MEINHARDT

Design Note 03

PROJECT:	**Selkirk House, 166 High Holborn, 1 Museum Street, 10-12 Museum Street, 35-41 New Oxford Street and 16A-18 West Central Street**		
TITLE:	**MEINHARDT'S RESPONSE TO LLFA PLANNING COMMENTS**		
REVISION:	**01**		
PREPARED BY:	Mr. C. Marchant	Date:	27 February 2023
REVIEWED BY:	Mr. C. Marchant	Date:	**27 February 2023**
APPROVED BY:	Mr. G. Bansal	Date:	**27 February 2023**

This design note has been prepared in response to the comments received from the London Borough of Camden (LBC), the Lead Local Flood Authority (LLFA) for the London Borough. The comments were received on 2nd February 2023, in relation to the proposed planning application submitted for the site; Selkirk House, 166 High Holborn, 1 Museum Street, 10-12 Museum Street, 35-41 New Oxford Street and 16A-18 West Central Street reference 2021/2954/P.

For the full LLFA comments via email please refer to Appendix A.

1 LLFA Review Summary of Application

Review Summary:

- Type of development: Major
- Types of conveyance / attenuation features: Attenuation tanks, green and blue roofs
- Runoff rate restriction (l/s): Original application 46l/s (36l/s unrestricted from Museum St site and 5l/s for the West Central development and 5l/s for the Museum Street Development).
- Runoff rate restriction per hectare (l/s/ha): N/A
- Runoff attenuation volume (m3): Originally stated to be at least 169m3. The blue roof attenuation volume has been amended. Calculations have been provided although these do not take the whole site into account.
- Maintenance plan: Incomplete
- Any other previously identified outstanding matters: The applicant has provided evidence that the London Borough of Camden have previously approved the unattenuated portion of Museum street.

2 LLFA Planning Comments – Below Ground Drainage Strategy

2.1.1 LLFA Comment 1 – Pumped Surface Water Drainage Solution

The LLFA have stated the following comment on the Proposed Drainage Strategy Report.

“Both the developments in Museum Street and West Central Street propose the use of a pump to transfer water from the basement attenuation tanks to the sites internal drainage network. The applicant has not provided justification for the use of pumped drainage”.

The proposed Museum Street site consists of an existing basement structure which covers nearly the whole of the Museum Street private site ownership boundary. The existing basement structure makes it very difficult to design any below ground SuDS into the scheme, due to the footprint of the existing basement structure.

Therefore, to minimise the requirement for below ground SuDS, where possible we have designed above ground SuDS into the development such as blue and green roofs. However, due to project constraints such as the size of the development, the restricted discharge rate, not all roof areas being suitable for blue roofs and the fact that some of the external areas on the ground floor are built directly off the ground floor slab, making it is impossible to drain certain areas of the site via the restricted discharge rate without taking drainage into the existing basement. It is for the reasons above it is not possible to provide a SuDS solution for the development that can achieve the restricted discharge rate without providing a below basement attenuation tank and a pumped drainage solution.

To ensure the proposed building is feasible from a MEP engineering standpoint, the existing basement structure has been occupied for plant being used run the proposed development, leaving no room for attenuation tanks above the existing basement slab within the existing basement structure. However, even if there was additional space within the existing basement structure to provide an attenuation tank, the tank would still need to be pumped to connect into the Thames Water public sewer due to the depth of the existing public sewer network in the surrounding roads. Therefore, after exploring all of the options to provide a gravity-fed drainage system for the Museum Street development, the decision was made to provide a surface water attenuation tank beneath the basement slab and a pumped solution. However, it should be added that not all of the proposed museum street site is draining via the basement attenuation tank. All of the proposed areas of blue roofs will drain via gravity and make new connections to the Thames Water public sewer network. The proposed surface water discharge rate of 5.0l/s has been split between the proposed blue roofs and the remaining discharge rate is being used as the pumped discharge rate for the basement attenuation tank.

For the West Central Street site, we are also proposing to provide green roofs, blue roofs and a below ground attenuation tank system for the development. Just like the Museum Street Site, the West Central Street Site is constrained by the same elements such as a site wide existing basement, existing buildings being retained on site and limited space for below ground SuDS. Therefore, Meinhardt have worked with the design team to utilise as many of the available roof space areas for blue roofs as possible. However, some of the existing roof areas have been deemed by the structural engineers as not being able to take the loading from a blue roof, also there are areas of the site which will drain directly onto the ground floor with little to no space to provide attenuation without taking this drainage into the existing basement.

It is for the same reasoning as the Museum Street site, that a basement attenuation tank is required within the West Central Street development. Due to the depth of the existing Thames Water sewers, once the surface water drainage has been taken into the basement attenuation tank a pumped drainage solution is required to drain the tank.

2.1.2 LLFA Comment 2 – Discharge Location Points

The LLFA have stated the following comment on the Proposed Drainage Strategy Report.

"It is not clear how many off-site discharge points are proposed and where these are located. The applicant has not confirmed the number and locations of off-site discharge points into the Thames Water combined sewer (this differs between drawings)".

For the proposed Museum Street site we are proposing to create three new connection points into the Thames Water public sewer, there are shown on Drawing 2413-MT-CV-DR-1MS-00100-P02 in Appendix B of the Drainage Strategy Report submitted for Planning.

The three new connections points from the Museum Street Development have been summarised below:

- 1 x new combined water connection from the Vine Lane Building into the existing Thames Water Combined Sewer in West Central Street.
- 1 x new combined water connection from the Museum Street Building into the existing Thames Water combined Sewer in West Central Street.
- 1 x new combined water connection from the proposed Holborn Building and the Museum Street Building into the existing Thames Water combined water sewer within High Holborn.

For the proposed West Central Street Building, we are proposing to create 3 x sewer connections to the Thames Water combined sewers. These connection points are shown on Drawings 2413-MHT-CV-DR-WCS-00099-P01 and 2413-MHT-CV-DR-WCS-00100-P01, these drawings can be found in Appendix B of the Drainage Strategy Report submitted for Planning.

The three drainage connection points from the West Central Street development have been summarised below:

- Reuse 1 x existing below basement foul water connection into existing Thames Water combined sewer with Museum Street.
- Reuse 1 x existing below basement foul water connection into the existing Thames Water combined sewer with New Oxford Street.
- 1 x new combined water connection from the Internal MEP below ground floor drainage into the Thames Water combined water sewer within West Central Street.

Please also refer to Appendix B of this Design Note for the Proposed Below Ground Drainage Drawings with the proposed connection points to the Thames Water combined sewer's locations.

2.1.3 LLFA Comment 3 – West Central Street Blue Roofs

The LLFA have stated the following comment on the Proposed Drainage Strategy Report.

"Incomplete information has been submitted for the blue roof for West Central Street. The blue roof information in drainage drawing 2413-MHT-CV-DR-WCS-00101 P01 (Below Ground Drainage Strategy (September 2022), p.41) does not match the information provided in the surface water drainage strategy (Below Ground Drainage Strategy (September 2022), p.21".

In section 2.3.5 of the below ground drainage strategy report, Table 7 outlines the proposed summary of the blue roofs for the West Central Street development. An image of Table 7 is shown below.

Proposed West Central Street Blue Roofs				
Location	Area	Depth	Volume	Discharge Rate
Courtyard	95m²	100mm	9.0m³	0.35l/s
Roof 18	62m²	150mm	8.8m³	0.30l/s

Table 7: West Central Street Blue Roof Summary

Figure 1: West Central Street Blue Roof Summary Table 7

The proposed drawing 2413-MHT-CV-DR-WCS-00101-P01 on page 41 of the below ground drainage strategy report, highlights the proposed blue roof areas proposed for the West Central Street site. On the West Central Street drawing stated above, Meinhardt have shown the area and volume of the West Central Street blue roofs as:

- Courtyard - 95m², 100mm deep and a total volume of 9.5m³.

- Roof 18 (Yard Building) – 62m², 150mm deep and a total volume of 9.3m³

The reason the values on the drawings differ slightly between what is shown in the table within the report and what is shown on the drawing is the values in the table take into consideration the fact that the blue roof attenuation tanks have 95% porosity.

- Courtyard = 9.5m³ x 0.95 = 9.02m³. Value in the report table shown as 9.0m³
- Roof 18 = 9.3m³ x 0.95 = 8.84m³. Value in the report table shown as 8.8m³

This is the reason for the discrepancy within the blue roof volumes on the drawing compared to the West Central Street Blue roof summary table within the report.

2.1.4 LLFA Comment 4 – Blue and Green Roofs

The LLFA have stated the following comment on the Proposed Drainage Strategy Report.

"Not all the blue roofs are a minimum 150mm thickness. The depth of the proposed green roofs are not clear".

All of the proposed blue roof depths on the proposed Museum Street and the Vine Lane Building have been designed to be 150mm.

For West Central Street, there are two areas of blue roofs proposed the Courtyard and Roof 18 (Yard Building). The blue roof depth for proposed Roof 18 is 150mm as shown in the West Central Street blue roof summary and the drawing 2413-MHT-CV-DR-WCS-00101-P01.

The proposed blue roof for the courtyard area of the development has been designed as 100mm in depth. This is because when designing the blue roofs for the development, Meinhardt have been liaising with the blue roof designer Radmat who have completed their own blue roof design calculation for each of the proposed blue roofs on West Central Street site. Please refer to Appendix C for the Radmat proposed blue roof calculations.

The blue roof calculation demonstrates that for the proposed catchment area draining onto the courtyard blue roof, the optimum blue roof design depth to ensure maximum efficiency within the blue roof crate system is 100mm in depth. Therefore, we have decided to proceed with a 100mm deep blue roof crate design for this area of the development. The 100mm deep blue roof fits within the proposed architectural build-up for the courtyard and allows for a flush entrance into each of the proposed buildings from this level.

The green roof build-up is to be specified by the Architect, which will be confirmed at the next stage of the design. For the planning submission, we have assumed an 80mm deep green roof build-up.

Please can the green roof design and specification be included within the planning conditions.

2.1.5 LLFA Comment 5 – Greenfield Runoff Rates and Flow Controls

The LLFA have stated the following comment on the Proposed Drainage Strategy Report.

"Points relating to run-off rates and flow control have not been sufficiently addressed, greenfield rates have not been provided and a portion of the site will drain unrestricted. Greenfield runoff rates have not been provided for the 1 in 1 year, 1 in 30 year and 1 in 100 year return periods. Completion of GLA SuDS proforma required."

Both the Museum Street and the West Central Street development are brownfield sites. Meinhardt have calculated the existing brownfield surface water discharge rates for each site recording the 1 in 1, 1 in 30 and 1 in 100 year brownfield surface water discharge rates. This information has been stated in the below ground drainage strategy report issue for Planning.

The proposed greenfield runoff rates for the West Central Street and the Museum Street sites have been calculated and can be found in Appendix D of this design note.

Table 1: Museum Street Greenfield Runoff Rates

1 Museum Street Greenfield Runoff Rates	
Storm Event	Discharge Rate (l/s)
1 in 1 year	0.43
QBAR	0.51
1 in 30 Year	1.62
1 in 100 Year	1.90

Table 2: West Central Street Greenfield Runoff Rates

West Central Street Greenfield Runoff Rates	
Storm Event	Discharge Rate (l/s)
1 in 1 year	0.13
QBAR	0.16
1 in 30 Year	0.36
1 in 100 Year	0.50

The London Borough of Camden SuDS proforma has been filled out for both the West Central Street and Museum Street sites and can be found in Appendix D.

2.1.6 LLFA Comment 6 – Attenaution Volumes

The LLFA have stated the following comment on the Proposed Drainage Strategy Report.

"The applicant has not provided the required attenuation volume for the site or the attenuation volume of all of the drainage features. The calculations do not take the whole site area into account."

The proposed attenuation volumes for Museum Street can be found in section 2.3.4 of the drainage strategy report. These volumes have been summaries in the table below:

Table 3: Museum Street Attenuation Features

Proposed Museum Street Attenuation Features		
Location	Attenuation Feature	Volume (m^3)
Vine Lane 2nd Floor North Terrace	Blue Roof	9.3
Vine Lane 2nd Floor South Terrace	Blue Roof	5.3
Vine Lane 4th Floor Terrace	Blue Roof	16.5
Vine Lane Roof	Blue Roof	15.4
8th Floor Terrace	Blue Roof	17.8
11th Floor Terrace	Blue Roof	31.5
Museum Street Basement	Attenuation Tank	134
	Total Volume =	229.8

The whole of the private site catchment area has been included within the proposed drainage calculation, except for the area of the private site boundary that has been agreed by Thames Water and the LBC to be allowed to continue to drain unrestricted into the highway gullies connecting to the Thames Water combined sewer in Museum Street.

Table 4: West Central Street Attenuation Features

Proposed West Central Street Attenuation Features		
Location	Attenuation Feature	Volume (m^3)
Vine Lane 2nd Floor North Terrace	Blue Roof	9.5
Vine Lane 2nd Floor South Terrace	Blue Roof	9.3
West Central Street Basement	Attenuation Tank	20
	Total Volume =	38.8

The whole of the private site catchment area has been included in the design calculation for the West Central Street site. This can be seen by referring to the drainage calculations area summary sheet in Appendix E.

Figure 2: Private and Council owned area within the Planning Application Boundary

2.1.7 LLFA Comment 7 – DEFRA Technical Standards

The LLFA have stated the following comment on the Proposed Drainage Strategy Report.

"The application does not comply with Defra Non-Statutory Technical Standards S7, 8, 9. Information has not been provided to indicate how exceedance flows will be managed."

The Defra Non-Statutory Technical Standard state the following:

"S7 - The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event".

"S8 - The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development".

"S9 - The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100 year rainfall event are managed in exceedance routes that minimise the risks to people and property".

The proposed Museum Street and West Central Street sites have been designed to be able to accommodate a 1 in 30 year storm event and 1 in 100 year Storm Event + 40% CC without flooding.

For the design calculations providing this, please refer to Appendix I and J of the proposed drainage strategy report or refer to Appendix E of this Design Note.

The proposed Museum Street attenuation tank has been designed with a 300mm freeboard at the top of the attenuation tank and will be fitted with an alarm system in the pump chamber and the attenuation tank to ensure that should a pump failure or an exceedance storm event occur, the building management team is alerted of this issue and can provide the required response. The 300mm freeboard at the top of the basement attenuation tank accounts for circa 25m³ of additional attenuation for excess flows that could occur if a storm event greater than a 1 in 100 year +40% CC was to occur. If for a certain reason, the attenuation tank and the tank freeboard were full of surface water, any excess surface water would be able to drain away into the basement plant room foul water gullies which are connected to a pump draining into the Thames Water combined sewer.

The proposed West Central Street attenuation tank has been designed with a 60mm freeboard at the top of the attenuation tank. This freeboard will be fitted with a high-level alarm system to alert the building management team of an exceedance event. A high-level alarm will also be installed within the proposed pump chamber to alter building users of a failure of the basement pump. The 60mm freeboard within the attenuation tank will provide 1.2m³ of additional surface water attenuation to account for excess flows that could occur. Should the exceedance flows be far larger than the attenuation tank has capacity for then surface water that floods out of the attenuation tank would be able to drain away via the plant room gillies installed within the basement of the structure into the Thames Water combined sewer surrounding the site.

2.1.8 LLFA Comment 8 – Maintenance Strategy

The LLFA have stated the following comment on the Proposed Drainage Strategy Report.

“The maintenance strategy does not include each drainage component or state the maintenance owner. The pumps have not been added to the maintenance strategy and the building management company has not been named.”

The maintenance owner or company responsible for managing the maintenance of the building has not yet been confirmed.

The proposed SuDS for the Museum Street and the West Central Street development included green roofs, blue roofs and below ground attenuation tanks. A maintenance strategy has been provided for each of these design elements within the proposed drainage strategy report in section 4.0.

As requested by the LLFA, a maintenance strategy has been provided for a pump chamber.

Pump Chamber Maintenance Strategy

For the Museum Street site, both foul and surface water will be pumped out of the lower basement level. As part of the pump maintenance strategy, both pump chambers will require regular inspections and occasional maintenance.

A guideline maintenance regime for a pump chamber is outlined in the Table below.

Table 5: Operation and maintenance requirements for pump chambers

Maintenance Schedule	Required Action	Recommended Frequency
Regular maintenance	Removal of any debris or sediment with the potential to obstruct the pump. Access the pump motor and review the pump bearing condition. Check motor cables for wear and water ingress. Check the condition of the wet well/ pump chambers (where appropriate) for any damage	Monthly for 3 months, then six monthly or as required
Remedial actions	Repair/replacement of pump control device	As required
	Where a blockage has resulted in a flooded manhole, drain down and unblock as required	As required
Monitoring	Inspect/check flow control is in good condition and operating as designed, hose down as required. Check and test all safety/ alarm systems. Visually inspect the pumps in operation to ensure correct operation and that no damage has occurred.	Monthly for 3 months, then six monthly

2.1.9 LLFA Comment 9 – Thames Water Consent

The LLFA have stated the following comment on the Proposed Drainage Strategy Report.

"It is not clear if the Thames Water consent applies to each site or the entire development. Correspondence from Thames Water in response to the 2022 developer enquiry has not been submitted".

Within Appendix G of the drainage strategy report, the Thames Water correspondence from 6th July 2022 confirming they have the capacity for the proposed foul and surface water discharge rates is for the West Central Street site.

On the 23rd of February 2023, Thames Water responded to the proposed Museum Street pre-development enquiry confirming the capacity for the proposed foul water flow rates. Within the pre-development enquiry, Thames Water have also confirmed capacity for the proposed surface water drainage strategy to discharge the proposed development at a rate of 5l/s, whilst maintaining the existing site condition where 36l/s from the existing site area will continue to drainage into the highway gullies connected to the Thames Water sewer in Museum Street.

Please refer to Appendix F for the Thames Water correspondence confirming the capacity within their sewer network for the West Central Street and Museum Street new developments.

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Appendix A – LLFA Planning Comments

Craig Marchant

From: Daniel Staddon
Sent: 03 February 2023 10:06
To: Craig Marchant; Gurdeep Bansal
Subject: FW: 2021/2954/P - Selkirk House, 166 High Holborn, 1 Museum Street, 10-12 Museum Street, 35-41 New Oxford Street and 16A-18 West Central Street - LLFA

FYI below

Kind Regards

Daniel Staddon MEng (Hons) CEng MIStructE
Associate Director

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From: Andy Rudlin <arudlin@iceniprojects.com>
Sent: 03 February 2023 10:01
To: Daniel Staddon <Daniel.Staddon@meinhardt.co.uk>; Rob Menendez <Rob.Menendez@meinhardt.co.uk>
Cc: Anna Snow <ASnow@iceniprojects.com>; Helen Allan <hallan@iceniprojects.com>; Charles Thomas-Davies <C.Thomas-Davies@Gardiner.com>; Eleanor Wright <ewright@simten.co.uk>; Edward Beaver <ebeaver@simten.co.uk>; Isabel Moreira <imoreira@dsdha.co.uk>; David Hills <dhills@dsdha.co.uk>
Subject: FW: 2021/2954/P - Selkirk House, 166 High Holborn, 1 Museum Street, 10-12 Museum Street, 35-41 New Oxford Street and 16A-18 West Central Street - LLFA

Hi Daniel

Please see comments below regarding Flood Risk for 1 Museum Street.

Camden have recommended further that information is submitted / improvements to the scheme are made in order to recommend approval.

Please can you review and let us know your thoughts?

Cc'ing in DSDHA as well for any input on this.

Kind regards

Andy

Andy Rudlin
Planner, Planning

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iceni

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From: Katherine Frost <Katherine.Frost@camden.gov.uk>
Sent: 02 February 2023 15:32
To: David Fowler <David.Fowler@camden.gov.uk>
Subject: 2021/2954/P - Selkirk House, 166 High Holborn, 1 Museum Street, 10-12 Museum Street, 35-41 New Oxford Street and 16A-18 West Central Street - LLFA

David

Thank you for reconsulting us on 2021/2954/P - Selkirk House, 166 High Holborn, 1 Museum Street, 10-12 Museum Street, 35-41 New Oxford Street and 16A-18 West Central Street. We have considered the revised 'Below Ground Drainage Strategy by Meinhart Sept 2022.

Please see comments below. **Further information is required**. It is important that details of the proposed attenuation capacity, greenfield run off rate information, exceedance flow management information and correspondence from Thames Water are all satisfactorily provided prior to approval.

Figure 5: West Central Street Roof Study

1. 6th Floor Roof – Proposed Green Roof
2. 5th Floor External Plant Area – Proposed Green Roof
3. 6th Floor Roof (Yard Building) – Proposed 150mm blue roof
4. 5th Floor Roof – Proposed Green Roof
5. 1st Floor External Courtyard – Proposed 100mm blue roof
6. Private residential terrace
7. Existing Buildings were deemed unsuitable for additional loading from SuDS by Meinhar Structural Engineers.
8. Light well not suitable for SuDS

a) Review Summary

- Type of development: Major
- Types of conveyance / attenuation features: Attenuation tanks, green and blue roofs
- Runoff rate restriction (l/s): Original application 46l/s (36l/s unrestricted from Museum St site and 5l/s for the West Central development and 5l/s for the Museum Street Development).
- Runoff rate restriction per hectare (l/s/ha): N/A
- Runoff attenuation volume (m3): Originally stated to be at least 169m^3. The blue roof attenuation volume has been amended. Calculations have been provided although these do not take the whole site into account.

- Maintenance plan: Incomplete
- Any other previously identified outstanding matters: The applicant has provided evidence that the London Borough of Camden have previously approved the unattenuated portion of Museum street.

Previous comments:

1. Both the developments in Museum Street and West Central Street propose the use of a pump to transfer water from the basement attenuation tanks to the sites internal drainage network. – FAIL
2. It is not clear how many off-site discharge points are proposed and where these are located. – MORE INFORMATION REQUIRED
3. Incomplete information has been submitted for the blue roof for West Central Street. – MORE INFORMATION REQUIRED
4. Not all the blue roofs are a minimum 150mm thickness. –NOT APPLICABLE
5. Points relating to run-off rates and flow control have not been sufficiently addressed, greenfield rates have not been provided and a portion of the site will drain unrestricted. – MORE INFORMATION REQUIRED
6. The applicant has not provided the required attenuation volume for the site or the attenuation volume of all of the drainage features. – FAIL
7. The application does not comply with Defra Non-Statutory Technical Standards S7, 8, 9. - FAIL
8. The maintenance strategy does not include each drainage component or state the maintenance owner. - FAIL
9. It is not clear if the Thames Water consent applies to each site or the entire development. - FAIL

Recommendation and Requests

We require more information and improved proposals before recommending approval of the application for the following reasons:

1. The applicant has not provided justification for the use of pumped drainage.
2. The applicant has not confirmed the number and locations of off-site discharge points into the Thames Water combined sewer (this differs between drawings).
3. The blue roof information in drainage drawing 2413-MHT-CV-DR-WCS-00101 P01 (Below Ground Drainage Strategy (September 2022), p.41) does not match the information provided in the surface water drainage strategy (Below Ground Drainage Strategy (September 2022), p.21).
4. The depth of the proposed green roofs are not clear.
5. Greenfield runoff rates have not been provided for the 1 in 1 year, 1 in 30 year and 1 in 100 year return periods. Completion of GLA SuDS proforma required.
6. The calculations do not take the whole site area into account.
7. Information has not been provided to indicate how exceedance flows will be managed.
8. The pumps have not been added to the maintenance strategy and the building management company has not been named.
9. Correspondence from Thames Water in response to the 2022 developer enquiry has not been submitted.

To address the above, please can the applicant submit information which:

1. Justifies the use of pumps.
2. Confirms the number and locations of off-site discharge points into the Thames Water combined sewer.
3. Clarifies the correct dimensions, volume and discharge rates of the blue roofs and align the drainage strategy with the drainage drawing.

4. Demonstrates that all of the green roofs are a minimum substrate thickness of 150 mm.
5. Greenfield runoff rates should be provided for the 1 in 1 year, 1 in 30 year and 1 in 100 year return periods. These should be based upon the whole site area which includes areas of soft landscaping. Calculations to support the rates should be provided.
6. Provides calculations demonstrating that there is no flooding on site in a 1 in 30 year event and no flooding to buildings during a 1 in 100 year + climate change event, taking the whole site area into account with the exception of the portion of the site that will flow unrestricted to the Thames Water sewer.
7. Indicates how exceedance flows will be managed in the case of exceedance events, or blockage/ failure of the system.
8. If adequate justification is provided for their inclusion, the pumps must be added to the maintenance strategy. The building management company should be specified.
9. The response from Thames Water to the 2022 developer enquiry should be submitted confirming if they accept the proposed discharge rate.

Kind regards

Katherine

Katherine Frost
Senior Sustainability Officer (Planning)
Supporting Communities
London Borough of Camden

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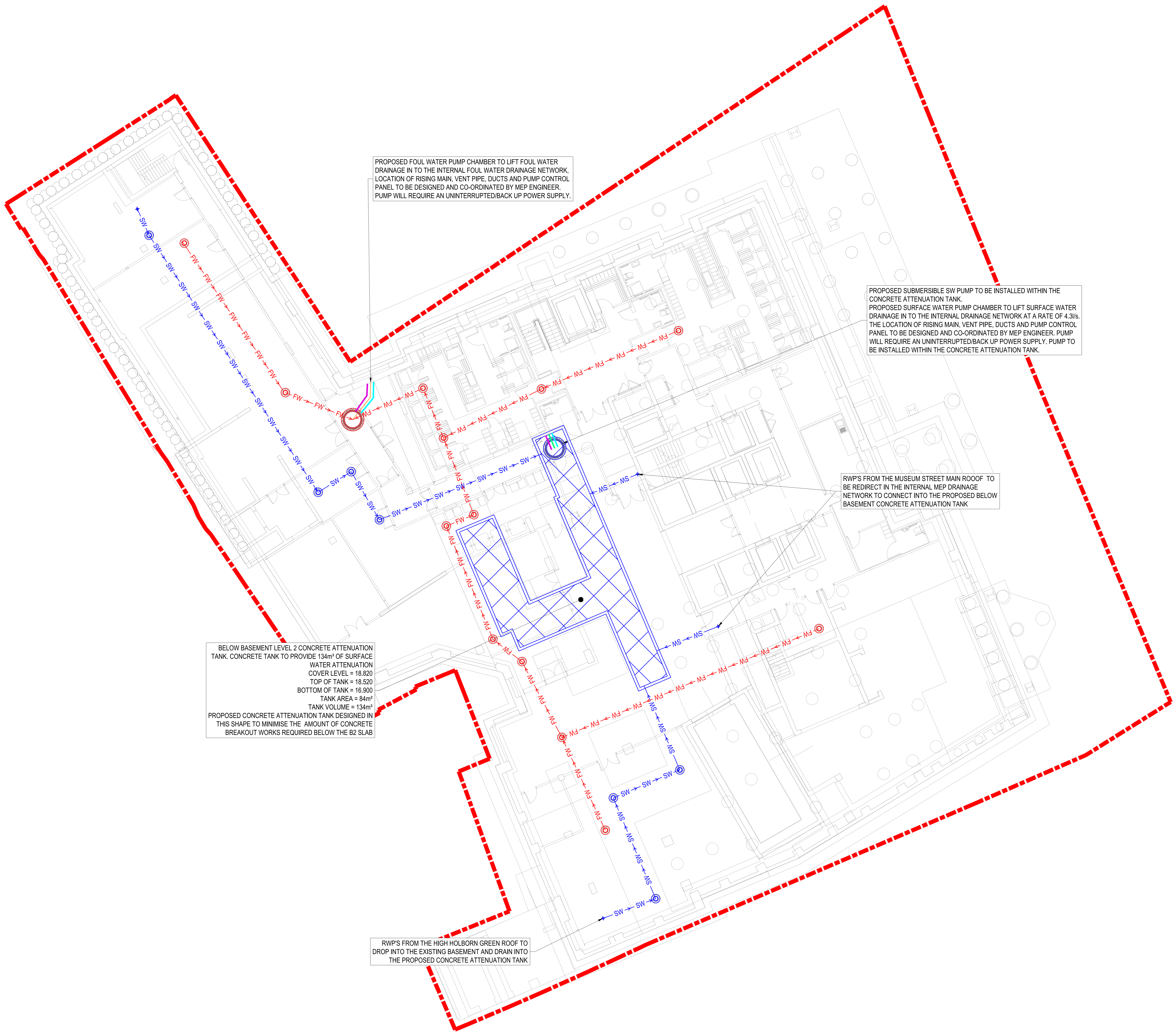
5 Pancras Square
London N1C 4AG

Appendix B – Proposed Below Ground Drainage Drawings



ISO A1 841mm x 594mm

STAGE 2
NOT FOR CONSTRUCTION

REV	DESCRIPTION	BY	DATE
P01	ISSUED FOR STAGE 2 REPORT	CM	20.05.22

NOTES:

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. THIS DRAWING IS FOR STAGE 2 PURPOSES ONLY AND SHOULD NOT BE USED FOR CONSTRUCTION.
4. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND CONSULTANTS DRAWINGS AND SPECIFICATIONS
5. DRAWING BASED ON:
   - DSDHA 1 MUSEUM STREET PROPOSED SECOND BASEMENT FLOOR PLAN ARCHITECTURAL LAYOUT REFERENCE 295A-DSD-1MS-B2-DR-A-20.098, REVISION A, RECEIVED 20.05.2022
   - MEINHARDT STRUCTURES - PROPOSED BASEMENT LEVEL 2 FOUNDATION PLAN, REFERENCE 2413-MHT-ST-DR-04080

KEY:

- SITE BOUNDARY
- FW FW — PROPOSED FOUL WATER SEWER
- SW SW — PROPOSED SURFACE WATER SEWER
- FWRM FWRM — PROPOSED FOUL WATER RISING MAIN
- FWRM FWRM — PROPOSED SURFACE WATER RISING MAIN
- PROPOSED FOUL WATER PUMP
- PROPOSED FOUL WATER PPIC
- PROPOSED SURFACE WATER PUMP
- PROPOSED SURFACE WATER PPIC
- PROPOSED RAIN WATER DRAINAGE POINT
- PROPOSED BELOW GROUND DRAINAGE ATTENUATION

CDM RESIDUAL CIVIL / STRUCTURAL DESIGN RISKS

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PROJECT
LABS HOLBORN
(1 MUSEUM STREET)
WC1A 1JP

CLIENT
LABTECH

TITLE
MUSEUM STREET
PROPOSED BELOW BASEMENT -2
DRAINAGE LAYOUT

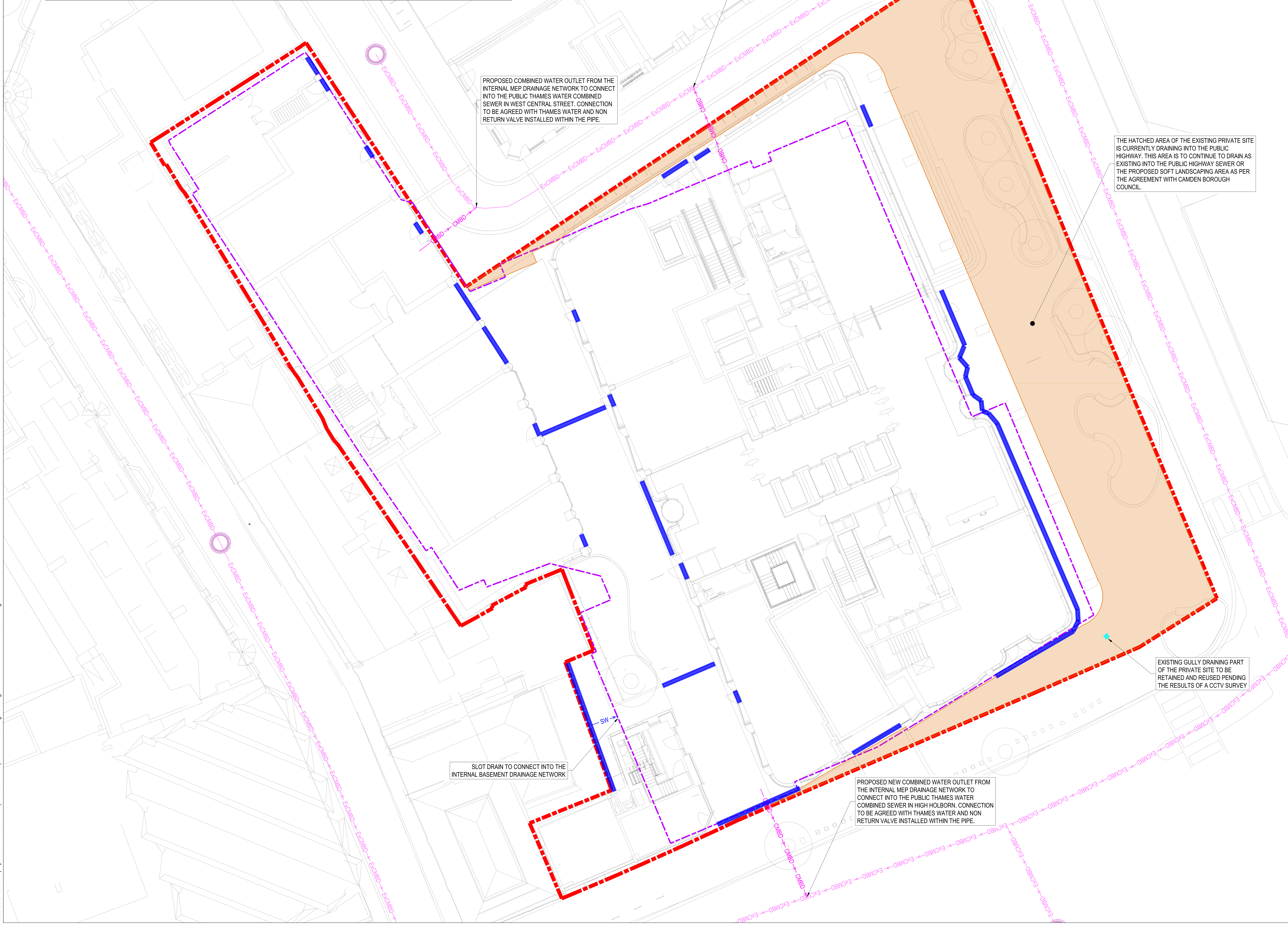
DISCIPLINE			SCALE @ A1
CIVILS DRAWING			1:150
DRAWN	DESIGNED	CHECKED	APPROVED
CM	CM	GB	PH
DRAWING No			ISSUE
2413-MHT-CV-DR-1MS-00099			P01

DATE: 06/01/2021
FILE LOCATION: h:\projects\2413 - labs holborn (1 museum street)\1. mht\civil\drawings\drawings\1ms\2413-mht-cv-dr-1ms-00099.dwg

ISO A1 841mm x 594mm

NOTES:

- THE EXTERNAL AREAS OF THE PRIVATE SITE OFF MUSEUM STREET IS CURRENTLY DRAINING SURFACE WATER RUNOFF INTO AN EXISTING DRAINAGE NETWORK OR THE PUBLIC HIGHWAY. IT HAS BEEN AGREED WITH CAMDEN COUNCIL AND THAMES WATER THAT THIS AREA OF THE PRIVATE SITE CAN CONTINUE TO DRAIN AS EXISTING AND THEREFORE NO DRAINAGE IS PROPOSED FOR THIS AREA.
- THE PROPOSED NEW COMBINED WATER CONNECTION POINTS TO THE PUBLIC SEWER HAVE BEEN ASSUMED AND THE FINAL LOCATION, DEPTH AND SIZE OF THE CONNECTION IS TO BE CONFIRMED.
- ALL CHANNEL DRAIN OUTLETS ARE TO BE BROUGHT BACK INTO THE BUILDING TO CONNECTED INTO THE BELOW BASEMENT ATTENUATION TANK.



STAGE 2
NOT FOR CONSTRUCTION

REV	DESCRIPTION	BY	DATE
P01	ISSUED FOR STAGE 2 REPORT	CM	20.05.22
P02	UPDATED TO ARCHITECTS COMMENTS	CM	25.05.22

NOTES:

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. THIS DRAWING IS FOR STAGE 3 PURPOSES ONLY AND SHOULD NOT BE USED FOR CONSTRUCTION.
4. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND CONSULTANTS DRAWINGS AND SPECIFICATIONS
5. DRAWING BASED ON:
   - DSDHA PROPOSED 1MS GROUND FLOOR PLAN ARCHITECTURAL LAYOUT REFERENCE 295-DSD-1MS-00-DR-A-20.100, RECEIVED 03.05.22
   - DSDHA PROPOSED VLB GROUND FLOOR PLAN ARCHITECTURAL LAYOUT REFERENCE 295-DSD-VLB-00-DR-A-20.100, RECEIVED 03.05.22
   - CSL SURVEYS TOPOGRAPHICAL SURVEY, REFERENCE PROJECT NO. 20117S, REVISION F1, DATED 14.09.17
   - THAMES WATER ASSET RECORDS, DATED 13.06.17
   - SURVATECS CCTV SURVEYS, DATED 5.11.20

KEY:

- SITE BOUNDARY
- BASEMENT EXTENT
- ExCMBD — EXISTING THAMES WATER COMBINED WATER SEWER
- CMBD — PROPOSED COMBINED WATER SEWER
- EXISTING AREA OF THE PRIVATE SITE DRAINING INTO THE PUBLIC HIGHWAY
- PROPOSED CHANNEL/SLOT DRAIN
- EXISTING SURFACE WATER GULLY

CDM RESIDUAL CIVIL / STRUCTURAL DESIGN RISKS

MEINHARDT
10 Aldersgate Street, London EC1A 4JU
Telephone: +44 (0)20 7831 7969
www.meinhardt.co.uk

PROJECT
LABS HOLBORN
(1 MUSEUM STREET)
WC1A 1JP

CLIENT
LABTECH

TITLE
MUSEUM STREET
PROPOSED GROUND FLOOR
DRAINAGE LAYOUT

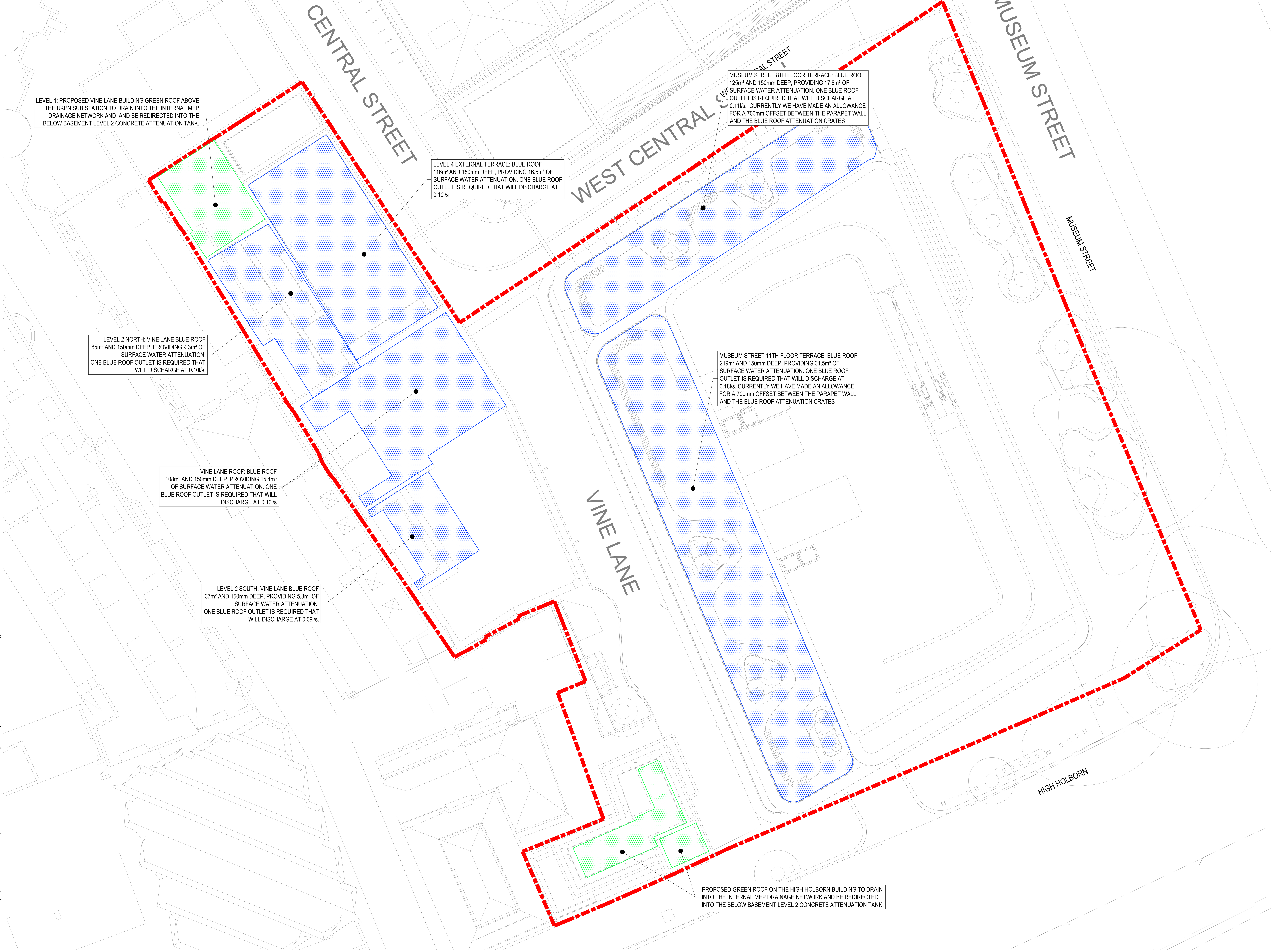
DISCIPLINE			SCALE @ A1
CIVILS DRAWING			1:150
DRAWN	DESIGNED	CHECKED	APPROVED
CM	CM	GB	PH
DRAWING No			ISSUE
2413-MHT-CV-DR-1MS-00100			P02

DATE: 06/01/2021
FILE LOCATION: h:\projects\2413 - labs holborn (1 museum street)\1. mht\civil\drawings\drawings\1ms\2413-mht-cv-dr-1ms-00100.dwg

ISO A1 841mm x 594mm

NOTES:

- BLUE ROOF CALCULATIONS BASED ON FSR DATA WITH A 40% INCREASE FOR CLIMATE CHANGE.
- BLUE ROOF DESIGN IS BASED ON RADMAT BLUE ROOF DESIGN CALCULATIONS. IF THE BLUE ROOF SUPPLIER IS CHANGE THEN AND CANNOT ACHIEVE THE SAME DISCHARGE RATE THEN THE VOLUME OF ATTENUATION BENEATH THE BASEMENT WILL NEED TO INCREASE.
- DRAINAGE STRATEGY BASED ON PROPOSED DISCHARGE RATE OF 5L/S, APPROVED IN PRINCIPLE BY LONDON BOROUGH OF CAMDEN.



STAGE 2
NOT FOR CONSTRUCTION

REV	DESCRIPTION	BY	DATE
P01	ISSUED FOR THE STAGE 2 REPORT	CM	20.05.22
P02	UPDATED TO ARCHITECTS COMMENTS	CM	25.05.22

NOTES:

1. DO NOT SCALE FROM THIS DRAWING.
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4. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND CONSULTANTS DRAWINGS AND SPECIFICATIONS
5. DRAWING BASED ON:
   - DSDHA SITE WIDE PROPOSED ROOF PLAN ARCHITECTURAL LAYOUT REFERENCE 295A-DSD-SITE-ZZ-DR-A-20.003, RECEIVED 03.05.2022
   - RADMAT BUILDING PRODUCTS BLUE ROOF CALCULATIONS - BR-6843-00 - 1 MUSEUM STREET/ 166 HIGH HOLBORN - ROOF TERRACE

CDM RESIDUAL CIVIL / STRUCTURAL DESIGN RISKS

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www.meinhardt.co.uk

PROJECT
LABS HOLBORN
(1 MUSEUM STREET)
WC1A 1JP

CLIENT
LABTECH

TITLE
MUSEUM STREET
PROPOSED GREEN/ BLUE ROOF LAYOUT

DISCIPLINE			SCALE @ A1
CIVILS DRAWING			1:150
DRAWN	DESIGNED	CHECKED	APPROVED
CM	CM	GB	PH
DRAWING No			ISSUE
2413-MHT-CV-DR-1MS-00101			P02

DATE: 06/01/2021
FILE LOCATION: h:\projects\2413 - labs holborn (1 museum street)\1. mht\civil\drawings\drawings\1ms\2413-mht-cv-dr-1ms-00101.dwg

ISO A1 841mm x 594mm

STAGE 2
NOT FOR CONSTRUCTION

REV	DESCRIPTION	BY	DATE
P01	ISSUED FOR STAGE 2 REPORT	CM	20.05.22

NOTES:

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5. DRAWING BASED ON:
   - DSDHA WEST CENTRAL STREET PROPOSED BASEMENT FLOOR PLAN ARCHITECTURAL LAYOUT REFERENCE 295B-DSD-WCS-B1-DR-A-20.109, , RECEIVED 03.05.22
   - SURVATECS CCTV SURVEYS, DATED 5.11.20

KEY:

(red dashed line)	SITE BOUNDARY
ExCMBD→	EXISTING THAMES WATER COMBINED WATER SEWER
ExFW → ExFW →	EXISTING FOUL WATER SEWER
FW → FW →	PROPOSED FOUL WATER SEWER
FWRM → FWRM →	PROPOSED FOUL WATER RISING MAIN
X — X — X	REDUNDANT FOUL WATER SEWER
	DUCT FOR PUMP CHAMBER
	VENT PIPE FOR PUMP CHAMBER
	EXISTING FOUL WATER MANHOLE
	EXISTING THAMES WATER COMBINED WATER MANHOLE
	PROPOSED FOUL WATER MANHOLE
	PROPOSED FOUL WATER PPIC
	PROPOSED FOUL WATER GULLY
	PROPOSED FOUL WATER DRAINAGE POINT
	PROPOSED ABOVE BASEMENT MEP ATTENUATION TANK

CDM RESIDUAL CIVIL / STRUCTURAL DESIGN RISKS

MEINHARDT
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PROJECT
LABS HOLBORN
(WEST CENTRAL STREET)
WC1A 1JP

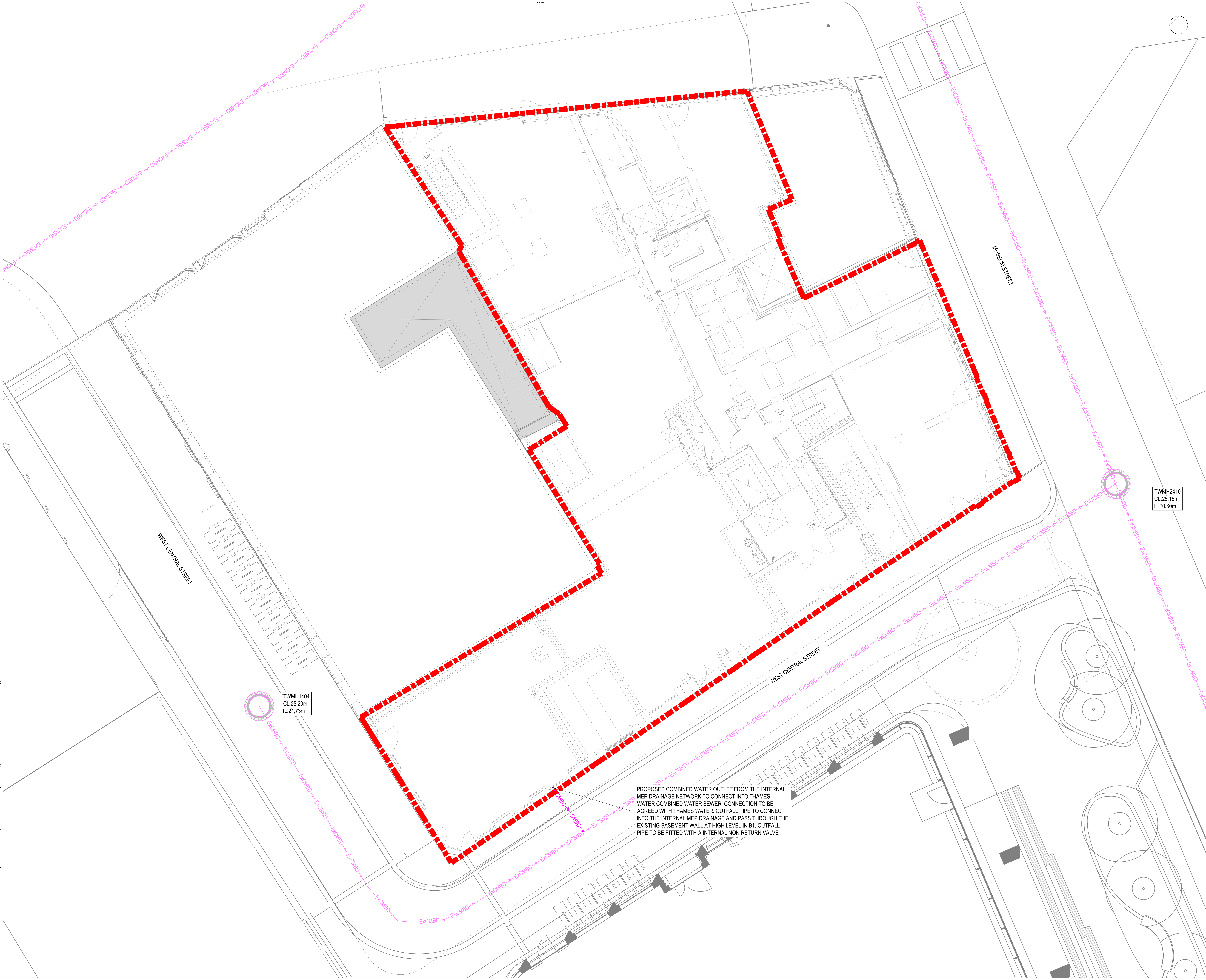
CLIENT
LABTECH

TITLE
WEST CENTRAL STREET
PROPOSED BELOW BASEMENT
DRAINAGE LAYOUT

DISCIPLINE			SCALE @ A1
CIVILS DRAWING			1:100
DRAWN	DESIGNED	CHECKED	APPROVED
CM	CM	GB	PH
DRAWING No			ISSUE
2413-MHT-CV-DR-WCS-00099			P01

DATE: 06/01/2021
FILE LOCATION: h:\projects\2413 - labs holborn (1 museum street)\1. mht\civil\drawings\drawings\wcs\2413-mht-cv-dr-wcs-00099.dwg

ISO A1 841mm x 594mm



STAGE 2
NOT FOR CONSTRUCTION

REV	DESCRIPTION	BY	DATE
P01	ISSUED FOR STAGE 2 REPORT	CM	20.05.22

NOTES:

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5. DRAWING BASED ON:
   - DSDHA WCS PROPOSED GROUND FLOOR PLAN ARCHITECTURAL LAYOUT REFERENCE 295B-DSD-WCS-00-DR-A-20.110, RECEIVED 03.05.22
   - THAMES WATER ASSET RECORDS, DATED 13.06.17
   - SURVATECS CCTV SURVEYS, DATED 5.11.20

KEY:

- SITE BOUNDARY
- CMBD → CMBD → PROPOSED COMBINED WATER SEWER
- ExCMBD → EXISTING THAMES WATER COMBINED WATER SEWER
- EXISTING THAMES WATER COMBINED WATER SEWER

CDM RESIDUAL CIVIL / STRUCTURAL DESIGN RISKS

MEINHARDT

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Telephone: +44 (0)20 7831 7969
www.meinhardt.co.uk

PROJECT
LABS HOLBORN (WEST CENTRAL STREET) WC1A 1JP

CLIENT
LABTECH

TITLE
WEST CENTRAL STREET PROPOSED GROUND FLOOR DRAINAGE LAYOUT

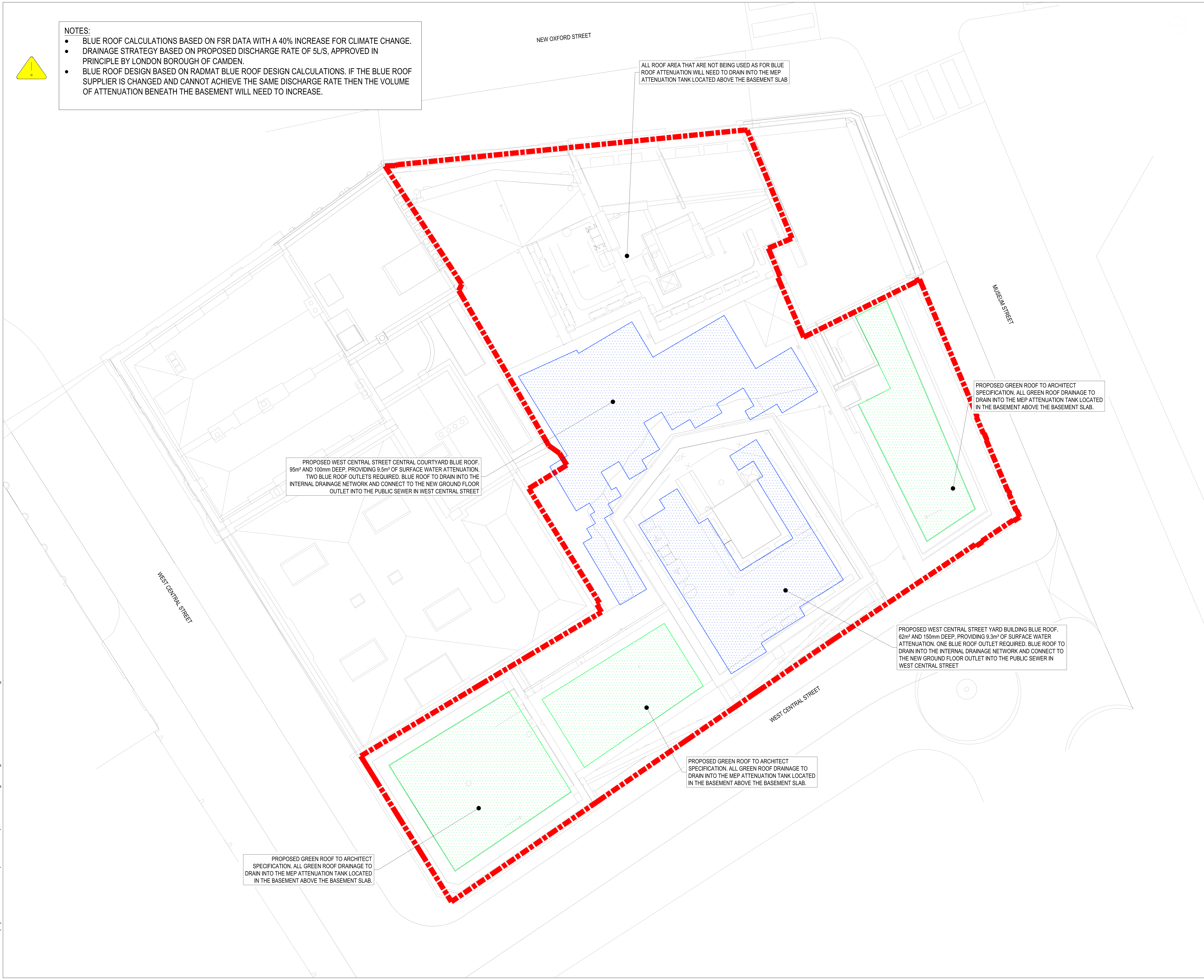
DISCIPLINE			SCALE @ A1
CIVILS DRAWING			1:100
DRAWN	DESIGNED	CHECKED	APPROVED
CN	CM	GB	PH
DRAWING No			ISSUE
2413-MHT-CV-DR-WCS-00100			P01

DATE: 06/02/2021
FILE LOCATION: h:\projects\2413 - labs holborn (1 museum street)\1. mht\civil\drawings\drawings\wcs\2413-mht-cv-dr-wcs-00100.dwg

ISO A1 841mm x 594mm

NOTES:

- BLUE ROOF CALCULATIONS BASED ON FSR DATA WITH A 40% INCREASE FOR CLIMATE CHANGE.
- DRAINAGE STRATEGY BASED ON PROPOSED DISCHARGE RATE OF 5L/S, APPROVED IN PRINCIPLE BY LONDON BOROUGH OF CAMDEN.
- BLUE ROOF DESIGN BASED ON RADMAT BLUE ROOF DESIGN CALCULATIONS. IF THE BLUE ROOF SUPPLIER IS CHANGED AND CANNOT ACHIEVE THE SAME DISCHARGE RATE THEN THE VOLUME OF ATTENUATION BENEATH THE BASEMENT WILL NEED TO INCREASE.



STAGE 2
NOT FOR CONSTRUCTION

REV	DESCRIPTION	BY	DATE
P01	ISSUED FOR STAGE 2 REPORT	CM	20.05.22

NOTES:

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5. DRAWING BASED ON:
   - DSDHA WCS PROPOSED ROOF PLAN ARCHITECTURAL LAYOUT REFERENCE 295B-DSD-WCS-06-DR-A-20.116, RECEIVED 03.05.22
   - DSDHA WCS PROPOSED FIRST FLOOR PLAN ARCHITECTURAL LAYOUT REFERENCE 295B-DSD-WCS-01-DR-A-20.111, RECEIVED 03.05.22
   - RADMAT BUILDING PRODUCTS BLUE ROOF CALCULATIONS

KEY:

- SITE BOUNDARY
- PROPOSED BLUE ROOF ATTENUATION
- PROPOSED GREEN ROOF

CDM RESIDUAL CIVIL / STRUCTURAL DESIGN RISKS

MEINHARDT

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PROJECT
LABS HOLBORN
(WEST CENTRAL STREET)
WC1A 1JP

CLIENT
LABTECH

TITLE
WEST CENTRAL STREET
PROPOSED GREEN/ BLUE ROOF LAYOUT

DISCIPLINE			SCALE @ A1
CIVILS DRAWING			1:100
DRAWN	DESIGNED	CHECKED	APPROVED
CM	CM	GB	PH
DRAWING No			ISSUE
2413-MHT-CV-DR-WCS-00101			P01

DATE: 06/02/2021
FILE LOCATION: h:\projects\2413 - labs holborn (1 museum street)\1. mht\civil\drawings\drawings\wcs\2413-mht-cv-dr-wcs-00101.dwg

Appendix C – Radmat Blue Roof Calculations

Radmat Building Products Ltd
Holland House
Valley Way, Rockingham Road
Market Harborough LE16 7PS
Tel 01858 410372
techenquiries@radmat.com

Client:
Project: 1 Museum Street/Vine Lane
Reference: BR-6843-01 Designer: N.Todd Date: 16/03/2022
Location: London
Roof Location: Vine Lane - 2nd Floor - Roof 1

Roof Details:

BlueRoof	37 m²	x 100 %
Additional Area	13 m²	x 100 %
Effective Area	50 m²	

Storage Details:

Length	37 m
Width	1 m
Depth	150 mm
Porosity	95 %

Rainfall Details - FSR Method:

Return Period	100 years
Climate Change Factor	40 %
r value	0.44
M5-60	20.7 mm

Summer Storm Profile

Duration	Intensity mm	mm/h	Required storage(m³)
5 min	21.0	251.8	1.0
10 min	30.9	185.5	1.5
15 min	37.1	148.3	1.8
30 min	47.9	95.7	2.3
45 min	54.2	72.3	2.6
60 min	58.7	58.7	2.7
2 hours	69.7	34.8	3.1
6 hours	86.8	14.5	3.1
24 hours	112.1	4.7	2.5

Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	12 mm
Discharge rate	0.09 l/s
Outlet	1 No

Result:

Outcome	Pass
Critical Storm Duration	3.42 hrs
Hmax	90 mm
Required Volume	3.2 m³
Time to half empty	4.7 hrs
Roof Loading	86.49 Kg/m²

Radmat Building Products Ltd
Holland House
Valley Way, Rockingham Road
Market Harborough LE16 7PS
Tel 01858 410372
techenquiries@radmat.com

Client:

Project: 1 Museum Street/Vine Lane

Reference: BR-6843-01 Designer: N.Todd Date: 16/03/2022

Location: London

Roof Location: Vine Lane - 2nd Floor - Roof 2

Roof Details:

BlueRoof	65 m²	x 100 %
Additional Area	20 m²	x 100 %
Effective Area	85 m²	

Storage Details:

Length	65 m
Width	1 m
Depth	150 mm
Porosity	95 %

Rainfall Details - FSR Method:

Return Period	100 years
Climate Change Factor	40 %
r value	0.44
M5-60	20.7 mm

Summer Storm Profile

Duration	Intensity		Required
	mm	mm/h	storage(m³)
5 min	21.0	251.8	1.8
10 min	30.9	185.5	2.6
15 min	37.1	148.3	3.1
30 min	47.9	95.7	4.0
45 min	54.2	72.3	4.5
60 min	58.7	58.7	4.8
2 hours	69.7	34.8	5.5
6 hours	86.8	14.5	6.0
24 hours	112.1	4.7	5.5

Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	12 mm
Discharge rate	0.1 l/s
Outlet	1 No

Result:

Outcome	Pass
Critical Storm Duration	6.08 hrs
Hmax	98 mm
Required Volume	6 m³
Time to half empty	8.6 hrs
Roof Loading	92.31 Kg/m²

Radmat Building Products Ltd
Holland House
Valley Way, Rockingham Road
Market Harborough LE16 7PS
Tel 01858 410372
techenquiries@radmat.com

Client:			
Project:	1 Museum Street/Vine Lane		
Reference:	BR-6843-01	Designer: N.Todd	Date: 16/03/2022
Location:	London		
Roof Location:	Vine Lane - 4th Floor		

Roof Details:

BlueRoof	116 m²	x 100 %
Additional Area	30 m²	x 100 %
Effective Area	146 m²	

Storage Details:

Length	116 m
Width	1 m
Depth	150 mm
Porosity	95 %

Rainfall Details - FSR Method:

Return Period	100 years
Climate Change Factor	40 %
r value	0.44
M5-60	20.7 mm

Summer Storm Profile

Duration	mm	Intensity mm/h	Required storage(m³)
5 min	21.0	251.8	3.1
10 min	30.9	185.5	4.5
15 min	37.1	148.3	5.4
30 min	47.9	95.7	6.9
45 min	54.2	72.3	7.8
60 min	58.7	58.7	8.4
2 hours	69.7	34.8	9.8
6 hours	86.8	14.5	11.3
24 hours	112.1	4.7	11.2

Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	12 mm
Discharge rate	0.1 l/s
Outlet	1 No

Result:

Outcome	**Pass**
Critical Storm Duration	10.82 hrs
Hmax	106 mm
Required Volume	11.6 m³
Time to half empty	16 hrs
Roof Loading	100 Kg/m²

Radmat Building Products Ltd
Holland House
Valley Way, Rockingham Road
Market Harborough LE16 7PS
Tel 01858 410372
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Client:					
Project:	1 Museum Street/Vine Lane				
Reference:	BR-6843-01	Designer:	N.Todd	Date:	16/03/2022
Location:	London				
Roof Location:	Vine Lane - Roof				

Roof Details:

BlueRoof	108 m²	x 100 %
Additional Area	29 m²	x 100 %
Effective Area	137 m²	

Storage Details:

Length	108 m
Width	1 m
Depth	150 mm
Porosity	95 %

Rainfall Details - FSR Method:

Return Period	100 years
Climate Change Factor	40 %
r value	0.44
M5-60	20.7 mm

Summer Storm Profile

Duration	Intensity mm	mm/h	Required storage(m³)
5 min	21.0	251.8	2.9
10 min	30.9	185.5	4.2
15 min	37.1	148.3	5.0
30 min	47.9	95.7	6.5
45 min	54.2	72.3	7.3
60 min	58.7	58.7	7.9
2 hours	69.7	34.8	9.1
6 hours	86.8	14.5	10.5
24 hours	112.1	4.7	10.4

Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	12 mm
Discharge rate	0.1 l/s
Outlet	1 No

Result:

Outcome	**Pass**
Critical Storm Duration	10.1 hrs
Hmax	105 mm
Required Volume	10.8 m³
Time to half empty	14.9 hrs
Roof Loading	100 Kg/m²

Blue Roof calculation service is provided in good faith using the information supplied to us in the brief and the stated parameters in the calculation.
If any of these parameters are incorrect or have been superseded, Radmat should be contacted to provide updated calculations.
References should be made to any relevant codes of practice.
Final determination of the suitability of any system is the sole responsibility of the user.
Radmat obligations in respect of any sale of its products are governed by the respective sales contract.

Radmat Building Products Ltd
Holland House
Valley Way, Rockingham Road
Market Harborough LE16 7PS
Tel 01858 410372
techenquiries@radmat.com

Client:

Project: 1 Museum Street/Vine Lane

Reference: BR-6843-01 Designer: N.Todd Date: 16/03/2022

Location: London

Roof Location: Museum Street - 8th Floor

Roof Details:

BlueRoof	125 m²	x 100 %
Additional Area	71 m²	x 100 %
Effective Area	196 m²	

Storage Details:

Length	125 m
Width	1 m
Depth	150 mm
Porosity	95 %

Rainfall Details - FSR Method:

Return Period	100 years
Climate Change Factor	40 %
r value	0.44
M5-60	20.7 mm

Summer Storm Profile

Duration	mm	Intensity mm/h	Required storage(m³)
5 min	21.0	251.8	4.1
10 min	30.9	185.5	6.0
15 min	37.1	148.3	7.2
30 min	47.9	95.7	9.3
45 min	54.2	72.3	10.5
60 min	58.7	58.7	11.3
2 hours	69.7	34.8	13.2
6 hours	86.8	14.5	15.5
24 hours	112.1	4.7	15.8

Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	12 mm
Discharge rate	0.11 l/s
Outlet	1 No

Result:

Outcome	**Pass**
Critical Storm Duration	13.08 hrs
Hmax	137 mm
Required Volume	16.2 m³
Time to half empty	19.6 hrs
Roof Loading	129.6 Kg/m²

Radmat building products

Radmat Building Products Ltd
Holland House
Valley Way, Rockingham Road
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Tel 01858 410372
techenquiries@radmat.com

Client:			
Project:	1 Museum Street/Vine Lane		
Reference:	BR-6843-01	Designer: N.Todd	Date: 16/03/2022
Location:	London		
Roof Location:	Museum Street - 11th Floor		

Roof Details:

BlueRoof	210 m²	x 100 %
Additional Area	133 m²	x 100 %
Effective Area	343 m²	

Storage Details:

Length	210 m
Width	1 m
Depth	150 mm
Porosity	95 %

Rainfall Details - FSR Method:

Return Period	100 years
Climate Change Factor	40 %
r value	0.44
M5-60	20.7 mm

Summer Storm Profile

Duration	Intensity mm	mm/h	Required storage(m³)
5 min	21.0	251.8	7.2
10 min	30.9	185.5	10.6
15 min	37.1	148.3	12.7
30 min	47.9	95.7	16.3
45 min	54.2	72.3	18.4
60 min	58.7	58.7	19.8
2 hours	69.7	34.8	23.2
6 hours	86.8	14.5	27.3
24 hours	112.1	4.7	28.4

Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	15 mm
Discharge rate	0.18 l/s
Outlet	1 No

Result:

Outcome	**Pass**
Critical Storm Duration	14.45 hrs
Hmax	145 mm
Required Volume	28.9 m³
Time to half empty	21.7 hrs
Roof Loading	137.62 Kg/m²

Radmat Building Products Ltd
Holland House
Valley Way, Rockingham Road
Market Harborough LE16 7PS
Tel 01858 410372
techenquiries@radmat.com

Client:					
Project:	West Central Street				
Reference:	BR-6779-01	Designer:	N.Todd	Date:	10/12/2020
Location:	London				
Roof Location:	Blue Roof 18				

Roof Details:

BlueRoof	62 m²	x 100 %
Additional Area	80 m²	x 100 %
Effective Area	142 m²	

Storage Details:

Length	62 m
Width	1 m
Depth	150 mm
Porosity	95 %

Rainfall Details - FSR Method:

Return Period	100 years
Climate Change Factor	40 %
r value	0.44
M5-60	20.7 mm

Summer Storm Profile

Duration	Intensity mm	mm/h	Required storage(m³)
5 min	21.0	251.8	2.9
10 min	30.9	185.5	4.3
15 min	37.1	148.3	5.1
30 min	47.9	95.7	6.5
45 min	54.2	72.3	7.2
60 min	58.7	58.7	7.7
2 hours	69.7	34.8	8.5
6 hours	86.8	14.5	8.5
24 hours	112.1	4.7	6.6

Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	19 mm
Discharge rate	0.3 l/s
Outlet	1 No

Result:

Outcome	Pass
Critical Storm Duration	3.03 hrs
Hmax	148 mm
Required Volume	8.7 m³
Time to half empty	4 hrs
Roof Loading	140.32 Kg/m²

Radmat Building Products Ltd
Holland House
Valley Way, Rockingham Road
Market Harborough LE16 7PS
Tel 01858 410372
techenquiries@radmat.com

Client:					
Project:	West Central Street				
Reference:	BR-6779-01	Designer:	N.Todd	Date:	10/12/2020
Location:	London				
Roof Location:	Blue Roof Courtyard				

Roof Details:

BlueRoof	95 m²	x 100 %
Additional Area	55 m²	x 100 %
Effective Area	150 m²	

Storage Details:

Length	95 m
Width	1 m
Depth	100 mm
Porosity	95 %

Rainfall Details - FSR Method:

Return Period	100 years
Climate Change Factor	40 %
r value	0.44
M5-60	20.7 mm

Summer Storm Profile

Duration	Intensity		Required
	mm	mm/h	storage(m³)
5 min	21.0	251.8	3.1
10 min	30.9	185.5	4.6
15 min	37.1	148.3	5.4
30 min	47.9	95.7	6.8
45 min	54.2	72.3	7.6
60 min	58.7	58.7	8.1
2 hours	69.7	34.8	8.9
6 hours	86.8	14.5	8.7
24 hours	112.1	4.7	6.5

Outflow Details:

Attenuation Control	Orifice Plate
Control Diameter	16 mm
Discharge rate	0.35 l/s
Outlet	2 No
Flow Per Outlet	0.17 l/s

Result:

Outcome	Pass
Critical Storm Duration	2.78 hrs
Hmax	100 mm
Required Volume	9 m³
Time to half empty	3.6 hrs
Roof Loading	94.74 Kg/m²

Appendix D – London Borough of Camden SuDS Proforma

Camden GREATER LONDON AUTHORITY LoDEG

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	1 Museum Street
Address & post code	166 High Holborn and 1 Museum Steet, 10-12 Museum Street and 35-41 New Oxford Street, WC1A 1JR.
OS Grid ref. (Easting, Northing)	E 530169 N 181391
LPA reference (if applicable)	
Brief description of proposed work	The proposed development is to retain the existing basement of the Museum Street development and contructed a new mixed use offcie and residential development.
Total site Area	3270 m^2
Total existing impervious area	3270 m^2
Total proposed impervious area	2700 m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	No
Existing drainage connection type and location	Pumped Surface. Gravity fed Foul Water Drainage into High Holborn
Designer Name	Craig Marchant
Designer Position	Civil Associate

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility		
Superficial geology classification	London Clay	
Bedrock geology classification		
Site infiltration rate		m/s
Depth to groundwater level	3.3	m below ground level
Is infiltration feasible?	No	

2b. Drainage Hierarchy	*Feasible (Y/N)*	*Proposed (Y/N)*
1 store rainwater for later use	Y	N
2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
3 attenuate rainwater in ponds or open water features for gradual release	N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	N	N
5 discharge rainwater direct to a watercourse	N	N
6 discharge rainwater to a surface water sewer/drain	N	N
7 discharge rainwater to the combined sewer.	Y	Y

2c. Proposed Discharge Details	
Proposed discharge location	Thames Water Combined Sewers
Has the owner/regulator of the discharge location been	Yes

	Designer Company	Meinhardt UK Ltd

	consulted?	

3. Drainage Strategy

3a. Discharge Rates & Required Storage

	Greenfield (GF) runoff rate (l/s)	Existing discharge rate (l/s)	Required storage for GF rate (m^3)	Proposed discharge rate (l/s)
Qbar	0.51			
1 in 1	0.43	40.7	230	5
1 in 30	1.62	109	230	5
1 in 100	1.9	127.1	230	5
1 in 100 + CC			230	5
Climate change allowance used		40%		

3b. Principal Method of Flow Control	Blue Roofs to drain via orifice plate. Attenaution tanks to be pumped

3c. Proposed SuDS Measures

	Catchment area (m^2)	Plan area (m^2)	Storage vol. (m^3)
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	82	82	0
Blue roofs	670	670	96
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	0	0	0
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	1948		134
Total	**2700**	**752**	**230**

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Section 2.3.2
Drainage hierarchy (2b)	Section 2.0
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Section 2.3.2
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Section 2.3.4 & 2.3.5
Proposed SuDS measures & specifications (3b)	Section 2.3.4 & 2.3.5

4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	Appendix B
Detailed drainage design drawings, including exceedance flow routes	Appendix B
Detailed landscaping plans	Appendix B
Maintenance strategy	Section 3.0
Demonstration of how the proposed SuDS measures improve:	Section 2.3.4 & 2.3.5
a) water quality of the runoff?	Section 2.3.4 & 2.3.5
b) biodiversity?	Section 2.3.4 & 2.3.5
c) amenity?	Section 2.3.4 & 2.3.5

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	West Central Street
Address & post code	16A-18 West Central Street, WC1A 1JR.
OS Grid ref. (Easting, Northing)	E 530176
	N 181424
LPA reference (if applicable)	
Brief description of proposed work	The proposed development is to retain the existing basement of the West Central Street development and construct a new residential development.
Total site Area	850 m^2
Total existing impervious area	850 m^2
Total proposed impervious area	850 m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	No
Existing drainage connection type and location	Gravity fed to the Thames Water combined Sewer
Designer Name	Craig Marchant
Designer Position	Civil Associate

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	London Clay	
Bedrock geology classification		
Site infiltration rate		m/s
Depth to groundwater level	3.3	m below ground level
Is infiltration feasible?	No	

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	Y	N
2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
3 attenuate rainwater in ponds or open water features for gradual release	N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	N	N
5 discharge rainwater direct to a watercourse	N	N
6 discharge rainwater to a surface water sewer/drain	N	N
7 discharge rainwater to the combined sewer.	Y	Y

2c. Proposed Discharge Details

Proposed discharge location	Thames Water Combined Sewers
Has the owner/regulator of the discharge location been	Yes

	Designer Company	Meinhardt UK Ltd

	consulted?	

Camden GREATER LONDON AUTHORITY LoDEG

3. Drainage Strategy

3a. Discharge Rates & Required Storage				
	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar	0.13			
1 in 1	0.16	10.4	39	5
1 in 30	0.36	29.8	39	5
1 in 100	0.5	38.6	39	5
1 in 100 + CC			39	5
Climate change allowance used		40%		
3b. Principal Method of Flow Control		Blue Roofs to drain via orifice plate. Attenaution tanks to be pumped		

3c. Proposed SuDS Measures			
	Catchment area (m^2)	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	140	140	0
Blue roofs	292	157	19
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	0	0	0
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	418		20
Total	**850**	**297**	**39**

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Section 2.3.2
Drainage hierarchy (2b)	Section 2.0
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Section 2.3.2
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Section 2.3.4 & 2.3.5
Proposed SuDS measures & specifications (3b)	Section 2.3.4 & 2.3.5

4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	Appendix B
Detailed drainage design drawings, including exceedance flow routes	Appendix B
Detailed landscaping plans	Appendix B
Maintenance strategy	Section 3.0
Demonstration of how the proposed SuDS measures improve:	Section 2.3.4 & 2.3.5
a) water quality of the runoff?	Section 2.3.4 & 2.3.5
b) biodiversity?	Section 2.3.4 & 2.3.5
c) amenity?	Section 2.3.4 & 2.3.5

Appendix E – Proposed Drainage Calculations

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

- Indicates pipe length does not match coordinates
« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	10.000#	1.000	10.0	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit	🔒
1.001	23.003	0.230	100.0	0.010	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
1.002	3.985	0.040	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
1.003	4.798	0.048	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
1.004	14.999	0.150	100.0	0.020	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
2.000	8.159	0.082	100.0	0.019	5.00	0.0	0.600	o	150	Pipe/Conduit	🔒
2.001	5.391	0.054	99.8	0.008	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
2.002	19.066	0.191	99.8	0.012	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
1.005	5.000#	0.050	100.0	0.119	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
1.006	5.000#	0.050	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
3.000	5.000	0.050	100.0	0.019	5.00	0.0	0.600	o	150	Pipe/Conduit	🔒
3.001	5.000#	0.050	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
3.002	10.000#	0.100	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
4.000	5.000#	0.050	100.0	0.014	5.00	0.0	0.600	o	150	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.05	19.500	0.000	0.0	0.0	0.0	3.20	56.6	0.0
1.001	50.00	5.43	18.370	0.010	0.0	0.0	0.0	1.00	17.8	1.3
1.002	50.00	5.50	18.110	0.010	0.0	0.0	0.0	1.00	17.8	1.3
1.003	50.00	5.58	18.070	0.010	0.0	0.0	0.0	1.00	17.8	1.3
1.004	50.00	5.77	18.020	0.030	0.0	0.0	0.0	1.31	52.0	4.1
2.000	50.00	5.14	18.220	0.019	0.0	0.0	0.0	1.00	17.8	2.6
2.001	50.00	5.20	18.138	0.028	0.0	0.0	0.0	1.31	52.0	3.7
2.002	50.00	5.45	18.084	0.040	0.0	0.0	0.0	1.31	52.0	5.4
1.005	50.00	5.85	16.900	0.189	0.0	0.0	0.0	1.00	17.8«	25.6
1.006	50.00	5.94	16.850	0.189	0.0	0.0	0.0	1.00	17.8«	25.6
3.000	50.00	5.08	29.600	0.019	0.0	0.0	0.0	1.00	17.8	2.6
3.001	50.00	5.17	29.550	0.019	0.0	0.0	0.0	1.00	17.8	2.6
3.002	50.00	5.33	24.000	0.019	0.0	0.0	0.0	1.00	17.8	2.6
4.000	50.00	5.08	29.600	0.014	0.0	0.0	0.0	1.00	17.8	1.8

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
4.001	5.000#	0.050	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
4.002	10.000	0.100	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
5.000	5.000	0.050	100.0	0.014	5.00	0.0	0.600	o	150	Pipe/Conduit	
5.001	5.000#	0.050	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
5.002	10.000#	0.100	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
6.000	5.000#	0.050	100.0	0.004	5.00	0.0	0.600	o	150	Pipe/Conduit	
6.001	5.000	0.050	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
6.002	10.000#	0.100	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
7.000	5.000#	0.050	100.0	0.028	5.00	0.0	0.600	o	150	Pipe/Conduit	
7.001	5.000#	0.050	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
7.002	10.000#	0.100	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
8.000	5.000#	0.050	100.0	0.002	5.00	0.0	0.600	o	150	Pipe/Conduit	
8.001	5.000#	0.050	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
8.002	10.000#	0.100	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.003	10.000#	0.100	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
4.001	50.00	5.17	29.550	0.014	0.0	0.0	0.0	1.00	17.8	1.8
4.002	50.00	5.33	24.000	0.014	0.0	0.0	0.0	1.00	17.8	1.8
5.000	50.00	5.08	26.900	0.014	0.0	0.0	0.0	1.00	17.8	2.0
5.001	50.00	5.17	29.550	0.014	0.0	0.0	0.0	1.00	17.8	2.0
5.002	50.00	5.33	24.000	0.014	0.0	0.0	0.0	1.00	17.8	2.0
6.000	50.00	5.08	29.600	0.004	0.0	0.0	0.0	1.00	17.8	0.6
6.001	50.00	5.17	29.550	0.004	0.0	0.0	0.0	1.00	17.8	0.6
6.002	50.00	5.33	24.000	0.004	0.0	0.0	0.0	1.00	17.8	0.6
7.000	50.00	5.08	29.600	0.028	0.0	0.0	0.0	1.00	17.8	3.8
7.001	50.00	5.17	29.550	0.028	0.0	0.0	0.0	1.00	17.8	3.8
7.002	50.00	5.33	24.000	0.028	0.0	0.0	0.0	1.00	17.8	3.8
8.000	50.00	5.08	29.600	0.002	0.0	0.0	0.0	1.00	17.8	0.2
8.001	50.00	5.17	29.550	0.002	0.0	0.0	0.0	1.00	17.8	0.2
8.002	50.00	5.33	24.000	0.002	0.0	0.0	0.0	1.00	17.8	0.2
3.003	50.00	5.50	23.500	0.081	0.0	0.0	0.0	1.00	17.8	11.0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.000	0.000	0.000
1.001	User	-	100	0.004	0.004	0.004
	User	-	100	0.004	0.004	0.008
	User	-	100	0.002	0.002	0.010
1.002	User	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
1.004	User	-	100	0.020	0.020	0.020
	User	-	100	0.000	0.000	0.020
2.000	User	-	100	0.019	0.019	0.019
2.001	User	-	100	0.008	0.008	0.008
2.002	User	-	100	0.007	0.007	0.007
	User	-	100	0.005	0.005	0.012
1.005	User	-	100	0.017	0.017	0.017
	User	-	100	0.098	0.098	0.116
	User	-	100	0.003	0.003	0.119
1.006	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.019	0.019	0.019
3.001	-	-	100	0.000	0.000	0.000
3.002	-	-	100	0.000	0.000	0.000
4.000	User	-	100	0.014	0.014	0.014
4.001	-	-	100	0.000	0.000	0.000
4.002	-	-	100	0.000	0.000	0.000
5.000	User	-	100	0.014	0.014	0.014
5.001	-	-	100	0.000	0.000	0.000
5.002	-	-	100	0.000	0.000	0.000
6.000	User	-	100	0.004	0.004	0.004
6.001	-	-	100	0.000	0.000	0.000
6.002	-	-	100	0.000	0.000	0.000
7.000	User	-	100	0.028	0.028	0.028
7.001	-	-	100	0.000	0.000	0.000
7.002	-	-	100	0.000	0.000	0.000
8.000	User	-	100	0.002	0.002	0.002
8.001	-	-	100	0.000	0.000	0.000
8.002	-	-	100	0.000	0.000	0.000
3.003	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.270	0.270	0.270

Online Controls for Storm

Pump Manhole: Pump Chamber, DS/PN: 1.006, Volume (m³): 0.4

Invert Level (m) 16.850

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.2500	0.400	1.0000	0.700	3.0000	1.000	4.3000
0.200	0.5000	0.500	1.5000	0.800	4.3000	1.100	4.3000
0.300	0.7500	0.600	2.0000	0.900	4.3000		

Pump Manhole: 12, DS/PN: 3.001, Volume (m³): 0.1

Invert Level (m) 29.550

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.050	0.1100	0.100	0.1100	0.150	0.1100

Pump Manhole: 15, DS/PN: 4.001, Volume (m³): 0.1

Invert Level (m) 29.550

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.050	0.1000	0.100	0.1000	0.150	0.1000

Pump Manhole: 18, DS/PN: 5.001, Volume (m³): 0.1

Invert Level (m) 29.550

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.050	0.1000	0.100	0.1000	0.150	0.1000

Pump Manhole: 21, DS/PN: 6.001, Volume (m³): 0.1

Invert Level (m) 29.550

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.055	0.1000	0.100	0.1000	0.150	0.1000

Pump Manhole: 24, DS/PN: 7.001, Volume (m³): 0.1

Invert Level (m) 29.550

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.050	0.1800	0.100	0.1800	0.150	0.1800

Pump Manhole: 27, DS/PN: 8.001, Volume (m³): 0.1

Invert Level (m) 29.550

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.050	0.1000	0.100	0.1000	0.150	0.1000

Storage Structures for Storm

Cellular Storage Manhole: Tank, DS/PN: 1.005

Invert Level (m) 16.900 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**
0.000	84.0	0.0	1.601	0.0	0.0
1.600	84.0	0.0			

Cellular Storage Manhole: 1MS 8 Floor BR, DS/PN: 3.000

Invert Level (m) 29.600 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	125.0	0.0	0.151	0.0	0.0
0.150	125.0	0.0			

Cellular Storage Manhole: VLB Roof BR, DS/PN: 4.000

Invert Level (m) 29.600 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	108.0	0.0	0.151	0.0	0.0
0.150	108.0	0.0			

Cellular Storage Manhole: VLB 4th Floor BR, DS/PN: 5.000

Invert Level (m) 26.900 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	116.0	0.0	0.151	0.0	0.0
0.150	116.0	0.0			

Cellular Storage Manhole: VLB 2nd BR N, DS/PN: 6.000

Invert Level (m) 29.600 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Cellular Storage Manhole: VLB 2nd BR N, DS/PN: 6.000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	65.0	0.0	0.151	0.0	0.0
0.150	65.0	0.0			

Cellular Storage Manhole: 1MS 11th Floor BR, DS/PN: 7.000

Invert Level (m) 29.600 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	210.0	0.0	0.151	0.0	0.0
0.150	210.0	0.0			

Cellular Storage Manhole: VLB 2nd BR S, DS/PN: 8.000

Invert Level (m) 29.600 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	37.0	0.0	0.151	0.0	0.0
0.150	37.0	0.0			

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 7
Number of Online Controls 7 Number of Time/Area Diagrams 1
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.437
Region England and Wales Cv (Summer) 0.950
M5-60 (mm) 20.600 Cv (Winter) 0.950

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
1.000	1	960 Summer	2	+0%			
1.001	1	15 Summer	2	+0%			
1.002	2	15 Summer	2	+0%			
1.003	3	15 Summer	2	+0%			
1.004	4	15 Summer	2	+0%			
2.000	5	15 Summer	2	+0%			
2.001	6	15 Summer	2	+0%			
2.002	7	15 Summer	2	+0%			
1.005	Tank	480 Summer	2	+0%	2/15 Summer		
1.006	Pump Chamber	480 Winter	2	+0%	2/15 Summer		
3.000	1MS 8 Floor BR	240 Winter	2	+0%			
3.001	12	240 Winter	2	+0%	100/240 Summer		
3.002	13	15 Winter	2	+0%			
4.000	VLB Roof BR	240 Summer	2	+0%			
4.001	15	240 Summer	2	+0%			
4.002	16	30 Summer	2	+0%			
5.000	VLB 4th Floor BR	1440 Summer	2	+0%			
5.001	18	1440 Summer	2	+0%			
5.002	19	15 Summer	2	+0%			

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.000	1		19.501	-0.149	0.000	0.00		
1.001	1		18.403	-0.117	0.000	0.11		
1.002	2		18.149	-0.111	0.000	0.15		
1.003	3		18.107	-0.113	0.000	0.14		
1.004	4		18.073	-0.172	0.000	0.13		
2.000	5		18.275	-0.095	0.000	0.28		
2.001	6		18.204	-0.159	0.000	0.18		
2.002	7		18.149	-0.160	0.000	0.18		
1.005	Tank		17.290	0.240	0.000	0.13		416
1.006	Pump Chamber		17.433	0.433	0.000	0.09		
3.000	1MS 8 Floor BR		29.626	-0.124	0.000	0.01		250
3.001	12		29.626	-0.074	0.000	0.01		
3.002	13		24.005	-0.145	0.000	0.01		
4.000	VLB Roof BR		29.620	-0.130	0.000	0.01		215
4.001	15		29.619	-0.081	0.000	0.01		
4.002	16		24.004	-0.146	0.000	0.01		
5.000	VLB 4th Floor BR		26.945	-0.105	0.000	0.00		
5.001	18		26.945	-2.755	0.000	0.00		
5.002	19		24.000	-0.150	0.000	0.00		

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.0	OK	
1.001	1	1.8	OK	
1.002	2	1.9	OK	
1.003	3	1.9	OK	
1.004	4	5.8	OK	
2.000	5	4.4	OK	
2.001	6	6.0	OK	
2.002	7	8.4	OK	
1.005	Tank	1.9	SURCHARGED	
1.006	Pump Chamber	1.3	SURCHARGED	
3.000	1MS 8 Floor BR	0.1	OK	
3.001	12	0.1	OK	
3.002	13	0.1	OK	
4.000	VLB Roof BR	0.1	OK	
4.001	15	0.1	OK	
4.002	16	0.1	OK	
5.000	VLB 4th Floor BR	0.0	OK	
5.001	18	0.0	OK	
5.002	19	0.0	OK	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
6.000	VLB 2nd BR N	120 Summer	2	+0%			
6.001	21	120 Summer	2	+0%			
6.002	22	120 Summer	2	+0%			
7.000	1MS 11th Floor BR	240 Summer	2	+0%			
7.001	24	240 Summer	2	+0%	100/360 Winter		
7.002	25	15 Summer	2	+0%			
8.000	VLB 2nd BR S	60 Summer	2	+0%			
8.001	27	60 Summer	2	+0%			
8.002	28	60 Summer	2	+0%			
3.003	14	60 Summer	2	+0%			

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
6.000	VLB 2nd BR N		29.608	-0.142	0.000	0.01		72
6.001	21		29.601	-0.099	0.000	0.01		
6.002	22		24.004	-0.146	0.000	0.01		
7.000	1MS 11th Floor BR		29.623	-0.127	0.000	0.01		251
7.001	24		29.622	-0.078	0.000	0.01		
7.002	25		24.008	-0.142	0.000	0.01		
8.000	VLB 2nd BR S		29.604	-0.146	0.000	0.01		33
8.001	27		29.587	-0.113	0.000	0.01		
8.002	28		24.003	-0.147	0.000	0.00		
3.003	14		23.518	-0.132	0.000	0.04		

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
6.000	VLB 2nd BR N	0.1	OK	
6.001	21	0.1	OK	
6.002	22	0.1	OK	
7.000	1MS 11th Floor BR	0.2	OK	
7.001	24	0.2	OK	
7.002	25	0.2	OK	
8.000	VLB 2nd BR S	0.1	OK	
8.001	27	0.1	OK	
8.002	28	0.1	OK	
3.003	14	0.6	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	7
Number of Online Controls	7	Number of Time/Area Diagrams	1
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.437
Region	England and Wales	Cv (Summer)	0.950
M5-60 (mm)	20.600	Cv (Winter)	0.950

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
1.000	1	120 Winter	30	+0%			
1.001	1	15 Summer	30	+0%			
1.002	2	15 Summer	30	+0%			
1.003	3	15 Summer	30	+0%			
1.004	4	15 Summer	30	+0%			
2.000	5	15 Summer	30	+0%			
2.001	6	15 Summer	30	+0%			
2.002	7	15 Summer	30	+0%			
1.005	Tank	240 Winter	30	+0%	2/15 Summer		
1.006	Pump Chamber	240 Winter	30	+0%	2/15 Summer		
3.000	1MS 8 Floor BR	360 Winter	30	+0%			
3.001	12	360 Winter	30	+0%	100/240 Summer		
3.002	13	15 Winter	30	+0%			
4.000	VLB Roof BR	240 Winter	30	+0%			
4.001	15	240 Winter	30	+0%			
4.002	16	30 Summer	30	+0%			
5.000	VLB 4th Floor BR	1440 Summer	30	+0%			
5.001	18	1440 Summer	30	+0%			
5.002	19	15 Summer	30	+0%			

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.000	1		19.505	-0.145	0.000	0.01		
1.001	1		18.424	-0.096	0.000	0.28		
1.002	2		18.174	-0.086	0.000	0.38		
1.003	3		18.131	-0.089	0.000	0.35		
1.004	4		18.108	-0.137	0.000	0.32		
2.000	5		18.299	-0.071	0.000	0.54		
2.001	6		18.235	-0.128	0.000	0.38		
2.002	7		18.183	-0.126	0.000	0.39		
1.005	Tank		17.584	0.534	0.000	0.26		317
1.006	Pump Chamber		17.633	0.633	0.000	0.24		
3.000	1MS 8 Floor BR		29.656	-0.094	0.000	0.01		518
3.001	12		29.656	-0.044	0.000	0.01		
3.002	13		24.005	-0.145	0.000	0.01		
4.000	VLB Roof BR		29.643	-0.107	0.000	0.01		380
4.001	15		29.644	-0.056	0.000	0.01		
4.002	16		24.004	-0.146	0.000	0.01		
5.000	VLB 4th Floor BR		26.978	-0.072	0.000	0.00		
5.001	18		26.978	-2.722	0.000	0.00		
5.002	19		24.000	-0.150	0.000	0.00		

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.3	OK	
1.001	1	4.7	OK	
1.002	2	4.8	OK	
1.003	3	4.8	OK	
1.004	4	14.7	OK	
2.000	5	8.4	OK	
2.001	6	12.5	OK	
2.002	7	18.4	OK	
1.005	Tank	3.7	SURCHARGED	
1.006	Pump Chamber	3.3	SURCHARGED	
3.000	1MS 8 Floor BR	0.1	OK	
3.001	12	0.1	OK	
3.002	13	0.1	OK	
4.000	VLB Roof BR	0.1	OK	
4.001	15	0.1	OK	
4.002	16	0.1	OK	
5.000	VLB 4th Floor BR	0.0	OK	
5.001	18	0.0	OK	
5.002	19	0.0	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
6.000	VLB 2nd BR N	120 Summer	30	+0%			
6.001	21	120 Summer	30	+0%			
6.002	22	15 Winter	30	+0%			
7.000	1MS 11th Floor BR	360 Winter	30	+0%			
7.001	24	360 Winter	30	+0%	100/360 Winter		
7.002	25	15 Winter	30	+0%			
8.000	VLB 2nd BR S	60 Summer	30	+0%			
8.001	27	60 Summer	30	+0%			
8.002	28	60 Winter	30	+0%			
3.003	14	30 Winter	30	+0%			

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
6.000	VLB 2nd BR N		29.616	-0.134	0.000	0.01		107
6.001	21		29.615	-0.085	0.000	0.01		
6.002	22		24.004	-0.146	0.000	0.01		
7.000	1MS 11th Floor BR		29.649	-0.101	0.000	0.01		468
7.001	24		29.650	-0.050	0.000	0.01		
7.002	25		24.008	-0.142	0.000	0.01		
8.000	VLB 2nd BR S		29.608	-0.142	0.000	0.01		40
8.001	27		29.601	-0.099	0.000	0.01		
8.002	28		24.004	-0.146	0.000	0.01		
3.003	14		23.519	-0.131	0.000	0.04		

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
6.000	VLB 2nd BR N	0.1	OK	
6.001	21	0.1	OK	
6.002	22	0.1	OK	
7.000	1MS 11th Floor BR	0.2	OK	
7.001	24	0.2	OK	
7.002	25	0.2	OK	
8.000	VLB 2nd BR S	0.1	OK	
8.001	27	0.1	OK	
8.002	28	0.1	OK	
3.003	14	0.6	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	7
Number of Online Controls	7	Number of Time/Area Diagrams	1
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.437
Region	England and Wales	Cv (Summer)	0.950
M5-60 (mm)	20.600	Cv (Winter)	0.950

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
1.000	1	60 Summer	100	+40%			
1.001	1	15 Summer	100	+40%			
1.002	2	15 Summer	100	+40%			
1.003	3	240 Summer	100	+40%			
1.004	4	240 Summer	100	+40%			
2.000	5	15 Summer	100	+40%			
2.001	6	15 Summer	100	+40%			
2.002	7	15 Summer	100	+40%			
1.005	Tank	240 Summer	100	+40%	2/15 Summer		
1.006	Pump Chamber	240 Summer	100	+40%	2/15 Summer		
3.000	1MS 8 Floor BR	480 Winter	100	+40%			
3.001	12	480 Winter	100	+40%	100/240 Summer		
3.002	13	30 Winter	100	+40%			
4.000	VLB Roof BR	480 Winter	100	+40%			
4.001	15	480 Winter	100	+40%			
4.002	16	15 Winter	100	+40%			
5.000	VLB 4th Floor BR	1440 Summer	100	+40%			
5.001	18	1440 Summer	100	+40%			
5.002	19	15 Summer	100	+40%			

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.000	1		19.515	-0.135	0.000	0.02		
1.001	1		18.446	-0.074	0.000	0.51		
1.002	2		18.203	-0.057	0.000	0.70		
1.003	3		18.179	-0.041	0.000	0.19		
1.004	4		18.178	-0.067	0.000	0.15		
2.000	5		18.359	-0.011	0.000	0.98		
2.001	6		18.278	-0.085	0.000	0.69		
2.002	7		18.227	-0.082	0.000	0.71		
1.005	Tank		18.178	1.128	0.000	0.35		264
1.006	Pump Chamber		18.424	1.424	0.000	0.31		
3.000	1MS 8 Floor BR		29.715	-0.035	0.000	0.01		
3.001	12		29.716	0.016	0.000	0.01		
3.002	13		24.005	-0.145	0.000	0.01		
4.000	VLB Roof BR		29.689	-0.061	0.000	0.01		
4.001	15		29.690	-0.010	0.000	0.01		
4.002	16		24.004	-0.146	0.000	0.01		
5.000	VLB 4th Floor BR		27.039	-0.011	0.000	0.00		
5.001	18		27.039	-2.661	0.000	0.00		
5.002	19		24.000	-0.150	0.000	0.00		

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.9	OK	
1.001	1	8.5	OK	
1.002	2	8.7	OK	
1.003	3	2.6	OK	
1.004	4	6.8	OK	
2.000	5	15.2	OK	
2.001	6	22.6	OK	
2.002	7	33.4	OK	
1.005	Tank	4.9	SURCHARGED	
1.006	Pump Chamber	4.3	SURCHARGED	
3.000	1MS 8 Floor BR	0.1	FLOOD RISK	
3.001	12	0.1	FLOOD RISK	
3.002	13	0.1	OK	
4.000	VLB Roof BR	0.1	OK	
4.001	15	0.1	OK	
4.002	16	0.1	OK	
5.000	VLB 4th Floor BR	0.0	OK	
5.001	18	0.0	OK	
5.002	19	0.0	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
6.000	VLB 2nd BR N	120 Winter	100	+40%			
6.001	21	120 Winter	100	+40%			
6.002	22	15 Winter	100	+40%			
7.000	1MS 11th Floor BR	480 Winter	100	+40%			
7.001	24	480 Winter	100	+40%	100/360 Winter		
7.002	25	60 Winter	100	+40%			
8.000	VLB 2nd BR S	60 Summer	100	+40%			
8.001	27	60 Summer	100	+40%			
8.002	28	60 Summer	100	+40%			
3.003	14	30 Summer	100	+40%			

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
6.000	VLB 2nd BR N		29.635	-0.115	0.000	0.01		185
6.001	21		29.635	-0.065	0.000	0.01		
6.002	22		24.004	-0.146	0.000	0.01		
7.000	1MS 11th Floor BR		29.701	-0.049	0.000	0.01		
7.001	24		29.701	0.001	0.000	0.01		
7.002	25		24.008	-0.142	0.000	0.01		
8.000	VLB 2nd BR S		29.617	-0.133	0.000	0.01		61
8.001	27		29.616	-0.084	0.000	0.01		
8.002	28		24.004	-0.146	0.000	0.01		
3.003	14		23.519	-0.131	0.000	0.04		

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
6.000	VLB 2nd BR N	0.1	OK	
6.001	21	0.1	OK	
6.002	22	0.1	OK	
7.000	1MS 11th Floor BR	0.2	FLOOD RISK	
7.001	24	0.2	FLOOD RISK	
7.002	25	0.2	OK	
8.000	VLB 2nd BR S	0.1	OK	
8.001	27	0.1	OK	
8.002	28	0.1	OK	
3.003	14	0.6	OK	

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

\# - Indicates pipe length does not match coordinates

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	8.260	0.200	41.3	0.000	5.00	0.0	0.600	o	100	Pipe/Conduit	
2.000	25.598	0.300	85.3	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	6.201	0.050	124.0	0.045	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	5.000#	0.050	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.000	5.000#	0.050	100.0	0.014	5.00	0.0	0.600	o	150	Pipe/Conduit	
3.001	5.000#	0.050	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.002	10.000#	0.100	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
4.000	5.000#	0.050	100.0	0.014	5.00	0.0	0.600	o	150	Pipe/Conduit	
4.001	5.000#	0.050	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
4.002	10.000#	0.100	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.003	10.000#	0.100	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.11	4.200	0.000	0.0	0.0	0.0	1.20	9.5	0.0
2.000	50.00	5.39	4.300	0.000	0.0	0.0	0.0	1.09	19.2	0.0
1.001	50.00	5.51	3.000	0.045	0.0	0.0	0.0	0.90	15.9	6.0
1.002	50.00	5.59	2.950	0.045	0.0	0.0	0.0	1.00	17.8	6.0
3.000	50.00	5.08	9.800	0.014	0.0	0.0	0.0	1.00	17.8	1.9
3.001	50.00	5.17	9.750	0.014	0.0	0.0	0.0	1.00	17.8	1.9
3.002	50.00	5.33	3.100	0.014	0.0	0.0	0.0	1.00	17.8	1.9
4.000	50.00	5.08	9.800	0.014	0.0	0.0	0.0	1.00	17.8	1.9
4.001	50.00	5.17	9.750	0.014	0.0	0.0	0.0	1.00	17.8	1.9
4.002	50.00	5.33	3.100	0.014	0.0	0.0	0.0	1.00	17.8	1.9
3.003	50.00	5.50	3.000	0.028	0.0	0.0	0.0	1.00	17.8	3.8

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.000	0.000	0.000
1.001	User	-	100	0.022	0.022	0.022
	User	-	100	0.008	0.008	0.030
	User	-	100	0.003	0.003	0.032
	User	-	100	0.004	0.004	0.036
	User	-	100	0.003	0.003	0.039
	User	-	100	0.005	0.005	0.045
1.002	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.014	0.014	0.014
3.001	-	-	100	0.000	0.000	0.000
3.002	-	-	100	0.000	0.000	0.000
4.000	User	-	100	0.014	0.014	0.014
4.001	-	-	100	0.000	0.000	0.000
4.002	-	-	100	0.000	0.000	0.000
3.003	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.073	0.073	0.073

Online Controls for Storm

Pump Manhole: Pump Chambers, DS/PN: 1.002, Volume (m³): 0.5

Invert Level (m) 2.950

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.0000	0.300	2.0000	0.500	4.3000
0.200	1.5000	0.400	3.5000	1.000	4.3000

Pump Manhole: 4, DS/PN: 3.001, Volume (m³): 0.1

Invert Level (m) 9.750

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.025	0.1000	0.050	0.2000	0.075	0.3000	0.100	0.3000

Pump Manhole: 7, DS/PN: 4.001, Volume (m³): 0.1

Invert Level (m) 9.750

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.038	0.1000	0.075	0.2000	0.110	0.3000	0.150	0.3000

Storage Structures for Storm

Cellular Storage Manhole: Attenuation Tank, DS/PN: 1.001

Invert Level (m) 3.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	20.0	0.0	1.001	0.0	0.0
1.000	20.0	0.0			

Cellular Storage Manhole: Courtyard BR, DS/PN: 3.000

Invert Level (m) 9.800 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	95.0	0.0	0.101	0.0	0.0
0.100	95.0	0.0			

Cellular Storage Manhole: Blue Roof 18, DS/PN: 4.000

Invert Level (m) 9.800 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	62.0	0.0	0.151	0.0	0.0
0.150	62.0	0.0			

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	3
Number of Online Controls	3	Number of Time/Area Diagrams	2
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.437
Region	England and Wales	Cv (Summer)	0.950
M5-60 (mm)	20.500	Cv (Winter)	0.950

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
1.000	Green Roof 1	60 Summer	2	+0%			
2.000	Green Roof 2	60 Summer	2	+0%			
1.001	Attenuation Tank	60 Summer	2	+0%	2/15 Summer		
1.002	Pump Chambers	60 Winter	2	+0%	2/15 Summer		
3.000	Courtyard BR	120 Summer	2	+0%			
3.001	4	120 Summer	2	+0%			
3.002	5	120 Summer	2	+0%			
4.000	Blue Roof 18	120 Summer	2	+0%			
4.001	7	120 Summer	2	+0%	100/60 Summer		
4.002	8	120 Summer	2	+0%			
3.003	6	120 Summer	2	+0%			

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.000	Green Roof 1		4.213	-0.087	0.000	0.04		
2.000	Green Roof 2		4.318	-0.132	0.000	0.03		

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.001	Attenuation Tank		3.208	0.058	0.000	0.14		42
1.002	Pump Chambers		3.219	0.119	0.000	0.13		
3.000	Courtyard BR		9.819	-0.131	0.000	0.02		93
3.001	4		9.815	-0.085	0.000	0.02		
3.002	5		3.112	-0.138	0.000	0.02		
4.000	Blue Roof 18		9.829	-0.121	0.000	0.02		105
4.001	7		9.829	-0.071	0.000	0.02		
4.002	8		3.109	-0.141	0.000	0.01		
3.003	6		3.017	-0.133	0.000	0.03		

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
1.000	Green Roof 1	0.3	OK	
2.000	Green Roof 2	0.6	OK	
1.001	Attenuation Tank	1.8	SURCHARGED	
1.002	Pump Chambers	1.8	SURCHARGED	
3.000	Courtyard BR	0.3	FLOOD RISK	
3.001	4	0.3	FLOOD RISK	
3.002	5	0.3	OK	
4.000	Blue Roof 18	0.2	FLOOD RISK	
4.001	7	0.2	FLOOD RISK	
4.002	8	0.2	OK	
3.003	6	0.5	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	3
Number of Online Controls	3	Number of Time/Area Diagrams	2
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.437
Region	England and Wales	Cv (Summer)	0.950
M5-60 (mm)	20.500	Cv (Winter)	0.950

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
1.000	Green Roof 1	30 Summer	30	+0%			
2.000	Green Roof 2	30 Summer	30	+0%			
1.001	Attenuation Tank	60 Summer	30	+0%	2/15 Summer		
1.002	Pump Chambers	60 Winter	30	+0%	2/15 Summer		
3.000	Courtyard BR	120 Summer	30	+0%			
3.001	4	120 Summer	30	+0%			
3.002	5	15 Winter	30	+0%			
4.000	Blue Roof 18	120 Winter	30	+0%			
4.001	7	120 Winter	30	+0%	100/60 Summer		
4.002	8	120 Winter	30	+0%			
3.003	6	120 Winter	30	+0%			

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.000	Green Roof 1		4.219	-0.081	0.000	0.07		
2.000	Green Roof 2		4.325	-0.125	0.000	0.06		

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.001	Attenuation Tank		3.421	0.271	0.000	0.30		48
1.002	Pump Chambers		3.433	0.333	0.000	0.28		
3.000	Courtyard BR		9.839	-0.111	0.000	0.02		123
3.001	4		9.841	-0.059	0.000	0.02		
3.002	5		3.113	-0.137	0.000	0.02		
4.000	Blue Roof 18		9.860	-0.090	0.000	0.02		130
4.001	7		9.862	-0.038	0.000	0.02		
4.002	8		3.113	-0.137	0.000	0.02		
3.003	6		3.019	-0.131	0.000	0.04		

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
1.000	Green Roof 1	0.6	OK	
2.000	Green Roof 2	1.2	OK	
1.001	Attenuation Tank	4.1	SURCHARGED	
1.002	Pump Chambers	4.0	SURCHARGED	
3.000	Courtyard BR	0.3	FLOOD RISK	
3.001	4	0.3	FLOOD RISK	
3.002	5	0.3	OK	
4.000	Blue Roof 18	0.3	FLOOD RISK	
4.001	7	0.3	FLOOD RISK	
4.002	8	0.3	OK	
3.003	6	0.6	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	3
Number of Online Controls	3	Number of Time/Area Diagrams	2
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.437
Region	England and Wales	Cv (Summer)	0.950
M5-60 (mm)	20.500	Cv (Winter)	0.950

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
1.000	Green Roof 1	30 Summer	100	+40%			
2.000	Green Roof 2	30 Summer	100	+40%			
1.001	Attenuation Tank	60 Summer	100	+40%	2/15 Summer		
1.002	Pump Chambers	60 Summer	100	+40%	2/15 Summer		
3.000	Courtyard BR	120 Winter	100	+40%			
3.001	4	120 Winter	100	+40%			
3.002	5	30 Summer	100	+40%			
4.000	Blue Roof 18	120 Winter	100	+40%			
4.001	7	120 Winter	100	+40%	100/60 Summer		
4.002	8	30 Summer	100	+40%			
3.003	6	15 Summer	100	+40%			

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.000	Green Roof 1		4.224	-0.076	0.000	0.13		
2.000	Green Roof 2		4.334	-0.116	0.000	0.12		

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.001	Attenuation Tank		3.938	0.788	0.000	0.35		52
1.002	Pump Chambers		3.968	0.868	0.000	0.31		
3.000	Courtyard BR		9.883	-0.067	0.000	0.02		217
3.001	4		9.884	-0.016	0.000	0.02		
3.002	5		3.113	-0.137	0.000	0.02		
4.000	Blue Roof 18		9.926	-0.024	0.000	0.02		218
4.001	7		9.927	0.027	0.000	0.02		
4.002	8		3.113	-0.137	0.000	0.02		
3.003	6		3.019	-0.131	0.000	0.04		

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
1.000	Green Roof 1	1.1	OK	
2.000	Green Roof 2	2.2	OK	
1.001	Attenuation Tank	4.7	SURCHARGED	
1.002	Pump Chambers	4.3	SURCHARGED	
3.000	Courtyard BR	0.3	FLOOD RISK	
3.001	4	0.3	FLOOD RISK	
3.002	5	0.3	OK	
4.000	Blue Roof 18	0.3	FLOOD RISK	
4.001	7	0.3	FLOOD RISK	
4.002	8	0.3	OK	
3.003	6	0.6	OK	

Appendix F – Thames Water Correspondence

Craig Marchant

MEINHARDT (UK) LTD
10 ALDERSGATE STREET
London

EC1A 4HJ

Wastewater pre-planning

Our ref DS6096359

23 February 2023

Pre-planning enquiry: Confirmation of sufficient capacity

Site Address: 1 Museum Street, Holborn, London, WC1A 1JR

Dear Craig,

Thank you for providing information on your development.

Proposed site: *proposed 24 flats and offices (23625sqm). Proposed foul water connection by gravity into a combined sewer MH1404. Proposed surface water connection int a combined sewer MH1404 at a total of 41l/s.*

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

Foul Water

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent combined sewer network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

Surface Water

When developing a site, policy 5.13 of the London Plan and Policy 3.4 of the Supplementary Planning Guidance (Sustainable Design And Construction) states that every attempt should be made to use flow attenuation and SuDS/Storage to reduce the surface water discharge from the site as much as possible.

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

The disposal hierarchy being:

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

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

If the above surface water hierarchy has been followed and if the flows are restricted to a total of 41 l/s then Thames Water would not have any objections to the proposal.

Please see the attached 'Planning your wastewater' leaflet for additional information.

What happens next?

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

If you've any further questions, please contact me on 07747 641 932

Yours sincerely

Natalya Bacon
Developer Services – Adoptions Engineer
Mobile: 07747 641 932
Clearwater Court, Vastern Road, Reading, RG1 8DB
Find us online at developers.thameswater.co.uk
Get advice on making your sewer connection correctly at connectright.org.uk

Mr Craig Marchant

Meinhardt (UK) Ltd
10 Aldersgate Street,
London,
E1A 4HJ

Wastewater pre-planning
Our ref DS6096361, DTS-65084

06 July 2022

Pre-planning enquiry: Confirmation of sufficient capacity

Site: 1 West Central Street, London - WC1V6PJ

Dear Craig,

Thank you for providing information on your proposed development.

Existing site: Flats (2 units), Public House (889 people), Offices (733m2) and Shopping Centre (587m2).
Proposed site: Flats (26 units).
Proposed foul water discharge by gravity into manholes TQ30812410, TQ3081141B and TQ30811404
Proposed surface water discharge at 5.0 l/s for all storm events up to and including 1:100yr+40$CC into manhole TQ30811404.

We're pleased to confirm that there will be sufficient foul water and surface water capacity in our sewerage network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

What happens next?

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

If you've any further questions, please contact me on 07747 647 155.

Kind Regards

Zaid Kazi
Developer Services – Major Projects, Project Engineer
zaid.kazi@thameswater.co.uk
Get advice on making your sewer connection correctly at connectright.org.uk
Clearwater Court, Vastern Road, Reading, RG1 8DB
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