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TALBOT MILL - MANCHESTER

Project No: 251/02

Date: September 2017

PLANNING REPORT DRAINAGE STATEMENT

contents

1.0	EXISTING SITE
1.1	LOCATION
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1.0	EXISTING SITE
1.1	LOCATION
1.1.1	The development site is situated in the St George's area of Manchester, in a mixed area of residential, commercial and light industry.
1.1.2	The site is bounded by Ellesmere Street to the south, Worsley Street to the north and adjacent to the Burton Place residential and commercial development to the east and Britannia Mills to the west. The Bridgewater Canal is located to the north of the site beyond the adjacent Timber Wharf development. A canal arm of this canal extends to the western boundary of the site
1.1.3	The development site is shown on the attached overall site plan, ref: 251/02/SI01, included in Appendix A.

2.0	GROUND CONDITIONS
2.1	A Phase 1 Preliminary Risk Assessment has been undertaken by specialist consultants, Delta- Simons Environmental Consultants Limited. Refer to Report 16-1144.01 January 2017. This work allows the context of the site to be understood so that development risks are better understood and will ultimately inform the brief for the Phase 2 intrusive geotechnical and environmental investigation which will be carried out later and targeted to suit the developing design. The Phase 1 Preliminary Risk Assessment will be submitted as part of the Planning Application.
2.2	Recommendations of the Phase 1 Report include;
2.2.1	“It is recommended that an intrusive Site Investigation is undertaken to access the potential for subsurface contamination at the Site. The investigation will also refine the Site-specific ground model and provide information for the foundation design. The results of the investigation will enable further risk evaluations to be undertaken and assess the requirements for further works (e.g. remediation) if required.”
2.3	Site Geology
2.3.1	“The 1: 50,000 BGS Geological Map for the Site (Sheet 85, Manchester) indicated that much of the Site is not underlain by drift deposits apart from the southern boundary of the Site which is shown to be underlain by Glaciofluvial sheet deposits of Devensian age, comprising sand and gravel. The underlying bedrock is the Chester Pebble Beds Formation (sandstone) of Triassic age. Given the current development, Made Ground is likely to be present overlying the Glaciofluvial Sheet Deposits at the Site.”

- 3.0

STATUTORY SERVICES
- 3.1

Available statutory services information relating to plant and services in the vicinity of the site has been provided by Services providers.
- 3.2

The below ground drainage is shown on 251/02/S111 in Appendix B. The drawing shows that the services in the vicinity of the site are primarily located in Ellesmere Street to the south.

4.0	BELOW GROUND DRAINAGE
4.1	EXISTING BUILDINGS
4.1.1	The existing buildings are currently in various uses including; material storage, parcel storage and distribution, knitwear manufacture, furniture manufacture, scientific instrument refurbishment, artist studio, and offices.
4.1.2	Existing and former uses in the courtyard involve car repair and storage for JCB excavators and as such some oil spillage into the ground is likely to have occurred.
4.1.3	The historic use of the site was as a Cotton Mill. The development site is shown on the attached overall site plan, ref: 251/02/SI01, included in Appendix A
4.2	PROPOSED BUILDINGS
4.2.1	The Architect's proposals involve the conversion of the Talbot Mill complex to create 114 residential apartments (Use Class C3), including rooftop extensions to Mill 1 and Mill 2, and rear extension to Mill 1; demolitions of Buildings A, B and C; retrospective application for the demolition of Building E; erection of a 9 storey building plus 1 basement level, to provide 88 residential apartments (Use Class C3); and creation of new landscaped courtyard, lighting and other associated works.
4.3	EXISTING BELOW GROUND DRAINAGE
4.3.1	The existing adopted sewer network is indicated on the statutory services drawings included in Appendix B as noted above and comprises a combined system in Ellesmere Street (approximately 550x620 at 5.4m depth).
4.3.2	The existing site drainage network will be subject to detailed CCTV survey and assessment in due course. The existing system is assumed to be combined and comprise: - Foul Drainage. - Assumed to run from toilet blocks adjacent to the existing stairs into the private drainage system via manholes / inspection chambers in the courtyard, before discharging to the combined sewer. - Surface Water. - From the roofs and courtyard the surface water is assumed to drain via internal downpipes or external gulley to the private drainage network before discharging to the combined sewer.
4.4	PROPOSED BELOW GROUND DRAINAGE
4.4.1	The strategic proposed drainage strategy is indicated on the Proposed Drainage Plan included in Appendix C. The proposed system is subject to detailed design development and is assumed to comprise new separate systems within the site, combining at the site boundary before connecting to the existing network.
4.5	PROPOSED FOUL DRAINAGE
4.5.1	As shown on the proposed drainage layout and subject to the agreement of United Utilities, foul water will drain under gravity within the site before discharging at an unrestricted rate to the existing combined sewer. Connection is assumed to be made via a new connection or re-use of existing direct connections subject to their condition.
4.6	PROPOSED SURFACE WATER DRAINAGE
4.6.1	The scheme proposals have been developed in accordance with the guidance document produced by the Lead Local Flood Authority – Manchester City Council, 'SuDS Requirements for New Developments'.

This is in line with the Written Ministerial Statement published by the Secretary of State for the Department of Community and Local Government in December 2014 which came into effect on the 6th April 2015 and further augmented by reference within the PPG Paragraph 079 of the Flood Risk and Coastal Change section which outlined that:

‘Whether a sustainable drainage system should be considered will depend on the proposed development and its location, for example whether there are concerns about flooding. Sustainable drainage systems may not be practicable for some forms of development. New development should only be considered appropriate in areas at risk of flooding if priority has been given to the use of sustainable drainage systems. Additionally, and more widely, when considering major development, as defined in the Town and Country Planning (Development Planning Procedure) (England) Order 2015, sustainable drainage systems should be provided unless demonstrated to be inappropriate.’

4.6.2 The Drainage Statement reviewed a number of Sustainable Drainage techniques in line with the drainage hierarchy outlined in NPPF PPG Paragraph 80. These are outlined below.

4.6.2.1 INFILTRATION TO THE GROUND

A Phase 1 Geo-Environmental Preliminary Risk Assessment has been carried out by Delta-Simons in January 2017, ref: 16-1144.01. This describes the site setting, context and former industrial uses including the potential for various contamination sources which may have affected the existing ground below the site.

Theoretically the use of infiltration techniques may be appropriate to the site, subject to completion of further targeted intrusive site investigation works as part of the Phase 2 works. However, the use of infiltration techniques has the potential to mobilise sources of contamination within the existing ground below the site which could in turn have an impact on surface water quality within the adjacent canal or principal aquifer.

As noted, these issues will be explored further in due course but this option is discounted at this stage, with the exception of free drainage from newly formed landscaped areas within the courtyard.

4.6.2.2 SWALES / DITCHES / BASINS

Due to the city centre location of the proposed development there is insufficient space available for the inclusion of swales, ditches or basins and therefore these methods have been discounted as not being practical.

4.6.2.3 PERMEABLE PAVEMENTS

Due to the existing finishes around the site it is not viable to utilise permeable paving as part of the drainage strategy.

4.6.2.4 GREEN ROOFS

Use of green roof space has been reviewed however due to the current detailing and preferred construction has been discounted as both impractical and cost prohibitive.

4.6.2.5 RAINWATER AND GREYWATER HARVESTING

Rainwater and greywater harvesting has been reviewed but has been discounted due to lack of available space within the development to make this option viable.

4.6.2.6 DISCHARGE TO A WATERCOURSE

The existing Bridgewater Canal runs close to the site with a former canal arm extending adjacent to Mill 2, which may offer the potential for discharge of surface water direct to this watercourse.

Further discussions will be necessary with the canal owner, Peel Holdings, the Navigation Authority and Manchester City Council to determine the suitability of this approach and to agree any necessary design parameters such as design levels in the canal, limiting discharge rates and velocities or necessary reductions in peak flow. Where necessary this will then inform requirements for attenuation / storage of surface water.

The relative level of the outfall and potential canal water level are however likely to present particular difficulties in the draining of the site under gravity in this manner and whilst these issues will be explored further in due course this option is discounted at this stage.

4.6.2.7 CONNECTION TO AN EXISTING PUBLIC COMBINED SEWER

There is no existing public surface water network in the vicinity of the site so this options is discounted.

4.6.6 CONNECTION TO AN EXISTING PUBLIC COMBINED SEWER

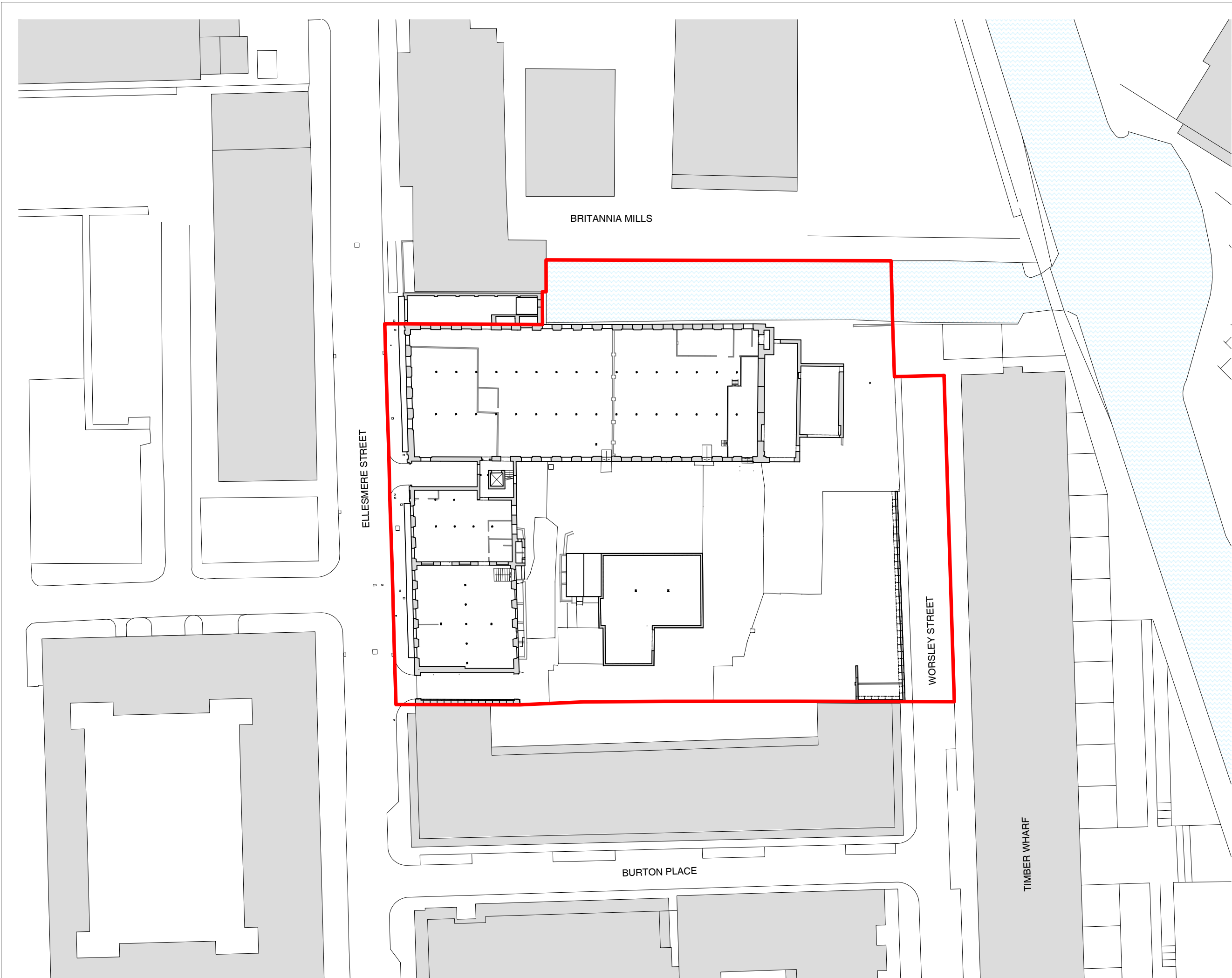
There is an existing public combined sewer in Ellesmere Street into which the existing foul and surface water drainage from the site is currently discharged.

As a result of this review at this stage it is proposed that the new surface water network will be re-connected to the existing combined sewer in Ellesmere Street.

Since the site is a brownfield site, located within a Critical Drainage Area, the proposed new surface water drainage system will target a minimum reduction of surface water runoff rate of 50% in accordance with the requirements of the Manchester City, Salford and Trafford Council Level 2 Strategic Flood Risk Assessment (MST SFRA).

This will be achieved through incorporation of free drainage from new landscaping within the courtyard as noted above, supplemented by the use of proprietary below ground attenuation tanks coupled with flow control devices. Outline hydraulic calculations to demonstrate necessary storage volumes and proposed discharge rates are included in Appendix C.

APPENDIX A - Existing Site Plan



Notes:

1. This drawing is to be read in conjunction with the site survey and all relevant Architects and Engineers drawings and the specification.

2. For general notes refer to drawing no. 251-02-__.

Key:

Site Boundary.

INFORMATION

24.01.17

Issued for Information.

-

TP

SW

Date:

Issue:

Rev:

Revised:

Checked:

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Project:

Talbot Mill,
Manchester.

Title:

Existing,
Site Plan.

Job No:

251-02

Orig No:

SI 01

Rev:

-

Scale:

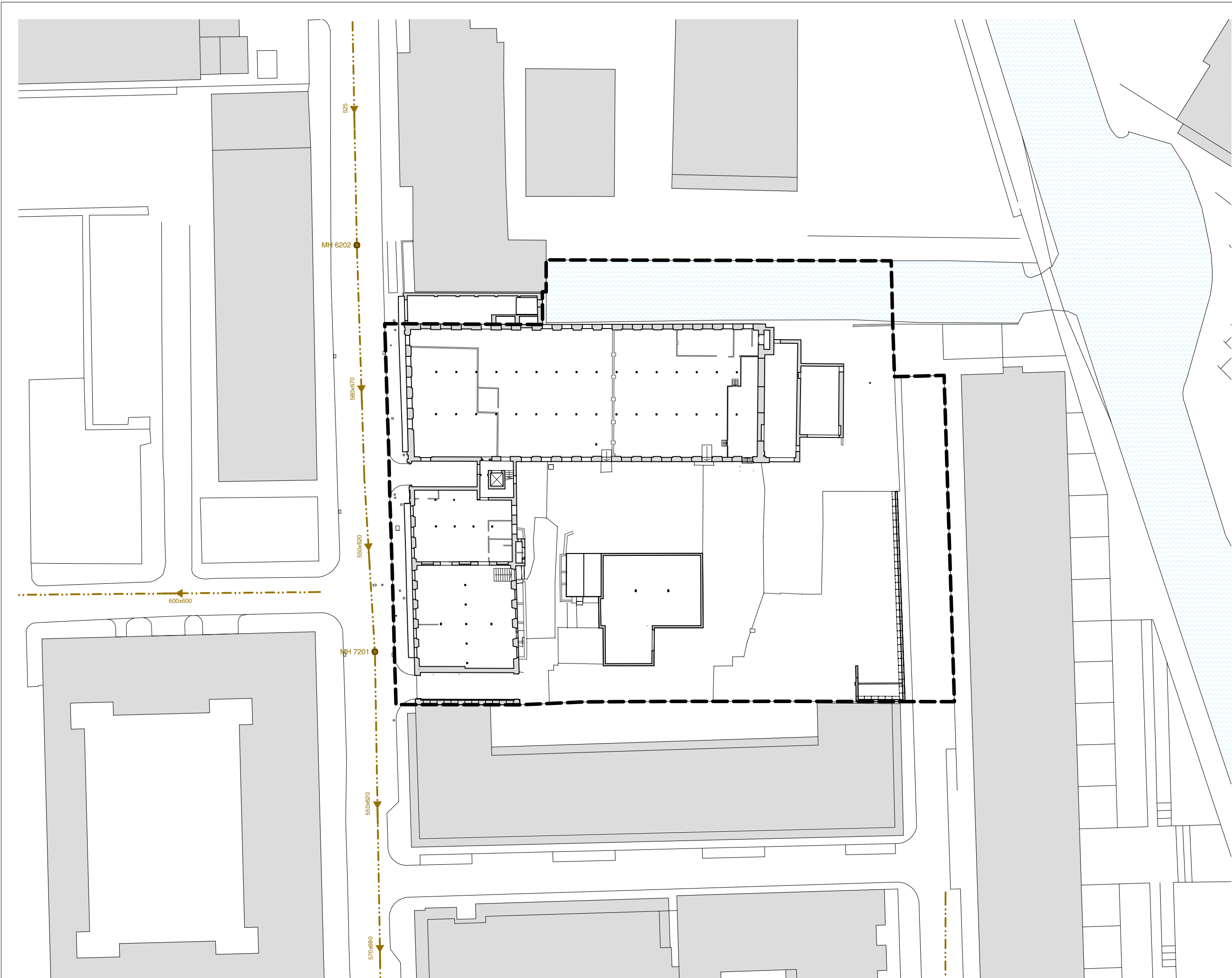
250 @ A1
500 @ A3

Date:

01.17

Drawn:

TP



Notes:

1. This drawing is to be read in conjunction with the site survey and all relevant Architects and Engineers drawings and the specification.

2. The statutory services information summarised on this drawing has been collated from information received from the statutory undertakers. The services are summarised so that Joule can comment to the Client an any effect that these may have on the structural works. Contractors are to liaise directly with all statutory undertakers well in advance of commencing the works to confirm the locations of all existing services.

3. For general notes refer to drawing no. 251-02-___.

Key:

Site Boundary.

Stats Key:

Existing Drainage.
(combined foul & storm water)

Reference	Cover Level	Invert Level
MH 6202	29.37	24.21
MH 7201	29.46	24.03

Statutory services information shown are indicative only taken from information obtained November / December 2016 & April 2000. Further information to be added on receipt of statutory service information provided by others.

INFORMATION

Issued for Information.

Date:

Issue:

-

Rev:

TP

Revised:

SW

Checked:

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Timber Wharf
40 Worley Street
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Manchester
M15 4LD

Project:
Talbot Mill,
Manchester.

Title:
Existing,
Site Plan,
Statutory Services,
Drainage.

Job No:
251-02

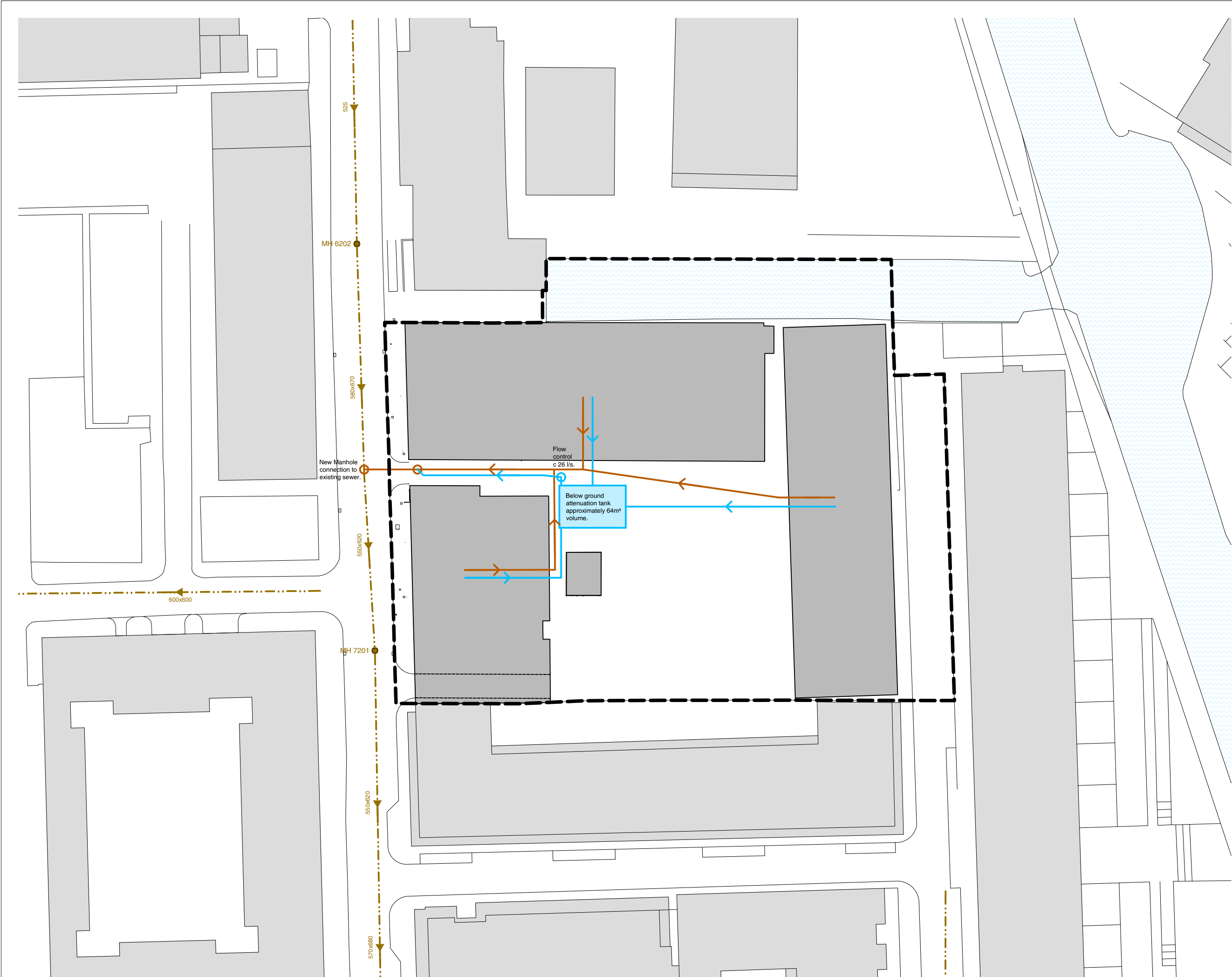
Orig No:
SI 11

Rev:
-

Scale:
250 @ A1
500 @ A3

Date:
01.17

Drawn:
TP



Notes:

1. This drawing is to be read in conjunction with the site survey and all relevant Architects and Engineers drawings and the specification.

2. The statutory services information summarised on this drawing has been collated from information received from the statutory undertakers. The services are summarised so that Joule can comment to the Client an any effect that these may have on the structural works. Contractors are to liaise directly with all statutory undertakers well in advance of commencing the works to confirm the locations of all existing services.

3. For general notes refer to drawing no. 251-02-___.

Key:

Site Boundary.

Stats Key:

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Reference	Cover Level	Invert Level
MH 6202	29.37	24.21
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Statutory services information shown are indicative only taken from information obtained November / December 2016 & April 2000. Further information to be added on receipt of statutory service information provided by others.

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Date:

Issue:

-

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TP

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Project:

Talbot Mill,
Manchester.

Title:

Proposed,
Site Plan,
Drainage Strategy.

Job No:

251-02

Orig No:

SI 20

Rev:

-

Scale:

250 @ A1
500 @ A3

Date:

08.17

Drawn:

TP

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Job No	251/02	Sheet No	01
Project	TALBOT MILL	Engineer	sjw
Element	MANAGE - EXISTING.	Date	07/16.
		Checked by	
		Date	

EXISTING SITE.

THE EXISTING SITE INCLUDES BUILDING (MILL 1 + MILL 2)
AND HANDSTANDING.

THE APPROXIMATE SITE AREA IS $394m^2$. $PIMP = 100\%$.

CALCULATE EXISTING PEAK SURFACE WATER FLOWS USING
THE WASHINGTON PROCEDURE.

REFER TO ATTACHED TSDS CALC.

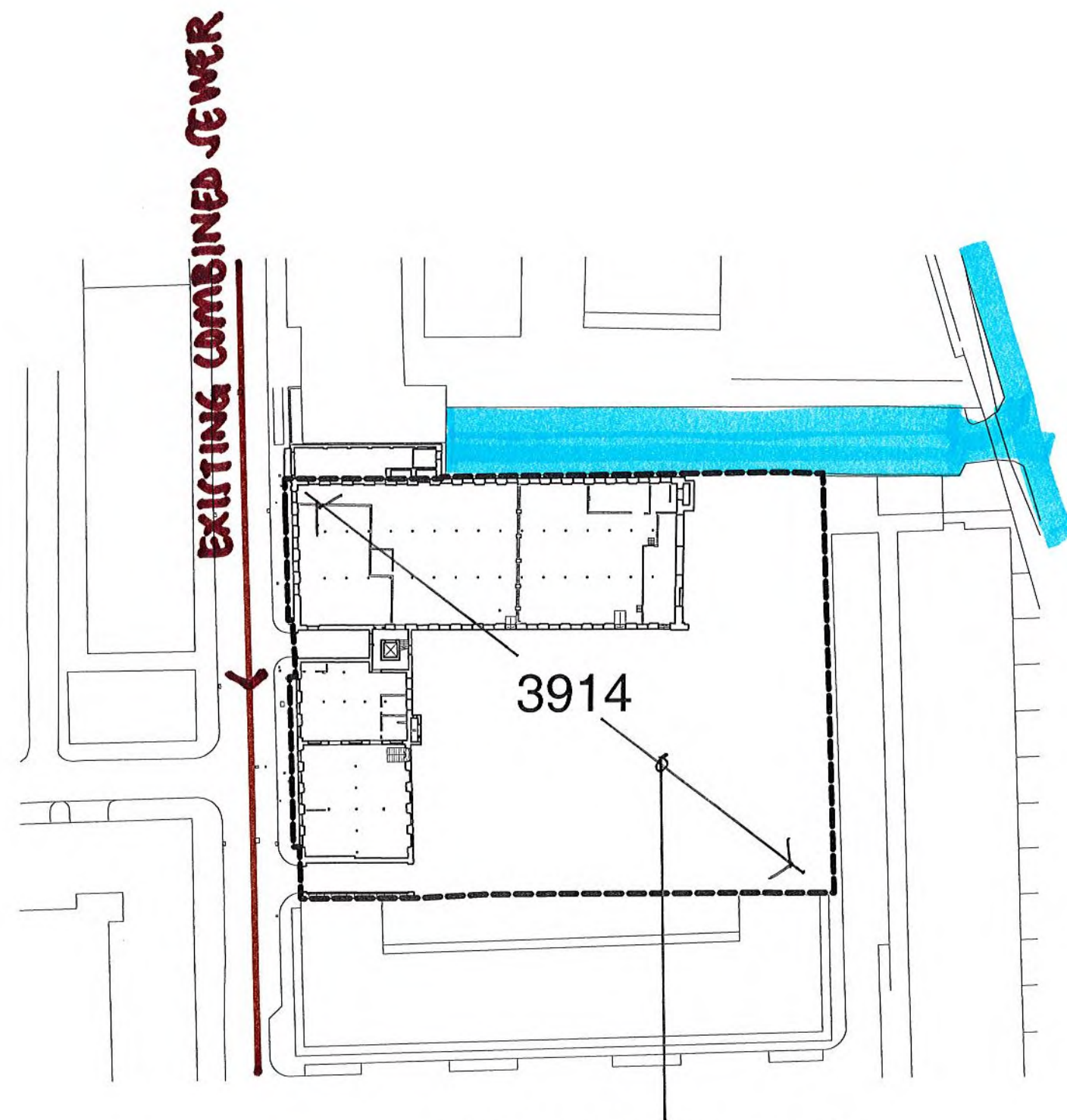
M1-5 storm $Q = \underline{\underline{52.2 \text{ L/s.}}}$

M2-5 storm $Q = \underline{\underline{66.8 \text{ L/s.}}}$

M5-5 storm $Q = \underline{\underline{86.5 \text{ L/s.}}}$

M30-5 storm $Q = \underline{\underline{122.2 \text{ L/s.}}}$

M100-5 storm $Q = \underline{\underline{154.3 \text{ L/s.}}}$



SITE COMPRISES BUILDINGS/
HARD LANDSCAPING, ASSUMED
TO DRAIN DIRECTLY TO THE
EXISTING COMBINED SEWER IN
EUREMORE STREET.

SITE AREA = 3914m²
PIMP = 100%.

EXISTING SITE.



Project				Job no.	
Talbot Mill				251-02	
Calcs for				Start page no./Revision	
Existing M1-5 Storm				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
sjw	01/08/2017				

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area	Manchester
Storm duration	D = 5 min
Return period	Period = 1 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.360
5-year return period rainfall of 60 minutes duration	M5_60min = 18.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 0 %
Factor Z1 (Wallingford procedure)	Z1 = 0.36
Rainfall for 5min storm with 5 year return period	M5_5min _i = Z1 × M5_60min = 6.5 mm
Factor Z2 (Wallingford procedure)	Z2 = 0.62
Rainfall for 5min storm with 1 year return period	M1_5min = Z2 × M5_5min _i = 4.0 mm
Design rainfall intensity	I _{max} = M1_5min / D = 48.0 mm/hr

Maximum surface water runoff

Catchment area	A _{catch} = 3914 m²
Percentage of area that is impermeable	p = 100 %
Maximum surface water runoff	Q _{max} = A _{catch} × p × I _{max} = 52.2 l/s

04

	Project Talbot Mill				Job no. 251-02	
	Calcs for Existing M2-5 Storm				Start page no./Revision 1	
	Calcs by sjw	Calcs date 01/08/2017	Checked by	Checked date	Approved by	Approved date

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area	Manchester
Storm duration	D = 5 min
Return period	Period = 2 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.360
5-year return period rainfall of 60 minutes duration	M5_60min = 18.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 0 %
Factor Z1 (Wallingford procedure)	Z1 = 0.36
Rainfall for 5min storm with 5 year return period	M5_5min _i = Z1 × M5_60min = 6.5 mm
Factor Z2 (Wallingford procedure)	Z2 = 0.79
Rainfall for 5min storm with 2 year return period	M2_5min = Z2 × M5_5min _i = 5.1 mm
Design rainfall intensity	I _{max} = M2_5min / D = 61.4 mm/hr

Maximum surface water runoff

Catchment area	A _{catch} = 3914 m ²
Percentage of area that is impermeable	p = 100 %
Maximum surface water runoff	Q _{max} = A _{catch} × p × I _{max} = 66.8 l/s

05

	Project Talbot Mill				Job no. 251-02	
	Calcs for Existing M5-5 Storm				Start page no./Revision 1	
	Calcs by sjw	Calcs date 01/08/2017	Checked by	Checked date	Approved by	Approved date

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity	
Location of catchment area	Manchester
Storm duration	D = 5 min
Return period	Period = 5 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.360
5-year return period rainfall of 60 minutes duration	M5_60min = 18.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 0 %
Factor Z1 (Wallingford procedure)	Z1 = 0.36
Rainfall for 5min storm with 5 year return period	M5_5min _i = Z1 × M5_60min = 6.5 mm
Factor Z2 (Wallingford procedure)	Z2 = 1.02
Rainfall for 5min storm with 5 year return period	M5_5min = Z2 × M5_5min _i = 6.6 mm
Design rainfall intensity	I _{max} = M5_5min / D = 79.5 mm/hr
Maximum surface water runoff	
Catchment area	A _{catch} = 3914 m ²
Percentage of area that is impermeable	p = 100 %
Maximum surface water runoff	Q _{max} = A _{catch} × p × I _{max} = 86.5 l/s

	Project				Job no.	
	Talbot Mill				251-02	
	Calcs for				Start page no./Revision	
	Existing M30-5 Storm				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date	
sjw	01/08/2017					

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area	Manchester
Storm duration	D = 5 min
Return period	Period = 30 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.360
5-year return period rainfall of 60 minutes duration	M5_60min = 18.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 0 %
Factor Z1 (Wallingford procedure)	Z1 = 0.36
Rainfall for 5min storm with 5 year return period	M5_5min _i = Z1 × M5_60min = 6.5 mm
Factor Z2 (Wallingford procedure)	Z2 = 1.45
Rainfall for 5min storm with 30 year return period	M30_5min = Z2 × M5_5min _i = 9.4 mm
Design rainfall intensity	I _{max} = M30_5min / D = 112.4 mm/hr

Maximum surface water runoff

Catchment area	A _{catch} = 3914 m ²
Percentage of area that is impermeable	p = 100 %
Maximum surface water runoff	Q _{max} = A _{catch} × p × I _{max} = 122.2 l/s

	Project				Job no.	
	Talbot Mill				251-02	
	Calcs for				Start page no./Revision	
	Existing M100-5 Storm				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date	
sjw	01/08/2017					

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area	Manchester
Storm duration	D = 5 min
Return period	Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.360
5-year return period rainfall of 60 minutes duration	M5_60min = 18.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 0 %
Factor Z1 (Wallingford procedure)	Z1 = 0.36
Rainfall for 5min storm with 5 year return period	M5_5min _i = Z1 × M5_60min = 6.5 mm
Factor Z2 (Wallingford procedure)	Z2 = 1.83
Rainfall for 5min storm with 100 year return period	M100_5min = Z2 × M5_5min _i = 11.8 mm
Design rainfall intensity	I _{max} = M100_5min / D = 142.0 mm/hr

Maximum surface water runoff

Catchment area	A _{catch} = 3914 m ²
Percentage of area that is impermeable	p = 100 %
Maximum surface water runoff	Q _{max} = A _{catch} × p × I _{max} = 154.3 l/s

Job No	251/02	Sheet No	08
Project	TRUBOT MILL	Engineer	JW
Element	DRAINAGE - PROPOSED.	Checked by	Date

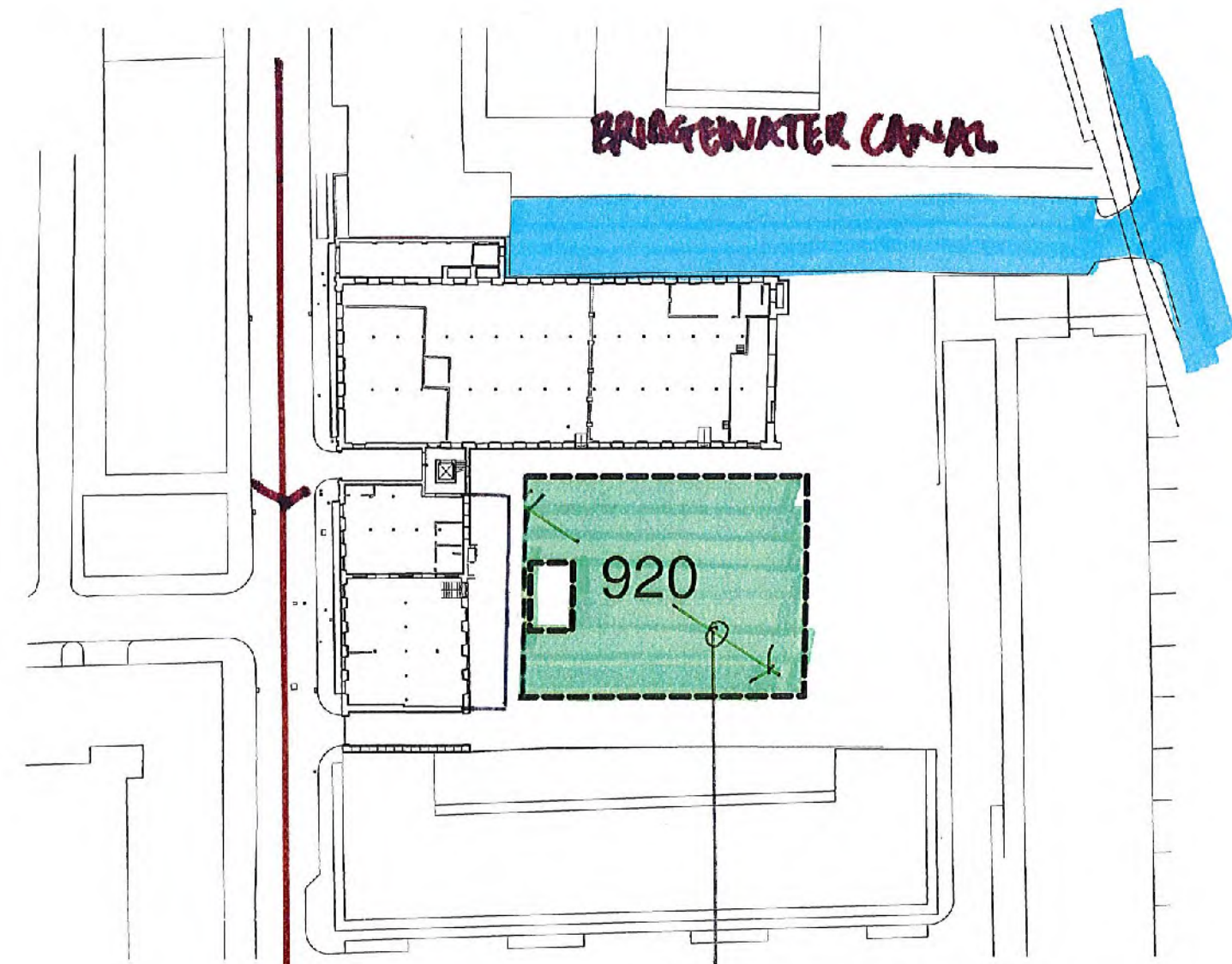
PROPOSED SITE:

WITHIN THE PROPOSED SITE OPTIONS FOR REDUCING OVERALL FLOW TO THE SEWER ARE LIMITED. THIS IS DUE TO THE EXISTING BUILDING ARRANGEMENT AND COURTYARD ARRANGEMENT AND REQUIREMENT FOR BUILDING SERVICING.

WITHIN THE COURTYARD PERMEABLE FINISHES ARE SPECIFIED BY THE LANDSCAPE ARCHITECT WHERE APPROPRIATE. THIS ALLOWS NATURAL PERCOLATION TO THE GROUND TO REDUCE OVERALL RUNOFF WHERE POSSIBLE.

EVERYWHERE ATTENUATION TANKS ARE PROVIDED TO STORE RAIN WATER FROM ROOFS/HARD SURFACING TO MANAGE FLOWS OFF SITE. AT THIS STAGE IT IS ASSUMED THAT TANKS WILL BE POSITIONED CENTRALLY AND CAN TAKE FEEDS FROM ALL CONTRIBUTING SURFACES.

IN ACCORDANCE WITH THE REQUIREMENTS OF THE MANCHESTER CITY, Salford AND TRAFFORD COUNCIL LEVEL 2 STRATEGIC FLOOD RISK ASSESSMENT (MST SFA) A MINIMUM REDUCTION OF SURFACE WATER RUNOFF RATE IS TARGETED AT 50%.



COMBINED
SEWER.

PERMEABLE FINISHES TO
COURTYARD.

$$\begin{aligned} \text{SITE AREA} &= 3914 \text{ m}^2 \\ \text{LANDSCAPE} &= 920 \text{ m}^2 \end{aligned}$$

$$\text{PIMP} = \frac{3914 - 920}{3914} = 76\%$$

PROPOSED SITE.

Job No 251/02	Sheet No 10	
Project TRUBOT MILU	Engineer sjw	Date 08/17
Element DRAINAGE - PROPOSED.	Checked by	Date

CONSIDER ENTIRE SITE, TARGETING -50% IN RUNOFF RATE.

$$\text{ALLOWABLE LIMITING DISCHARGE} = 52.2/2 = \underline{\underline{26.1 \text{ L/s}}}$$

FROM PREVIOUS CALC

$$\Sigma A = 3914 \text{ m}^2 \quad \Sigma \text{LANDSCAPE} = 920 \text{ m}^2 \quad \text{PIMP} = 76\%$$

CALCULATE FLOW AT 100 YR STORM + 30% CLIMATE CHANGE.

REFER TO ATTACHED TERRY CALC

$$\begin{aligned} \text{M100-5+30\% storm} \quad Q &= 156.4 \text{ L/s} \quad Q_{\text{net}} = 156.4 - 26.1 = 130.3 \text{ L/s} \\ V &= 130.3 \times 5 \times 60 = \underline{\underline{39 \text{ m}^3}} \end{aligned}$$

$$\begin{aligned} \text{M100-10+30\% storm} \quad Q &= 114.8 \text{ L/s} \quad Q_{\text{net}} = 114.8 - 26.1 = 88.7 \text{ L/s} \\ V &= 88.7 \times 10 \times 60 = \underline{\underline{53 \text{ m}^3}} \end{aligned}$$

$$\begin{aligned} \text{M100-15+30\% storm} \quad Q &= 95.0 \text{ L/s} \quad Q_{\text{net}} = 95 - 26.1 = 68.9 \text{ L/s} \\ V &= 68.9 \times 15 \times 60 = \underline{\underline{62 \text{ m}^3}} \end{aligned}$$

$$\begin{aligned} \text{M100-30+30\% storm} \quad Q &= 61.6 \text{ L/s} \quad Q_{\text{net}} = 61.6 - 26.1 = 35.5 \text{ L/s} \\ V &= 35.5 \times 30 \times 60 = \underline{\underline{64 \text{ m}^3}} \end{aligned}$$

$$\begin{aligned} \text{M100-60+30\% storm} \quad Q &= 39.0 \text{ L/s} \quad Q_{\text{net}} = 39.0 - 26.1 = 12.9 \text{ L/s} \\ V &= 12.9 \times 60 \times 60 = \underline{\underline{46.4 \text{ m}^3}} \end{aligned}$$

$$\text{M100-120+30\% storm} \quad Q = 23.4 \text{ L/s} \quad \underline{\underline{\text{OK BY INSPECTION.}}}$$

11

	Project			Job no.		
	Talbot Mill			251-02		
	Calcs for			Start page no./Revision		
			Proposed M100-5 Storm +30%			1
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date	
sjw	01/08/2017					

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity	
Location of catchment area	Manchester
Storm duration	D = 5 min
Return period	Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.360
5-year return period rainfall of 60 minutes duration	M5_60min = 18.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 30 %
Factor Z1 (Wallingford procedure)	Z1 = 0.36
Rainfall for 5min storm with 5 year return period	M5_5min _i = Z1 × M5_60min × (1 + p _{climate}) = 8.4 mm
Factor Z2 (Wallingford procedure)	Z2 = 1.87
Rainfall for 5min storm with 100 year return period	M100_5min = Z2 × M5_5min _i = 15.8 mm
Design rainfall intensity	I _{max} = M100_5min / D = 189.3 mm/hr
Maximum surface water runoff	
Catchment area	A _{catch} = 3914 m²
Percentage of area that is impermeable	p = 76 %
Maximum surface water runoff	Q _{max} = A _{catch} × p × I _{max} = 156.4 l/s

12

	Project Talbot Mill				Job no. 251-02	
	Calcs for Proposed M100-10 Storm +30%				Start page no./Revision 1	
	Calcs by sjw	Calcs date 01/08/2017	Checked by	Checked date	Approved by	Approved date

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity	
Location of catchment area	Manchester
Storm duration	D = 10 min
Return period	Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.360
5-year return period rainfall of 60 minutes duration	M5_60min = 18.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 30 %
Factor Z1 (Wallingford procedure)	Z1 = 0.51
Rainfall for 10min storm with 5 year return period	M5_10min _i = Z1 × M5_60min × (1 + p _{climate}) = 11.9 mm
Factor Z2 (Wallingford procedure)	Z2 = 1.94
Rainfall for 10min storm with 100 year return period	M100_10min = Z2 × M5_10min _i = 23.2 mm
Design rainfall intensity	I _{max} = M100_10min / D = 139.0 mm/hr
Maximum surface water runoff	
Catchment area	A _{catch} = 3914 m ²
Percentage of area that is impermeable	p = 76 %
Maximum surface water runoff	Q _{max} = A _{catch} × p × I _{max} = 114.8 l/s

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	Project			Job no.		
	Talbot Mill			251-02		
	Calcs for			Start page no./Revision		
			Proposed M100-15 Storm +30%			1
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date	
sjw	01/08/2017					

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area Manchester
Storm duration D = 15 min
Return period Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period $r = 0.360$
5-year return period rainfall of 60 minutes duration $M5_60min = 18.0$ mm
Increase of rainfall intensity due to global warming $p_{climate} = 30$ %
Factor Z1 (Wallingford procedure) $Z1 = 0.62$
Rainfall for 15min storm with 5 year return period $M5_15min_i = Z1 \times M5_60min \times (1 + p_{climate}) = 14.5$ mm
Factor Z2 (Wallingford procedure) $Z2 = 1.98$
Rainfall for 15min storm with 100 year return period $M100_15min = Z2 \times M5_15min_i = 28.8$ mm
Design rainfall intensity $I_{max} = M100_15min / D = 115.0$ mm/hr

Maximum surface water runoff

Catchment area $A_{catch} = 3914$ m²
Percentage of area that is impermeable $p = 76$ %
Maximum surface water runoff $Q_{max} = A_{catch} \times p \times I_{max} = 95.0$ l/s

	Project				Job no.	
	Talbot Mill				251-02	
	Calcs for				Start page no./Revision	
	Proposed M100-30 Storm +30%				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date	
sjw	01/08/2017					

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area Manchester
Storm duration D = 30 min
Return period Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period $r = 0.360$
5-year return period rainfall of 60 minutes duration $M5_60min = 18.0$ mm
Increase of rainfall intensity due to global warming $p_{climate} = 30$ %
Factor Z1 (Wallingford procedure) $Z1 = 0.79$
Rainfall for 30min storm with 5 year return period $M5_30min_i = Z1 \times M5_60min \times (1 + p_{climate}) = 18.5$ mm
Factor Z2 (Wallingford procedure) $Z2 = 2.02$
Rainfall for 30min storm with 100 year return period $M100_30min = Z2 \times M5_30min_i = 37.3$ mm
Design rainfall intensity $I_{max} = M100_30min / D = 74.6$ mm/hr

Maximum surface water runoff

Catchment area $A_{catch} = 3914$ m²
Percentage of area that is impermeable $p = 76$ %
Maximum surface water runoff $Q_{max} = A_{catch} \times p \times I_{max} = 61.6$ l/s

	Project				Job no.	
	Talbot Mill				251-02	
	Calcs for				Start page no./Revision	
	Proposed M100-60 Storm +30%				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date	
sjw	01/08/2017					

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area	Manchester
Storm duration	D = 1 hr
Return period	Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.360
5-year return period rainfall of 60 minutes duration	M5_60min = 18.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 30 %
Factor Z1 (Wallingford procedure)	Z1 = 1.00
Rainfall for 1hr storm with 5 year return period	M5_1hr _i = Z1 × M5_60min × (1 + p _{climate}) = 23.4 mm
Factor Z2 (Wallingford procedure)	Z2 = 2.02
Rainfall for 1hr storm with 100 year return period	M100_1hr = Z2 × M5_1hr _i = 47.2 mm
Design rainfall intensity	I _{max} = M100_1hr / D = 47.2 mm/hr

Maximum surface water runoff

Catchment area	A _{catch} = 3914 m ²
Percentage of area that is impermeable	p = 76 %
Maximum surface water runoff	Q _{max} = A _{catch} × p × I _{max} = 39.0 l/s

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	Project			Job no.		
	Talbot Mill			251-02		
	Calcs for			Start page no./Revision		
			Proposed M100-120 Storm +30%			1
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date	
sjw	01/08/2017					

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.00

Design rainfall intensity

Location of catchment area Manchester
Storm duration D = 2 hr
Return period Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period $r = 0.360$
5-year return period rainfall of 60 minutes duration $M5_{60min} = 18.0$ mm
Increase of rainfall intensity due to global warming $p_{climate} = 30$ %
Factor Z1 (Wallingford procedure) $Z1 = 1.22$
Rainfall for 2hr storm with 5 year return period $M5_{2hr} = Z1 \times M5_{60min} \times (1 + p_{climate}) = 28.5$ mm
Factor Z2 (Wallingford procedure) $Z2 = 1.98$
Rainfall for 2hr storm with 100 year return period $M100_{2hr} = Z2 \times M5_{2hr} = 56.6$ mm
Design rainfall intensity $I_{max} = M100_{2hr} / D = 28.3$ mm/hr

Maximum surface water runoff

Catchment area $A_{catch} = 3914$ m²
Percentage of area that is impermeable $p = 76$ %
Maximum surface water runoff $Q_{max} = A_{catch} \times p \times I_{max} = 23.4$ l/s

Job No	251/02	Sheet No	17
Project	TRUBOT MUM	Engineer	jiw
Element	MANAGE-PROPOSED	Date	08/17.
		Checked by	
		Date	

BY INSPECTION PROVIDE ATTENUATION STORAGE IN
NETWORK/TANK c 64m³.

ASSUMING 95% EFFICIENCY, 1.2m DEEP. TANK AREA;

$$A = \frac{64}{1.2 \times 0.95}$$
$$= \underline{56m^2} \quad c 7.5 \times 7.5 \times 1.2m.$$