	RG	---
P06	05/04/22	Updated for Costing	DH	DH	RG	---
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P08	08/08/22	Issued for Technical Approval	ES	DH	RG	---
P09	10/10/22	Full WS4 Issue	ES	DH	RG	---
P10	20/10/22	Issued for Full WS4	ES	DH	RG	---
C01	31/10/22	Issued for Full WS4	ES	DH	RG	HG

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Client

[redacted]

Scale at A1: 1:500
Arup Job No: 282022-00
Role: Civil - Drainage
Suitability: A - Fit for Construction

Rev	By	Chkd	Appd	
C01	ES	DH	RG	HG
	Date 19/10/22	Date 20/10/22	Date 20/10/22	31/10/22

Name: VNIF - ARP - 00 - YYY - DR - CD - 0011
Project | Originator | Volume | Location | Type | Role | Number

Do not scale

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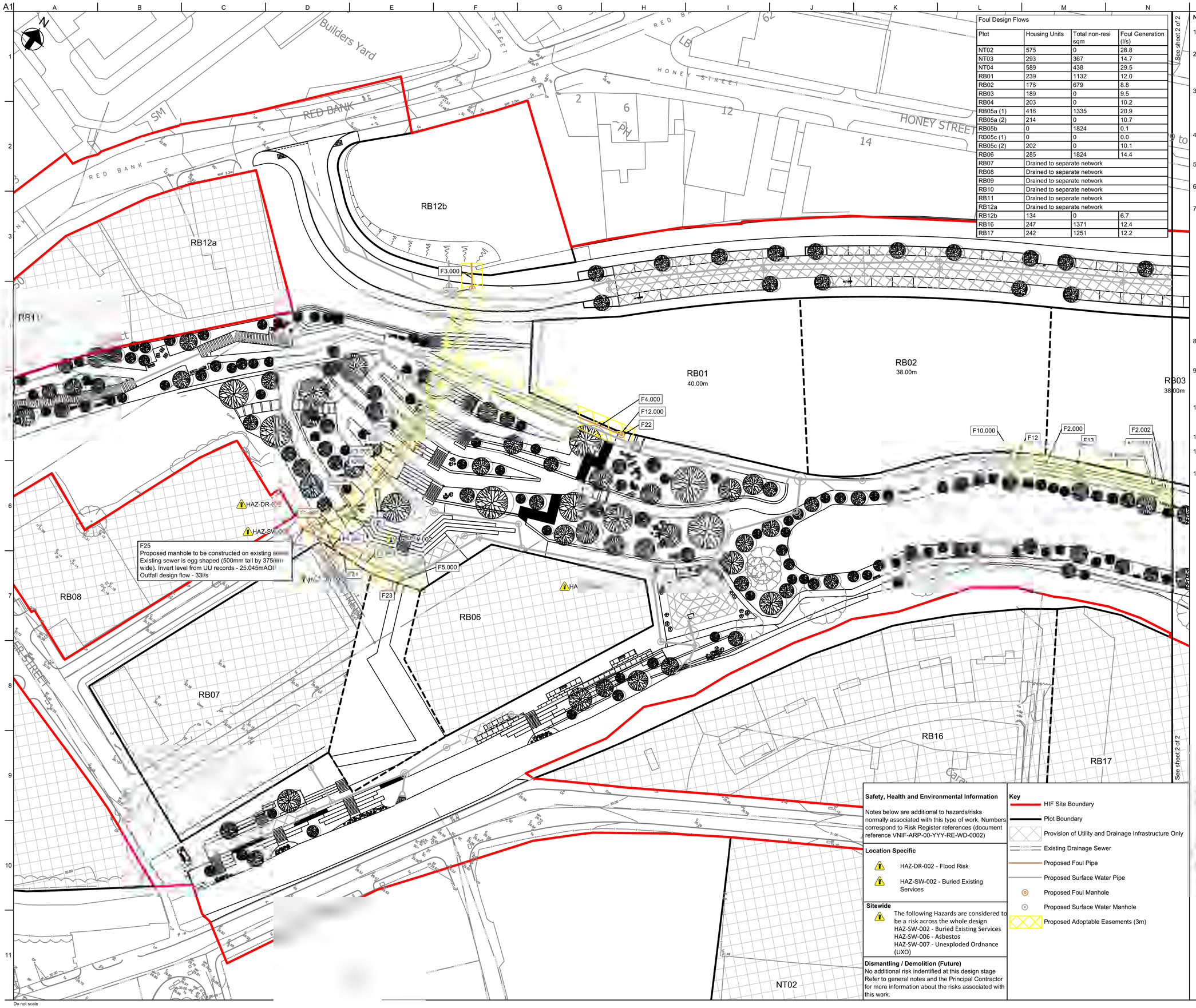
A1



Foul Design Flows			
Plot	Housing Units	Total non-resi sqm	Foul Generation (l/s)
NT02	575	0	28.8
NT03	293	367	14.7
NT04	589	438	29.5
RB01	239	1132	12.0
RB02	176	679	8.8
RB03	189	0	9.5
RB04	203	0	10.2
RB05a (1)	416	1335	20.9
RB05a (2)	214	0	10.7
RB05b	0	1824	0.1
RB05c (1)	0	0	0.0
RB05c (2)	202	0	10.1
RB06	285	1824	14.4
RB07	Drained to separate network		
RB08	Drained to separate network		
RB09	Drained to separate network		
RB10	Drained to separate network		
RB11	Drained to separate network		
RB12a	Drained to separate network		
RB12b	134	0	6.7
RB16	247	1371	12.4
RB17	242	1251	12.2

Notes

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   • Topographical Survey drawing PS-2158-TS by Paragon Surveys dated September 2021.
4. Existing Drainage layout based on the following information:
   - Utility Search Map drawing 97079 undertaken by Atkins dated 24/06/2021.
5. For the Infrastructure Specification refer to VNIF-ARP-ZZ-YYY-SP-C-0001.
6. This drawing should be read with reference to Arup's full WS4 drawings and specifications.
7. Utilities have been drawn to PAS128 standard. The Located Service Classification table below gives a brief overview. For further details refer to document 'PAS 128:2014 Specification for underground utility detection, verification and location'.

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Type C Site reconnaissance - Physical surface features identified	
Type D Desktop utility records search	

Despite Arup's best efforts to accurately display all information, the information is provided for general guidance only and, prior to any construction works being undertaken, site investigation works shall be carried out.

8. A connection point for foul water has been provided for each plot within the HIF Boundary at a minimum depth of 1.5m to plot level (assuming FFL will be 0.5m above plot level) as agreed with WSP.
9. Drainage construction materials, unless otherwise stated:
   - Drainage pipes - Vitrified Clay in accordance with BS EN 295
   - Manholes - Precast Concrete
   - Inspection Chambers - Polypropylene in accordance with BS 7158
10. For pipe abandonments and diversions, refer to drawing VNIF-ARP-00-YYY-DR-CU-1010 - 12 and schedule VNIF-ARP-ZZ-YYY-SH-CU-0001.
11. For all schedules, refer to drawing VNIF-ARP-00-YYY-DR-CD-0017.
12. Foul rates and pipe sizing has been based upon FEC document "Redbank - Incoming Water Flowrates" - dated 12-05-22
13. Foul drainage runs have been designed to not exceed 75% capacity as stated in the DCG to provide capacity for further future provisions.

Safety, Health and Environmental Information

Notes below are additional to hazards/risks normally associated with this type of work. Numbers correspond to Risk Register references (document reference VNIF-ARP-00-YYY-RE-WD-0002)

Location Specific

- HAZ-DR-002 - Flood Risk
- HAZ-SW-002 - Buried Existing Services

Sitewide

The following Hazards are considered to be a risk across the whole design
HAZ-SW-002 - Buried Existing Services
HAZ-SW-006 - Asbestos
HAZ-SW-007 - Unexploded Ordnance (UXO)

Dismantling / Demolition (Future)

No additional risk indentified at this design stage
Refer to general notes and the Principal Contractor for more information about the risks associated with this work.

Key

- HIF Site Boundary
- Plot Boundary
- Provision of Utility and Drainage Infrastructure Only
- Existing Drainage Sewer
- Proposed Foul Pipe
- Proposed Surface Water Pipe
- Proposed Foul Manhole
- Proposed Surface Water Manhole
- Proposed Adoptable Easements (3m)

Rev	Date	Description	By	Chkd	Appd	Auth
P01	14/07/22	WS4 Issue to BAM	DH	DH	RG	---
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C01	31/10/22	Issued for Full WS4	ES	DH	RG	HG

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Client

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Scale at A1: 1:500
Arup Job No: 282022-00
Role: Civil - Drainage
Suitability: A - Fit for Construction

Rev	By	Chkd	Appd	
C01	ES	DH	RG	HG
	Date 19/10/22	Date 20/10/22	Date 20/10/22	31/10/22

Name: VNIF - ARP - 00 - YYY - DR - CD - 0022
Project | Originator | Volume | Location | Type | Role | Number

Do not scale

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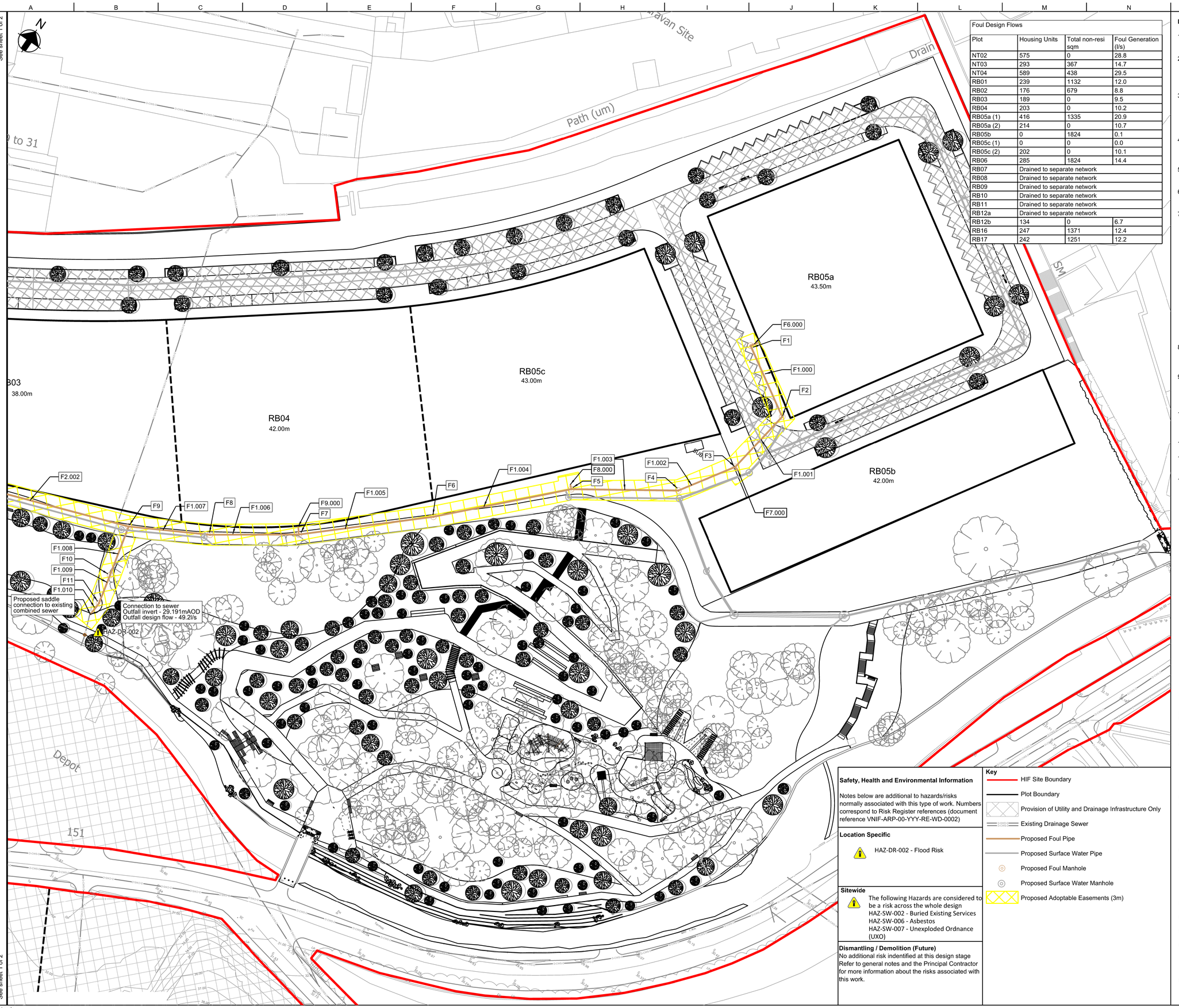
A1



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RB06	285	1824	14.4
RB07	Drained to separate network		
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RB10	Drained to separate network		
RB11	Drained to separate network		
RB12a	Drained to separate network		
RB12b	134	0	6.7
RB16	247	1371	12.4
RB17	242	1251	12.2

Notes

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13. Foul drainage runs have been designed to not exceed 75% capacity as stated in the DCG to provide capacity for further future provisions.

Safety, Health and Environmental Information

Notes below are additional to hazards/risks normally associated with this type of work. Numbers correspond to Risk Register references (document reference VNIF-ARP-00-YYY-RE-WD-0002)

Location Specific

⚠ HAZ-DR-002 - Flood Risk

Sitewide

⚠ The following Hazards are considered to be a risk across the whole design
HAZ-SW-002 - Buried Existing Services
HAZ-SW-006 - Asbestos
HAZ-SW-007 - Unexploded Ordnance (UXO)

Dismantling / Demolition (Future)

No additional risk indentified at this design stage
Refer to general notes and the Principal Contractor for more information about the risks associated with this work.

Key

- HIF Site Boundary
- Plot Boundary
- Provision of Utility and Drainage Infrastructure Only
- Existing Drainage Sewer
- Proposed Foul Pipe
- Proposed Surface Water Pipe
- Proposed Foul Manhole
- Proposed Surface Water Manhole
- Proposed Adoptable Easements (3m)

Rev	Date	Description	By	Chkd	Appd	Auth
P01	14/07/22	WS4 Issue to BAM	DH	DH	RG	---
P02	08/08/22	Issued for Technical Approval	ES	DH	RG	---
P03	10/10/22	Full WS4 Issue	ES	DH	RG	---
P04	20/10/22	Issued for Full WS4	ES	DH	RG	---
C01	31/10/22	Issued for Full WS4	ES	DH	RG	HG

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Client

MANCHESTER CITY COUNCIL

bam nuttall

Project Title

Victoria North HIF Infrastructure & Enabling Works

Drawing Title

Proposed Foul Water Drainage
Sheet 2 of 2

Scale at A1	1:500	Arup Job No	282022-00
Role	Civil - Drainage		
Suitability	A - Fit for Construction		

Rev	By	Chkd	Appd	
C01	ES	DH	RG	HG
	Date 19/10/22	Date 20/10/22	Date 20/10/22	31/10/22

Name

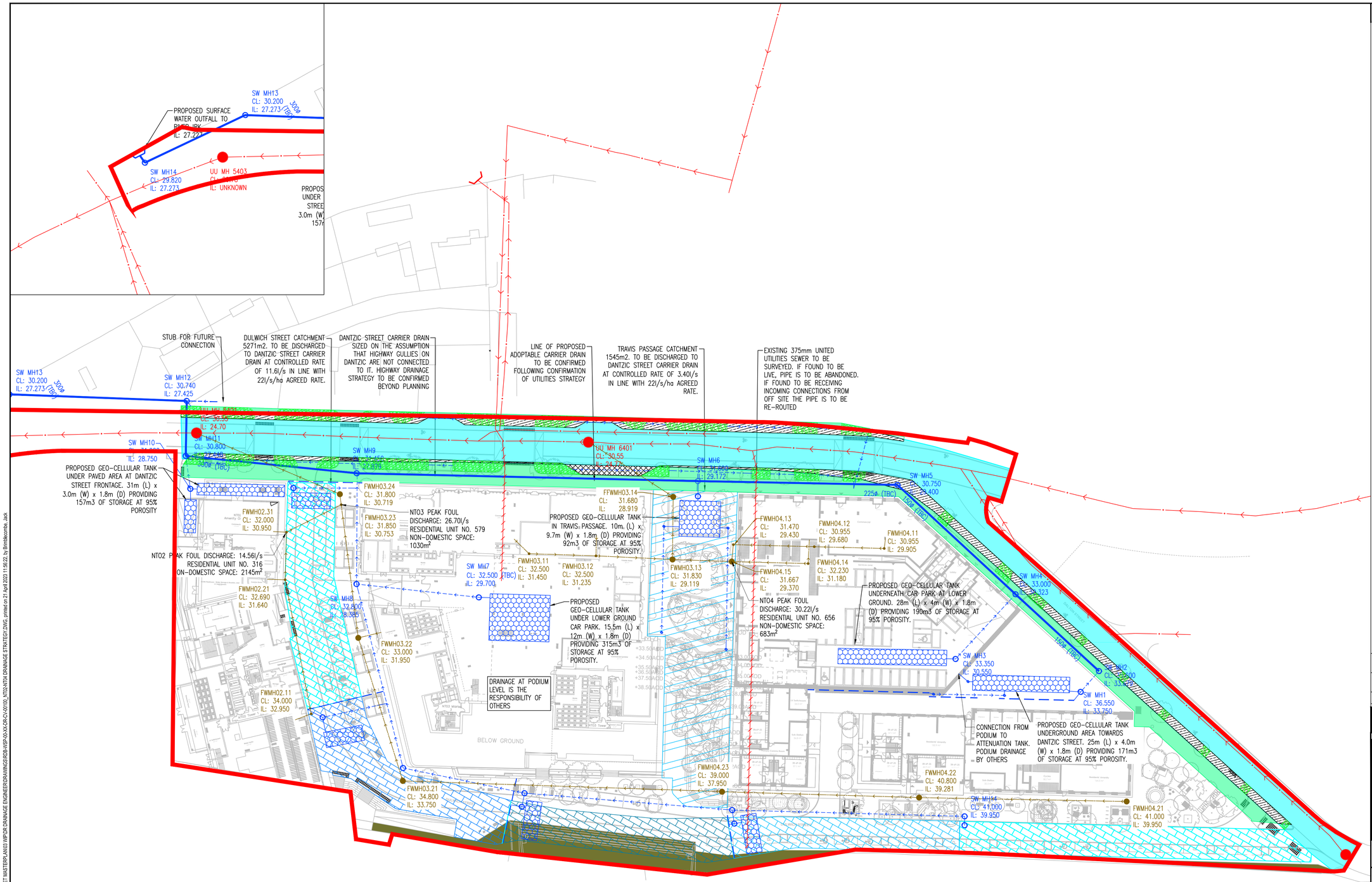
VNIF - ARP - 00 - YYY - DR - CD - 0023
Project | Originator | Volume | Location | Type | Role | Number

Do not scale

© Arup

Appendix 10.1

Appendix K - Drainage Strategy



Plot		Area (Assumed 100% Impermeable)	Permitted Discharge (l/s)	Storage (m^3)
NT02	2B	0.23	5.06	156
NT03	2C	0.54	11.88	315
NT04	2D	0.63	13.86	360

DO NOT SCALE

NOTES:

1. THIS DRAINAGE STRATEGY HAS BEEN PRODUCED USING THE FLOOD STUDIES REPORT RAINFALL DATA.

KEY:

- PRIVATE SURFACE WATER DRAIN
- ADOPTABLE SURFACE WATER CARRIER DRAIN
- CHANNEL DRAIN
- EXISTING UNITED UTILITIES COMBINED SEWER
- EXISTING UU COMBINED SEWER TO BE ABANDONED
- SURFACE WATER MANHOLE
- FOUL WATER MANHOLE
- SURFACE WATER HEADWALL
- COMBINED SEWER OVERFLOW HEADWALL
- SURFACE WATER ATTENUATION
- DULWICH STREET PERMEABLE PAVEMENT
- TRAVIS PASSAGE CATCHMENT AREA
- EXISTING HIGHWAY LAND TO REMAIN UNATTENUATED (2880m^2)
- EXISTING HIGHWAY LAND TO BE ATTENUATED (800m^2)
- PROPOSED NEW HIGHWAY LAND TO BE ATTENUATED (1535m^2)
- PROPOSED NEW HIGHWAY LAND TO BE UNATTENUATED (50m^2)

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
P02	21/04/2023	JEB	UPDATED FOR PLANNING	SM	SM
P01	31/03/2023	JEB	FIRST ISSUE	SM	SM

DRAWING STATUS: S2 - FOR INFORMATION

wsp
8 First Street, Manchester, M15 4GU, UK
T+ 44 (0) 161 200 5000
wsp.com

CLIENT: FAR EAST CONSORTIUM

ARCHITECT: HAWKINS BROWN / MACREANOR LAVINGTON

SITE/PROJECT: REDBANK & DANTZIC STREET

TITLE: APPLICATION 5
DETAILED DRAINAGE STRATEGY

SCALE @ A1:	CHECKED:	APPROVED:
1:500	SM	S

PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70079268	JEB	JEB	April 23

DRAWING No: RDB-WSP-00-XX-DR-CV-00101 REV: P02

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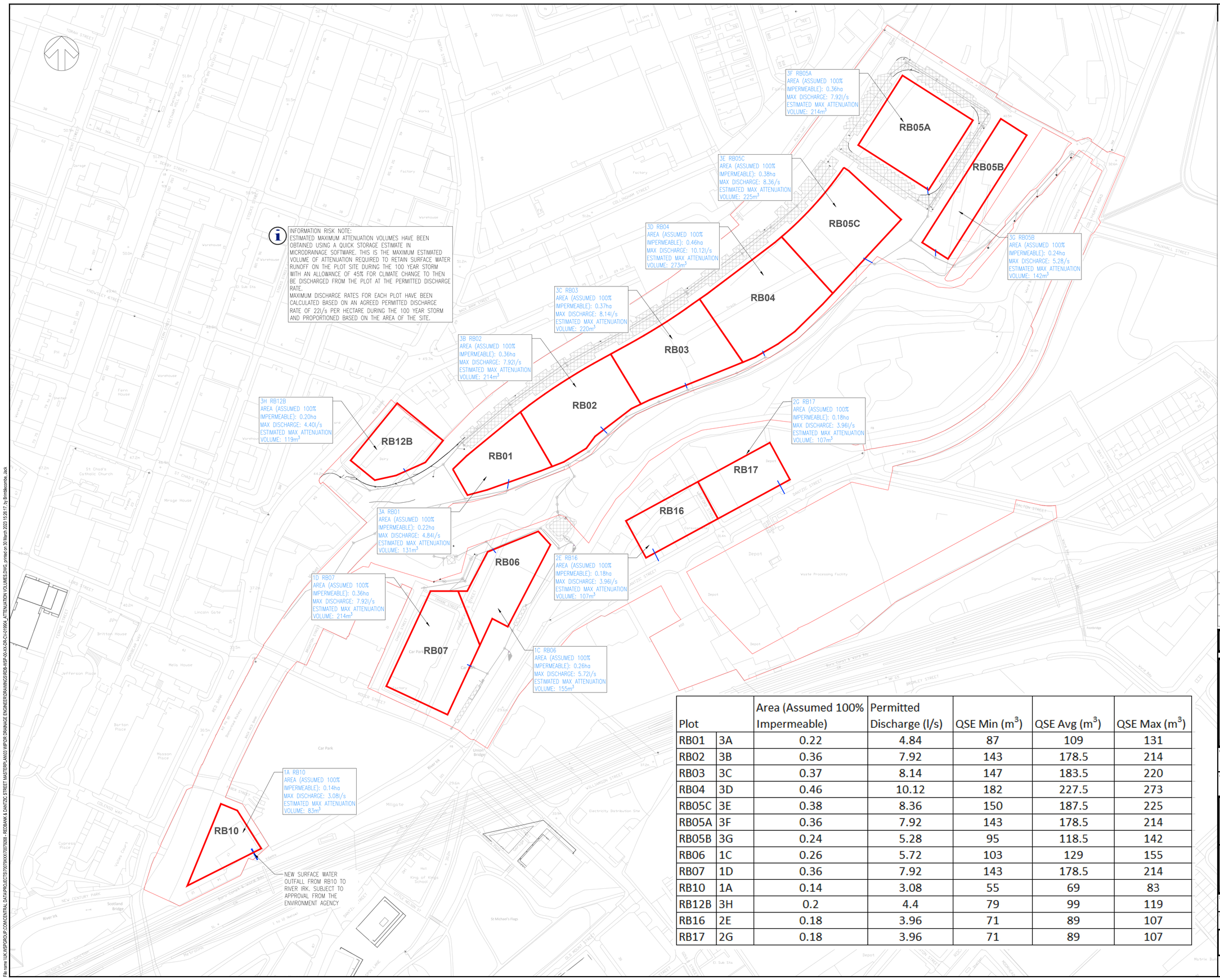
File name: \\UK.WSPGROUP.COM\CENTRAL DATA\PROJECTS\70079XXX\70079268 - REDBANK & DANTZIC STREET MASTERPLAN\03 WIP\DR DRAINAGE ENGINEER\DRAWINGS\RDB-WSP-00-XX-DR-CV-00100_NT02#2D4 DRAINAGE STRATEGY.DWG, printed on 21 April 2023 11:49:22, by Brendacombe, Jack



Plot		Area (Assumed 100% Impermeable)	Permitted Discharge (l/s)	QSE Min (m^3)	QSE Avg (m^3)	QSE Max (m^3)
RB01	3A	0.22	4.84	87	109	131
RB02	3B	0.36	7.92	143	178.5	214
RB03	3C	0.37	8.14	147	183.5	220
RB04	3D	0.46	10.12	182	227.5	273
RB05C	3E	0.38	8.36	150	187.5	225
RB05A	3F	0.36	7.92	143	178.5	214
RB05B	3G	0.24	5.28	95	118.5	142
RB06	1C	0.26	5.72	103	129	155
RB07	1D	0.36	7.92	143	178.5	214
RB10	1A	0.14	3.08	55	69	83
RB12B	3H	0.2	4.4	79	99	119
RB16	2E	0.18	3.96	71	89	107
RB17	2G	0.18	3.96	71	89	107

DO NOT SCALE

NOTES:

1. THE VALUES PROVIDED ARE SUBJECT TO CHANGE THROUGHOUT THE DEVELOPMENT OF THE DESIGN.
2. FOR FURTHER DETAILS OF THE HIF DELIVERED SURFACE WATER DRAINAGE PLEASE REFER TO DRAWING VNIF-ARP-00-YYY-DR-CD-0002
3. THIS DRAINAGE STRATEGY HAS BEEN PRODUCED USING THE FLOOD STUDIES REPORT RAINFALL DATA.

KEY:

PLOT BOUNDARY

HIF DELIVERED SURFACE WATER DRAINAGE

PROPOSED PLOT SURFACE WATER CONNECTION

REV	DATE	BY	DESCRIPTION	CHK	APP
P04	31/03/2023	JEB	ISSUED FOR PLANNING	SM	SM
P03	09/03/2023	JEB	CLIMATE CHANGE UPDATED	SM	SM
P02	30/01/2023	DR	BUILDING FOOTPRINTS AMENDED	SM	SM
P01	21/01/2022	JTB	FIRST ISSUE	SM	SM

DRAWING STATUS: S2 - FOR INFORMATION

wsp
8 First Street, Manchester, M15 4GU, UK
T+ 44 (0) 161 200 5000
wsp.com

CLIENT: FEC

ARCHITECT: MLM

SITE/PROJECT: RED BANK AND DANTZIC STREET

TITLE: APPLICATION 4
SURFACE WATER DRAINAGE STRATEGY

SCALE @ A1:	CHECKED:	APPROVED:
1:1250	SM	SM

PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70079268	JB	JB	March 23

DRAWING No: RDB-WSP-00-XX-DR-CV-019904 REV: P04

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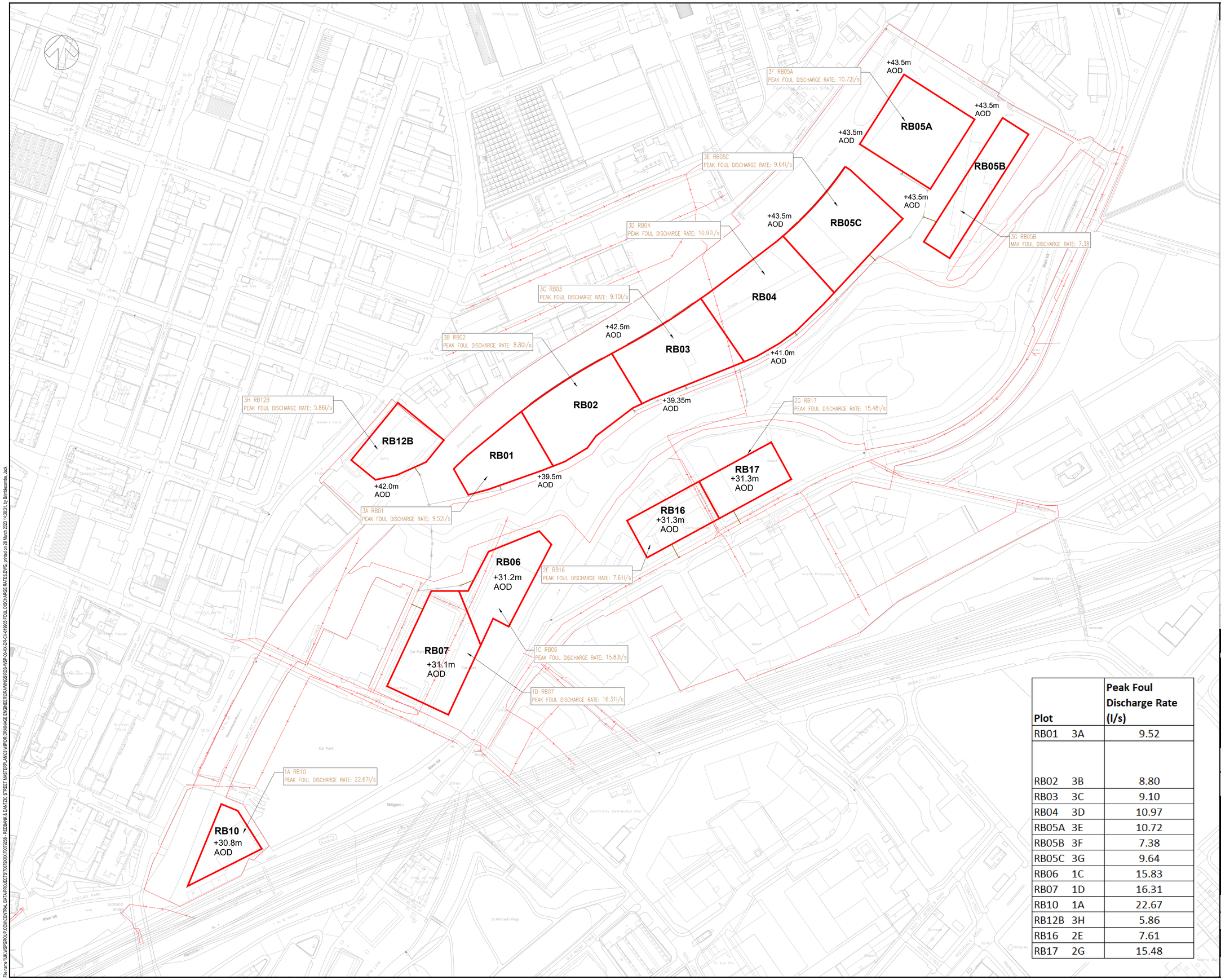
File name: \\UK.WSPGROUP.COM\CENTRAL DATA\PROJECTS\70079XX\70079268 - REDBANK & DANTZIC STREET MASTERPLAN\03 IN\PDR DRAINAGE ENGINEER\DRAWINGS\RDB-WSP-00-XX-DR-CV-019904_ATTENUATION VOLUMES.DWG, printed on 30 March 2023 15:26:17, by Brentdecombe, Jack



DO NOT SCALE

NOTES:

1. THE DISCHARGE RATES PROVIDED ARE SUBJECT TO CHANGE THROUGHOUT DESIGN DEVELOPMENT.
2. FOR FURTHER DETAILS OF THE HIF DELIVERED FOUL WATER DRAINAGE SYSTEM REFER TO DRAWING VNIF-ARP-00-YYY-DR-CD-0003

KEY:

- EXISTING UU COMBINED SEWER
- HIF DELIVERED ADOPTABLE FOUL DRAINAGE
- PROPOSED FOUL CONNECTION FROM PLOT

Plot		Peak Foul Discharge Rate (l/s)
RB01	3A	9.52
RB02	3B	8.80
RB03	3C	9.10
RB04	3D	10.97
RB05A	3E	10.72
RB05B	3F	7.38
RB05C	3G	9.64
RB06	1C	15.83
RB07	1D	16.31
RB10	1A	22.67
RB12B	3H	5.86
RB16	2E	7.61
RB17	2G	15.48

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	31/03/2023	DR	FIRST ISSUE	JEB	SM

DRAWING STATUS: S2 - FOR INFORMATION

wsp
8 First Street, Manchester, M15 4GU, UK
T+ 44 (0) 161 200 5000
wsp.com

CLIENT: FEC

ARCHITECT: MLM

SITE/PROJECT: RED BANK AND DANTZIC STREET

TITLE: APPLICATION 4 FOUL DRAINAGE STRATEGY

SCALE @ A1:	CHECKED:	APPROVED:
1:1250	JEB	SM

PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70079268	DR	DR	March 23

DRAWING No: RDB-WSP-00-XX-DR-CV-019905 REV: P01

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File name: \\UK.WSPGROUP.COM\CENTRAL DATA\PROJECTS\70079XXX\70079268 - REDBANK & DANTZIC STREET MASTERPLAN\03 WIP\DR DRAINAGE ENGINEER\DRAWINGS\RDB-WSP-00-XX-DR-CV-019905 FOUL DISCHARGE RATES.DWG, printed on 28 March 2023 14:39:31, by Brendaconnie, .stb

Appendix 10.1

Appendix L - Calculations

Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 199 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Σ Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	28.750	0.550	0.0	4.5	4.5	48.6	O K
30 min Summer	28.926	0.726	0.0	4.5	4.5	64.1	O K
60 min Summer	29.093	0.893	0.0	4.5	4.5	78.9	O K
120 min Summer	29.209	1.009	0.0	4.5	4.5	89.1	O K
180 min Summer	29.229	1.029	0.0	4.5	4.5	90.9	O K
240 min Summer	29.218	1.018	0.0	4.5	4.5	89.9	O K
360 min Summer	29.176	0.976	0.0	4.5	4.5	86.2	O K
480 min Summer	29.131	0.931	0.0	4.5	4.5	82.3	O K
600 min Summer	29.083	0.883	0.0	4.5	4.5	78.0	O K
720 min Summer	29.028	0.828	0.0	4.5	4.5	73.1	O K
960 min Summer	28.918	0.718	0.0	4.5	4.5	63.4	O K
1440 min Summer	28.736	0.536	0.0	4.5	4.5	47.4	O K
2160 min Summer	28.546	0.346	0.0	4.5	4.5	30.5	O K
2880 min Summer	28.434	0.234	0.0	4.3	4.3	20.7	O K
4320 min Summer	28.331	0.131	0.0	3.7	3.7	11.6	O K
5760 min Summer	28.301	0.101	0.0	3.1	3.1	9.0	O K
7200 min Summer	28.286	0.086	0.0	2.6	2.6	7.6	O K
8640 min Summer	28.277	0.077	0.0	2.3	2.3	6.8	O K
10080 min Summer	28.270	0.070	0.0	2.0	2.0	6.2	O K
15 min Winter	28.822	0.622	0.0	4.5	4.5	54.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	123.479	0.0	53.1	25
30 min Summer	82.705	0.0	71.1	38
60 min Summer	52.935	0.0	91.2	66
120 min Summer	32.787	0.0	113.0	124
180 min Summer	24.447	0.0	126.4	180
240 min Summer	19.729	0.0	136.1	208
360 min Summer	14.463	0.0	149.6	272
480 min Summer	11.610	0.0	160.1	340
600 min Summer	9.783	0.0	168.7	410
720 min Summer	8.502	0.0	175.9	478
960 min Summer	6.806	0.0	187.7	604
1440 min Summer	4.966	0.0	205.4	850
2160 min Summer	3.616	0.0	224.5	1196
2880 min Summer	2.883	0.0	238.7	1536
4320 min Summer	2.092	0.0	259.7	2212
5760 min Summer	1.664	0.0	275.6	2936
7200 min Summer	1.393	0.0	288.3	3672
8640 min Summer	1.204	0.0	298.9	4392
10080 min Summer	1.064	0.0	308.1	5048
15 min Winter	123.479	0.0	59.5	25

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Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	29.024	0.824	0.0	4.5	4.5	72.8	O K
60 min Winter	29.215	1.015	0.0	4.5	4.5	89.7	O K
120 min Winter	29.355	1.155	0.0	4.5	4.5	102.1	O K
180 min Winter	29.388	1.188	0.0	4.5	4.5	105.0	O K
240 min Winter	29.378	1.178	0.0	4.5	4.5	104.0	O K
360 min Winter	29.321	1.121	0.0	4.5	4.5	99.1	O K
480 min Winter	29.261	1.061	0.0	4.5	4.5	93.7	O K
600 min Winter	29.193	0.993	0.0	4.5	4.5	87.7	O K
720 min Winter	29.120	0.920	0.0	4.5	4.5	81.3	O K
960 min Winter	28.943	0.743	0.0	4.5	4.5	65.6	O K
1440 min Winter	28.666	0.466	0.0	4.5	4.5	41.1	O K
2160 min Winter	28.435	0.235	0.0	4.3	4.3	20.8	O K
2880 min Winter	28.339	0.139	0.0	3.7	3.7	12.2	O K
4320 min Winter	28.293	0.093	0.0	2.8	2.8	8.2	O K
5760 min Winter	28.277	0.077	0.0	2.3	2.3	6.8	O K
7200 min Winter	28.268	0.068	0.0	1.9	1.9	6.0	O K
8640 min Winter	28.262	0.062	0.0	1.6	1.6	5.4	O K
10080 min Winter	28.257	0.057	0.0	1.5	1.5	5.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	82.705	0.0	79.7	39
60 min Winter	52.935	0.0	102.2	66
120 min Winter	32.787	0.0	126.6	122
180 min Winter	24.447	0.0	141.6	178
240 min Winter	19.729	0.0	152.4	230
360 min Winter	14.463	0.0	167.6	286
480 min Winter	11.610	0.0	179.4	364
600 min Winter	9.783	0.0	188.9	442
720 min Winter	8.502	0.0	197.0	520
960 min Winter	6.806	0.0	210.3	654
1440 min Winter	4.966	0.0	230.1	890
2160 min Winter	3.616	0.0	251.4	1216
2880 min Winter	2.883	0.0	267.3	1532
4320 min Winter	2.092	0.0	290.9	2208
5760 min Winter	1.664	0.0	308.6	2928
7200 min Winter	1.393	0.0	322.9	3640
8640 min Winter	1.204	0.0	334.8	4360
10080 min Winter	1.064	0.0	345.1	5032

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Model Details

Storage is Online Cover Level (m) 31.000

Cellular Storage Structure

Invert Level (m) 28.200 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	93.0	0.0	2.600	0.0	0.0
0.200	93.0	0.0	2.800	0.0	0.0
0.400	93.0	0.0	3.000	0.0	0.0
0.600	93.0	0.0	3.200	0.0	0.0
0.800	93.0	0.0	3.400	0.0	0.0
1.000	93.0	0.0	3.600	0.0	0.0
1.200	93.0	0.0	3.800	0.0	0.0
1.400	93.0	0.0	4.000	0.0	0.0
1.600	93.0	0.0	4.200	0.0	0.0
1.800	93.0	0.0	4.400	0.0	0.0
2.000	0.0	0.0	4.600	0.0	0.0
2.200	0.0	0.0	4.800	0.0	0.0
2.400	0.0	0.0	5.000	0.0	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0095-5100-1800-5100
Design Head (m)	1.800
Design Flow (l/s)	5.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	95
Invert Level (m)	28.200
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.800	5.1
Flush-Flo™	0.413	4.5
Kick-Flo®	0.846	3.6
Mean Flow over Head Range	-	4.2

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

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Hydro-Brake® Optimum Outflow Control

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.0	1.200	4.2	3.000	6.5	7.000	9.7
0.200	4.1	1.400	4.5	3.500	7.0	7.500	10.0
0.300	4.4	1.600	4.8	4.000	7.4	8.000	10.3
0.400	4.5	1.800	5.1	4.500	7.8	8.500	10.6
0.500	4.5	2.000	5.3	5.000	8.2	9.000	10.9
0.600	4.4	2.200	5.6	5.500	8.6	9.500	11.2
0.800	3.8	2.400	5.8	6.000	9.0		
1.000	3.9	2.600	6.0	6.500	9.3		

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Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 170 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ Outflow (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	30.341	0.641	0.0	11.9	11.9	113.2	O K
30 min Summer	30.543	0.843	0.0	11.9	11.9	148.9	O K
60 min Summer	30.729	1.029	0.0	11.9	11.9	181.9	O K
120 min Summer	30.861	1.161	0.0	11.9	11.9	205.2	O K
180 min Summer	30.876	1.176	0.0	11.9	11.9	207.9	O K
240 min Summer	30.860	1.160	0.0	11.9	11.9	205.0	O K
360 min Summer	30.797	1.097	0.0	11.9	11.9	193.9	O K
480 min Summer	30.726	1.026	0.0	11.9	11.9	181.2	O K
600 min Summer	30.655	0.955	0.0	11.9	11.9	168.8	O K
720 min Summer	30.587	0.887	0.0	11.9	11.9	156.8	O K
960 min Summer	30.461	0.761	0.0	11.9	11.9	134.4	O K
1440 min Summer	30.251	0.551	0.0	11.9	11.9	97.4	O K
2160 min Summer	30.048	0.348	0.0	11.6	11.6	61.5	O K
2880 min Summer	29.938	0.238	0.0	10.7	10.7	42.0	O K
4320 min Summer	29.854	0.154	0.0	9.0	9.0	27.2	O K
5760 min Summer	29.826	0.126	0.0	7.3	7.3	22.3	O K
7200 min Summer	29.811	0.111	0.0	6.1	6.1	19.6	O K
8640 min Summer	29.801	0.101	0.0	5.3	5.3	17.8	O K
10080 min Summer	29.793	0.093	0.0	4.7	4.7	16.4	O K
15 min Winter	30.424	0.724	0.0	11.9	11.9	127.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	123.479	0.0	124.5	24
30 min Summer	82.705	0.0	166.9	38
60 min Summer	52.935	0.0	214.1	66
120 min Summer	32.787	0.0	265.3	122
180 min Summer	24.447	0.0	296.7	174
240 min Summer	19.729	0.0	319.3	202
360 min Summer	14.463	0.0	351.1	268
480 min Summer	11.610	0.0	375.9	330
600 min Summer	9.783	0.0	395.9	394
720 min Summer	8.502	0.0	412.8	460
960 min Summer	6.806	0.0	440.7	588
1440 min Summer	4.966	0.0	482.2	830
2160 min Summer	3.616	0.0	527.0	1172
2880 min Summer	2.883	0.0	560.3	1508
4320 min Summer	2.092	0.0	609.6	2208
5760 min Summer	1.664	0.0	647.0	2936
7200 min Summer	1.393	0.0	676.8	3672
8640 min Summer	1.204	0.0	701.7	4368
10080 min Summer	1.064	0.0	723.2	5104
15 min Winter	123.479	0.0	139.5	24

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Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	30.656	0.956	0.0	11.9	11.9	168.9	O K
60 min Winter	30.877	1.177	0.0	11.9	11.9	208.1	O K
120 min Winter	31.032	1.332	0.0	11.9	11.9	235.4	O K
180 min Winter	31.061	1.361	0.0	11.9	11.9	240.4	O K
240 min Winter	31.039	1.339	0.0	11.9	11.9	236.6	O K
360 min Winter	30.962	1.262	0.0	11.9	11.9	223.0	O K
480 min Winter	30.874	1.174	0.0	11.9	11.9	207.5	O K
600 min Winter	30.764	1.064	0.0	11.9	11.9	188.0	O K
720 min Winter	30.648	0.948	0.0	11.9	11.9	167.4	O K
960 min Winter	30.445	0.745	0.0	11.9	11.9	131.7	O K
1440 min Winter	30.146	0.446	0.0	11.8	11.8	78.9	O K
2160 min Winter	29.926	0.226	0.0	10.6	10.6	39.9	O K
2880 min Winter	29.855	0.155	0.0	9.1	9.1	27.4	O K
4320 min Winter	29.818	0.118	0.0	6.7	6.7	20.8	O K
5760 min Winter	29.801	0.101	0.0	5.3	5.3	17.8	O K
7200 min Winter	29.790	0.090	0.0	4.5	4.5	15.9	O K
8640 min Winter	29.782	0.082	0.0	3.8	3.8	14.6	O K
10080 min Winter	29.777	0.077	0.0	3.4	3.4	13.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	82.705	0.0	187.0	38
60 min Winter	52.935	0.0	239.8	66
120 min Winter	32.787	0.0	297.2	122
180 min Winter	24.447	0.0	332.4	176
240 min Winter	19.729	0.0	357.7	226
360 min Winter	14.463	0.0	393.3	284
480 min Winter	11.610	0.0	421.0	362
600 min Winter	9.783	0.0	443.4	436
720 min Winter	8.502	0.0	462.4	502
960 min Winter	6.806	0.0	493.6	628
1440 min Winter	4.966	0.0	540.1	860
2160 min Winter	3.616	0.0	590.3	1180
2880 min Winter	2.883	0.0	627.5	1496
4320 min Winter	2.092	0.0	682.8	2204
5760 min Winter	1.664	0.0	724.7	2928
7200 min Winter	1.393	0.0	758.0	3672
8640 min Winter	1.204	0.0	786.0	4408
10080 min Winter	1.064	0.0	810.1	5128

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Model Details

Storage is Online Cover Level (m) 32.500

Cellular Storage Structure

Invert Level (m) 29.700 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	186.0	0.0	2.600	0.0	0.0
0.200	186.0	0.0	2.800	0.0	0.0
0.400	186.0	0.0	3.000	0.0	0.0
0.600	186.0	0.0	3.200	0.0	0.0
0.800	186.0	0.0	3.400	0.0	0.0
1.000	186.0	0.0	3.600	0.0	0.0
1.200	186.0	0.0	3.800	0.0	0.0
1.400	186.0	0.0	4.000	0.0	0.0
1.600	186.0	0.0	4.200	0.0	0.0
1.800	186.0	0.0	4.400	0.0	0.0
2.000	0.0	0.0	4.600	0.0	0.0
2.200	0.0	0.0	4.800	0.0	0.0
2.400	0.0	0.0	5.000	0.0	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0146-1190-1800-1190
Design Head (m)	1.800
Design Flow (l/s)	11.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	146
Invert Level (m)	29.700
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.800	11.9
Flush-Flo™	0.525	11.9
Kick-Flo®	1.100	9.4
Mean Flow over Head Range	-	10.4

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

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Hydro-Brake® Optimum Outflow Control

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.3	1.200	9.8	3.000	15.1	7.000	22.7
0.200	10.3	1.400	10.6	3.500	16.3	7.500	23.5
0.300	11.3	1.600	11.2	4.000	17.4	8.000	24.2
0.400	11.7	1.800	11.9	4.500	18.4	8.500	24.9
0.500	11.9	2.000	12.5	5.000	19.3	9.000	25.6
0.600	11.9	2.200	13.1	5.500	20.2	9.500	26.3
0.800	11.5	2.400	13.6	6.000	21.1		
1.000	10.4	2.600	14.1	6.500	21.9		

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Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 180 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ Outflow (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	31.205	0.655	0.0	13.9	13.9	132.0	O K
30 min Summer	31.412	0.862	0.0	13.9	13.9	173.7	O K
60 min Summer	31.605	1.055	0.0	13.9	13.9	212.4	O K
120 min Summer	31.739	1.189	0.0	13.9	13.9	239.6	O K
180 min Summer	31.755	1.205	0.0	13.9	13.9	242.7	O K
240 min Summer	31.739	1.189	0.0	13.9	13.9	239.5	O K
360 min Summer	31.678	1.128	0.0	13.9	13.9	227.2	O K
480 min Summer	31.606	1.056	0.0	13.9	13.9	212.6	O K
600 min Summer	31.533	0.983	0.0	13.9	13.9	197.9	O K
720 min Summer	31.463	0.913	0.0	13.9	13.9	183.9	O K
960 min Summer	31.333	0.783	0.0	13.9	13.9	157.7	O K
1440 min Summer	31.117	0.567	0.0	13.9	13.9	114.2	O K
2160 min Summer	30.908	0.358	0.0	13.5	13.5	72.0	O K
2880 min Summer	30.794	0.244	0.0	12.6	12.6	49.2	O K
4320 min Summer	30.710	0.160	0.0	10.5	10.5	32.3	O K
5760 min Summer	30.682	0.132	0.0	8.5	8.5	26.7	O K
7200 min Summer	30.667	0.117	0.0	7.2	7.2	23.5	O K
8640 min Summer	30.656	0.106	0.0	6.2	6.2	21.4	O K
10080 min Summer	30.648	0.098	0.0	5.5	5.5	19.8	O K
15 min Winter	31.290	0.740	0.0	13.9	13.9	149.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	123.358	0.0	145.0	24
30 min Summer	82.663	0.0	194.5	38
60 min Summer	52.935	0.0	249.8	66
120 min Summer	32.803	0.0	309.6	122
180 min Summer	24.465	0.0	346.4	172
240 min Summer	19.746	0.0	372.8	202
360 min Summer	14.479	0.0	410.1	266
480 min Summer	11.625	0.0	439.0	330
600 min Summer	9.797	0.0	462.5	394
720 min Summer	8.514	0.0	482.3	460
960 min Summer	6.817	0.0	514.9	588
1440 min Summer	4.975	0.0	563.6	830
2160 min Summer	3.623	0.0	616.1	1172
2880 min Summer	2.890	0.0	655.1	1508
4320 min Summer	2.097	0.0	712.9	2208
5760 min Summer	1.669	0.0	756.7	2936
7200 min Summer	1.396	0.0	791.6	3672
8640 min Summer	1.207	0.0	820.8	4360
10080 min Summer	1.067	0.0	846.1	5136
15 min Winter	123.358	0.0	162.5	24

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Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	31.528	0.978	0.0	13.9	13.9	197.0	O K
60 min Winter	31.755	1.205	0.0	13.9	13.9	242.7	O K
120 min Winter	31.914	1.364	0.0	13.9	13.9	274.6	O K
180 min Winter	31.943	1.393	0.0	13.9	13.9	280.5	O K
240 min Winter	31.920	1.370	0.0	13.9	13.9	276.0	O K
360 min Winter	31.844	1.294	0.0	13.9	13.9	260.6	O K
480 min Winter	31.755	1.205	0.0	13.9	13.9	242.7	O K
600 min Winter	31.647	1.097	0.0	13.9	13.9	220.9	O K
720 min Winter	31.526	0.976	0.0	13.9	13.9	196.5	O K
960 min Winter	31.317	0.767	0.0	13.9	13.9	154.4	O K
1440 min Winter	31.008	0.458	0.0	13.8	13.8	92.3	O K
2160 min Winter	30.781	0.231	0.0	12.4	12.4	46.5	O K
2880 min Winter	30.712	0.162	0.0	10.6	10.6	32.5	O K
4320 min Winter	30.674	0.124	0.0	7.8	7.8	24.9	O K
5760 min Winter	30.656	0.106	0.0	6.2	6.2	21.4	O K
7200 min Winter	30.645	0.095	0.0	5.2	5.2	19.1	O K
8640 min Winter	30.637	0.087	0.0	4.5	4.5	17.5	O K
10080 min Winter	30.631	0.081	0.0	4.0	4.0	16.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	82.663	0.0	218.0	38
60 min Winter	52.935	0.0	279.8	66
120 min Winter	32.803	0.0	346.8	122
180 min Winter	24.465	0.0	388.0	176
240 min Winter	19.746	0.0	417.6	226
360 min Winter	14.479	0.0	459.3	282
480 min Winter	11.625	0.0	491.8	362
600 min Winter	9.797	0.0	518.0	438
720 min Winter	8.514	0.0	540.3	502
960 min Winter	6.817	0.0	576.8	628
1440 min Winter	4.975	0.0	631.3	860
2160 min Winter	3.623	0.0	690.0	1176
2880 min Winter	2.890	0.0	733.7	1480
4320 min Winter	2.097	0.0	798.5	2204
5760 min Winter	1.669	0.0	847.6	2912
7200 min Winter	1.396	0.0	886.6	3672
8640 min Winter	1.207	0.0	919.4	4328
10080 min Winter	1.067	0.0	947.7	5136

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Model Details

Storage is Online Cover Level (m) 33.350

Cellular Storage Structure

Invert Level (m) 30.550 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	212.0	0.0	2.600	0.0	0.0
0.200	212.0	0.0	2.800	0.0	0.0
0.400	212.0	0.0	3.000	0.0	0.0
0.600	212.0	0.0	3.200	0.0	0.0
0.800	212.0	0.0	3.400	0.0	0.0
1.000	212.0	0.0	3.600	0.0	0.0
1.200	212.0	0.0	3.800	0.0	0.0
1.400	212.0	0.0	4.000	0.0	0.0
1.600	212.0	0.0	4.200	0.0	0.0
1.800	212.0	0.0	4.400	0.0	0.0
2.000	0.0	0.0	4.600	0.0	0.0
2.200	0.0	0.0	4.800	0.0	0.0
2.400	0.0	0.0	5.000	0.0	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0157-1390-1800-1390
Design Head (m)	1.800
Design Flow (l/s)	13.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	157
Invert Level (m)	30.550
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.800	13.9
Flush-Flo™	0.529	13.9
Kick-Flo®	1.111	11.1
Mean Flow over Head Range	-	12.1

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

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Hydro-Brake® Optimum Outflow Control

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.6	1.200	11.5	3.000	17.7	7.000	26.6
0.200	11.9	1.400	12.3	3.500	19.1	7.500	27.5
0.300	13.1	1.600	13.1	4.000	20.3	8.000	28.4
0.400	13.7	1.800	13.9	4.500	21.5	8.500	29.2
0.500	13.9	2.000	14.6	5.000	22.6	9.000	30.0
0.600	13.8	2.200	15.3	5.500	23.7	9.500	30.8
0.800	13.4	2.400	15.9	6.000	24.7		
1.000	12.3	2.600	16.5	6.500	25.7		

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Appendix 10.1

Appendix M - Maintenance Schedule

REDBANK AND DANTZIC STREET - DRAINAGE INSPECTION & MAINTENANCE SCHEDULE

Maintenance Schedule	Required Action	Typical Frequency
Below Ground Drainage Pipes, Manholes, etc		
Regular maintenance	Lift covers and inspect manholes for evidence of debris and silt deposits and evidence of blockages (standing water). Carry out CCTV survey if required	Quarterly
Remedial actions	High pressure jetting and/or remove minor blockages and silt build up	As required – 20% loss of pipe cross-section
	Replace broken access covers, remove major blockages, repair structurally defective pipework	As required
Flow Control Chamber		
Regular maintenance	Lift covers and inspect chamber fore evidence of debris and silt deposits and evidence of blockages. Test bypass door operating correctly.	Quarterly
Remedial actions	Replace broken access covers, remove major blockages, repair/replace defective flow control devices	As required
	High pressure jetting and/or remove minor blockages and silt build up	As required
Linear Channel Drains and Gullies		
Regular maintenance	Lift access covers and inspect for silt/debris accumulation	Quarterly
Remedial actions	High pressure jetting and or remove minor blockages and silt build up	As required
	Replace broken access covers, gratings	As required
Rainwater Pipes		
Regular maintenance	Inspect rainwater goods for evidence of leaking pipework	Quarterly
Occasional maintenance	Remove rodding eyes and carry out high pressure jetting to remove any debris	Annually
Remedial actions	Replace cracked/leaking pipework	As required
Permeable Paving Systems		
Regular maintenance	Remove litter and debris from permeable pavement surface, access chambers	Monthly (or as required)
	Inspect Silt accumulation rates	Annually
Occasional Maintenance	Removal of weeds through applying killer directly on to weeds rather than spraying	As required
Remedial Actions	Remedial work to any depression or cracked/broken blocks deemed structurally detrimental or a hazard to users. Replace lost jointing material.	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	10 to 15 yearly (dependent on infiltration performance)
Attenuation tank		
Regular maintenance	The majority of inspection and maintenance requirements are in the flow control downstream of the system.	See above
	Internal inspection and debris removal can be achieved via entry into the attenuation structure via manhole immediately upstream of tank.	As required
Bioretention Systems		
Regular Maintenance	Inspect inlets and outlets for blockage	Quarterly
	Remove litter, surface debris and weeds	Quarterly
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
Remedial Actions	Remove and replace filter medium and vegetation above	As required but likely to be >20 years
Swales		
Regular Maintenance	Remove Litter and Debris	Monthly, or as required

	Inspect inlets, outlets and overflows for blockages and clear as required	Monthly
Occasional Maintenance	Reseed areas of poor vegetation growth	As required (Bare soil over >10% of swale treatment area)
Remedial Actions	Repair erosion or other damage by returfing or reseeding	As Required
	Remove and dispose of oils or petrol residues using safe standard practices	As required