

JM Enviro Limited
Environmental Consulting
Water, Air & Land


Flood Risk Assessment & Drainage Strategy

**Redevelopment of Upper Floors at
31-35 Montague Street, Worthing**

For

Worthing Investments Ltd

June 2020

PROJECT RECORD		
PROJECT NAME	Redevelopment of Upper Floors at 31-35 Montague Street, Worthing	
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REPORT DETAILS		
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REGISTRATION OF AMENDMENTS

Revision and Date	Amendment Details	Approved

1.0 INTRODUCTION

1.1 Brief

JM Enviro Limited was instructed by Worthing Investments Ltd (The Client) to undertake a Flood Risk Assessment to inform and support a planning application for the refurbishment and extension of the upper floors of 31-35 Montague Street BN11 3BE.

1.2 Project Context

The site comprises a part-3 and part-4 storey rectangular brick building located between Montague Place and Bath Place, with the ground and first floors currently in use as retail, occupied by H&M and Mountain Warehouse. The main customer entrance fronts Montague Street, with side and rear emergency escape access to Bath Place via two service passageways.

The planning application boundary covers an area 950m² in red as shown on Figure 1.1. The ownership of the client extends to the east towards Bath Place at ground and first floors and a storeroom at the rear of the site (shown in blue below) but these areas are unchanged by this application.

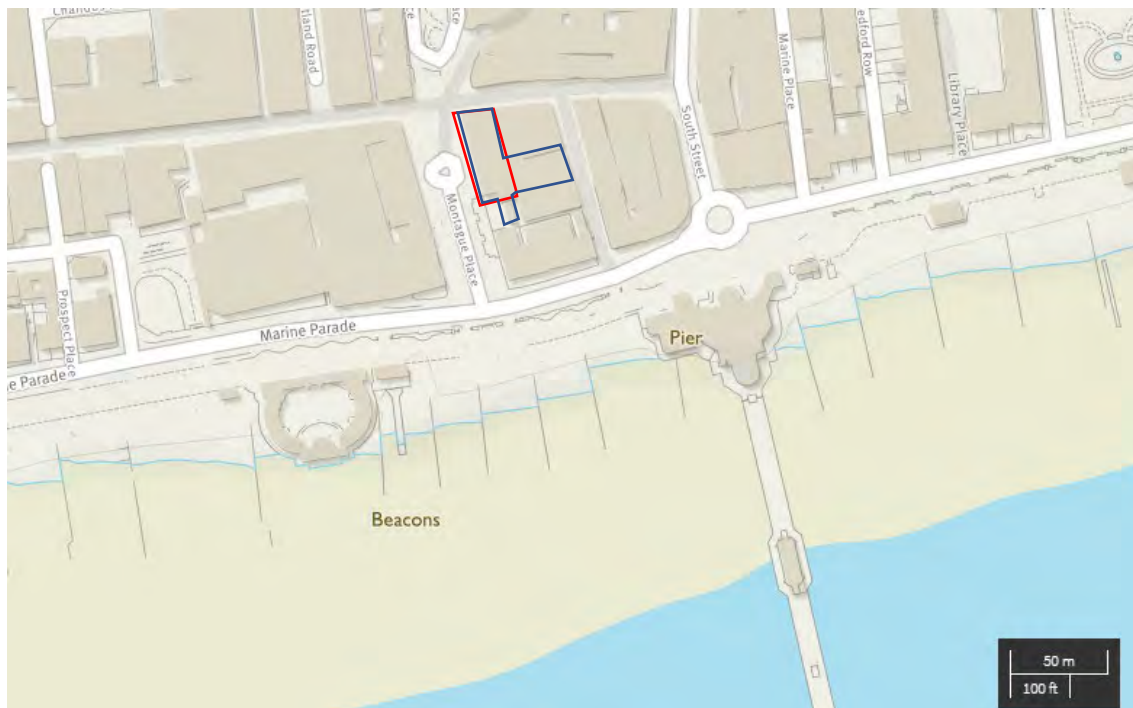


Figure 1.1 Site Location (in red) – area in client ownership (blue)

The client intends to submit a full detailed planning application to refurbish, and change the use of the existing 2nd floor, and to replace the existing upper floor with a new floor covering a larger footprint than present, in order to create 14 residential units. In addition, a small 4 storey extension will be constructed on the southeastern corner of the building which will provide access from the residential units to Montague Place, and will include a lobby, stairwell, bin store and cycle parking. The existing ground floor and first floor retail spaces will remain unchanged from existing.

The existing and proposed development plans are shown on Drawings in Appendix A.

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1.3 Objectives

To prepare an FRA report in accordance with National Planning Policy Framework¹ (NPPF), Planning Practice Guidance² (PPG) and local planning policy and guidance (summarised below) and other published information sources as set out in Table 1.1.

This report also includes a summary and assessment of the proposed drainage strategy.

1.4 Sources of Information

1.4.1 Records Review

Key reports, drawings and websites pertinent to this assessment are detailed below in Table 1.1.

Table 1.1: Key Information Sources

Document/Website	Author/Publisher	Date
Flood Maps for Planning, Rivers and Sea Flood Maps, Reservoir Flood Maps, Surface Water Flood Maps https://flood-warning-information.service.gov.uk/long-term-flood-risk and https://flood-map-for-planning.service.gov.uk/	Environment Agency (EA)	Accessed March 2020
Proposed Development Plans (Appendix A): <ul style="list-style-type: none"> • Ground floor/block plan - Drawing 18 1338 01C • First floor plan 18 1338 02C • Second floor - Drawing 18 1338 03C • Third floor - Drawing 18 1338 04E 	Sub Rosa Architects	January 2019
Proposed Development Elevations (Appendix A) - Drawings 18 1338 06 to 09	Sub Rosa Architects	March 2020
Redevelopment of upper floors 31-35 Montague Street, Worthing, BN11 3BE Design and Access Statement	Sub Rosa Architects	May 2020
Topographical Survey Drawing DAT/9.1 (Appendix B)	Datum Survey Services td	October 2018
EA Product 4 including Flood Levels Data (Included as Appendix D)	EA	17 th March 2020
Worthing Borough Council Sequential & Exceptions Test Regulation 18	Worthing Borough Council	October 2018
West Sussex County Council Report on June 2012 Flood Event. November 2012	West Sussex County Council	2012
Worthing Borough Council Core Strategy	Worthing Borough Council	2011
Worthing Borough Council Draft Local Plan 2016 – 2033 Regulation 18	Worthing Borough Council	October 2018
Guide for Residential Development Supplementary Planning Document	Worthing Borough Council	October 2013
West Sussex County Local Flood Risk Management Strategy	West Sussex Lead Local Flood Authority/ West Sussex County Council	2013

¹ NPPF (Accessed online March 2020)

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf

² PPG (Accessed online March 2020) <http://planningguidance.planningportal.gov.uk/>

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West Sussex County Council Preliminary Flood Risk Assessment	West Sussex County Council	2011
BGS Geoindex – Geology and borehole records - www.bgs.ac.uk/geoindex	British Geological Survey	Accessed online March 2014
West Sussex County Council Strategic Flood Risk Assessment	Capita Symonds	2010
Planning & Climate Change, Live Position Statement	Adur & Worthing Councils	November 2019
Worthing and Adur Strategic Flood Risk Assessment	JBA Consulting	2012
Southern Water Asset Plans (Included as Appendix C)	Southern Water	1st March 2020
Beachy Head to Selsey Bill Shoreline Management Plan (SMP)	Various	2006

1.4.2 Consultation

Key parties consulted as part of this Flood Risk Assessment are detailed in Table 1.2.

Table 1.2: List of Parties Consulted and Summary of Outcome

Consultee	Form of Consultation	Topics Discussed and Actions Agreed
Southern Water	Download of data from DIGDAT March 2020	Assets records were downloaded from an online database, and are included in Appendix C.
West Sussex County Council (Lead Local Flood Authority)	Email request for the Appendices from the LFRMS	Obtained wetspot map for Worthing from the Flood Risk Management Team.
Laura Gibbons & Glenn Longley, Engineering Team, Adur & Worthing Councils	Email responses dated 30 th , 31 st March and 28 th and 29 th April 2020	<p>Worthing Borough Council was contacted to obtain information on the existing coastal defences, and to seek details on the existing and proposed flood defences.</p> <p>The Council indicated that the shingle beach situated between the Pier and the Lido has an approximate crest/berm height of 6.0m AOD, however during storms the shingle beach can be eroded resulting in the crest height being reduced.</p> <p>The council indicated that on 10th February 2020 localised overtopping of the sea defences occurred within this area, which resulted in sea water washing across the promenade and down on to the southern section of footpath on Marine Parade.</p> <p>The reason for the overtopping was due to the culmination of very strong winds, low pressure and spring high tides.</p> <p>The council confirmed that the site is within Flood Zone 3, which means that an FRA needs to be submitted as part of any planning application. The FRA should include consideration of safe access and egress and whether this is possible. It was also noted that areas adjacent to the site are shown to be at moderate risk of surface water flooding.</p> <p>A discussion in relation to the drainage strategy for the site was held, and a written record of the agreed points is included in Appendix D. In summary, it was agreed that the SUDS options are very limited based on the proposed scheme, and therefore a realistic target would be to seek to achieve no increase to the overall site runoff. The opportunity to remove any surface water entering the foul sewer network (which may be combined) would also be desirable, but would need surveys to assess what is feasible. It was agreed that a condition relating to drainage would be an acceptable approach in this instance, and the detailed design would determine what additional measures could be included. It was confirmed that if the target could not be met, then there would be flexibility in what is acceptable.</p>

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Consultee	Form of Consultation	Topics Discussed and Actions Agreed
		It was agreed that appropriate mitigation measures for the mitigation of flood risk to site users would be the adoption of a flood response plan, a flood barrier on the entrance and flood resilient design to the ground floor.
Environment Agency	Product 4 data dated 17 th March 2020, and levels dated 23 rd March 2020.	<p>A request for site specific EA Flood Level data was made. A product 4 data report was supplied (included as Appendix C).</p> <p>The EA stated that the flood risk data provided is based on existing EA hydraulic models for existing 0.5% annual probability events with an allowance for climate change. The response indicated that the climate change allowances provided are not based on the latest UK Government estimates.</p>
	Email correspondence dated 6 th and 16 th April 2020	<p>Clarification was sought as to whether overtopping was included in the data EA model output provided. Erroneous values in the data were queried.</p> <p>The EA confirmed that only the defended scenarios include overtopping, and provided revised flood levels.</p>

1.4.3 Site Walkover

A site walkover including a visual inspection of the drainage was undertaken on 5th March 2020. A selection of photographs are included in Appendix G.

2.0 PLANNING POLICY CONTEXT

2.1 National planning policy and guidance

The potential consequences of inappropriate development in a flood risk area for occupiers, either of the development or elsewhere, pose significant risks in terms of personal safety and damage to property. The approach taken in the assessment of flood risk at planning stage is set out in national, regional and local planning policy and associated guidance. The following section summarises the key policies and guidance relevant to the proposed development.

The National Planning Policy Framework (NPPF) (adopted July 2018 and subsequently updated in February 2019) sets out the UK Government's planning policies, including Government policy on 'development and flood risk' which states that:

"155. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere...."

163. When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment⁵⁰. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

- a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
- b) the development is appropriately flood resistant and resilient;*
- c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*
- d) any residual risk can be safely managed;*
- e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.*

164. Applications for some minor development and changes of use⁵¹ should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 50.

165. Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

- a) take account of advice from the lead local flood authority;*
- b) have appropriate proposed minimum operational standards;*
- c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and*
- d) where possible, provide multifunctional benefits".*

Footnote 50 of the NPPF states:

"A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use".

Footnote 51 of the NPPF states:

This includes householder development, small non-residential extensions (with a footprint of less than 250m²) and changes of use; except for changes of use to a caravan, camping or chalet site, or to a mobile home or park home site, where the sequential and exception tests should be applied as appropriate.

To comply with the NPPF, an FRA must be submitted for planning applications for developments within flood zones 2 and 3 (medium or high risk of fluvial or tidal flooding) and for all developments of 1 hectare or greater located in flood zone 1 (low risk).

An FRA should be appropriate to the scale, nature and location of the development and should identify and assess the risk from all sources of flooding to and from the development and demonstrate how any flood risks will be managed over the lifetime of the development.

An assessment of any hydrological impacts should be assessed including an assessment of impacts on surface water runoff and impacts to the drainage network in order to demonstrate how flood risk to others will be managed following development and taking climate change into account.

The Planning Practice Guidance (substantially revised in March 2015 in relation to drainage) requires that sustainable drainage systems should be considered and included where practicable, in line with DEFRA Technical Standards³.

The DEFRA Technical Standards are therefore a key reference document and should be used in the formulation of the surface water drainage strategy for a scheme of this nature. The standards include the following requirements:

"Flood risk outside the development

S1 Where the drainage system discharges to a surface water body that can accommodate uncontrolled surface water discharges without any impact on flood risk from that surface water body (e.g. the sea or a large estuary) the peak flow control standards (S2 and S3 below) and volume control technical standards (S4 and S6 below) need not apply.

Peak flow control

S2 For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.

S3 For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

Volume control

S4 Where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year 6 hour rainfall event should never exceed the greenfield runoff volume for the same event.

³Technical Standards Accessed Online

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf

S5 Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.

S6 Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with S4 or S5 above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.

Flood risk within the development

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.

Structural Integrity

S10 Components must be designed to ensure structural integrity of the drainage system and any adjacent structures or infrastructure under anticipated loading conditions over the design life of the development taking into account the requirements for reasonable levels of maintenance.

S11 The materials, including products, components, fittings or naturally occurring materials, which are specified by the designer must be of a suitable nature and quality for their intended use.

Designing for Maintenance Considerations

S12 Pumping should only be used to facilitate drainage for those parts of the Site where it is not reasonably practicable to drain water by gravity.

Construction

S13 The mode of construction of any communication with an existing sewer or drainage system must be such that the making of the communication would not be prejudicial to the structural integrity and functionality of the sewerage or drainage system.

S14 Damage to the drainage system resulting from associated construction activities must be minimised and must be rectified before the drainage system is considered to be completed."

2.2 Local Planning Policy

Worthing Core Strategy

The Worthing Core Strategy was adopted by the Council on 12th April 2011. The document, which forms the key part of the Local Development Framework (LDF), will help guide planning and

development in the Borough up to 2026. It will be used to help inform decision making on all planning applications and it will also provide the context for all subsequent Local Development Documents and their policies.

Policy 15 'Flood Risk and Sustainable Water Management' states the following:

"To avoid inappropriate development in areas at current or future risk from flooding new development will be assessed for flood risk during the planning process in accordance with PPS25.

Development will be directed away from areas of highest risk in accordance with the sequential test.

Development will only be permitted within areas at risk from flooding provided:

- The sequential, and where necessary, the exception test has been satisfied
- A Flood Risk Assessment, using the most up-to-date flood risk mapping, has demonstrated that the development will be safe and the risks of increasing flood risk to surrounding areas have been minimised
- The scheme incorporates appropriate flood resilience and resistance measures.

All development will be required to ensure that there is no net increase in surface water runoff. Appropriate Sustainable Drainage Systems (SuDS) will be implemented at site specific locations.

Guide for Residential Development Supplementary Planning Document (SPD)

In relation to flood risk and planning, the 'Guide for residential development SPD' (October 2013) states that:

"..new development should be located, designed, built and operated in ways that reduce the risks from flooding as much as possible. Key considerations are:

1. Building in flood risk areas - government has given clear guidance as to where development of different uses can be located. Residential and other vulnerable use have to be directed to areas of the lowest flood risk possible (more information can be found at <http://www.environmentagency.gov.uk/> and the Councils website.

2. Making buildings safe - consideration will need to be given to site layout ensuring that the most vulnerable uses are in areas of the site with lowest flood risk. Buildings will need to be designed and built to withstand any potential flooding. Consideration will need to be given to matters of safety of the occupants and how they will evacuate the site safely if required to do so.

3. Reducing flood risk – the design of new developments can be designed in such a way so as to minimise the likelihood of flooding. For example, building should not block key flood flow paths. The design of drainage is important, it needs to cope with the heaviest storms and help reduce and slow down the amount of run-off leaving a site. Surface water should be managed on or close to site using sustainable urban drainage techniques (SUDs). Consideration needs to be given to the amount of hard surfacing and the materials used".

Draft Worthing Local Plan

A new Local Plan is currently being prepared to replace the Core strategy, which when adopted, it will be a key document in shaping the future of the borough over a 15 year period. The Draft Plan, that sets out the Council's preferred options, were published for consultation between October and

December 2018. The emerging Local Plan contains includes Policy CP21 which covers 'Flood Risk And Sustainable Drainage', stating in relation to flood risk:

- "c) The Flood Risk Assessment will need to demonstrate that:*
- i. within the site the most vulnerable development is located in areas of lowest flood risk;*
 - ii. development will be safe for its lifetime taking into account the vulnerability of users, considering current and future flooding from all sources;*
 - iii. development will not increase flood risk elsewhere, and where possible will reduce flood risk overall;*
 - iv. residual risk can be safely managed, taking account of the impacts of climate change;*
 - v. development is appropriately flood resilient and resistant;*
 - vi. priority is given to the use of Sustainable Drainage Systems to manage surface water runoff."*

In relation to surface water drainage:

- "d) The surface water drainage scheme should use Sustainable Drainage Systems (unless demonstrated to be inappropriate) and be designed to provide adequate capacity with an allowance for climate change. Opportunities should be taken to incorporate techniques that increase biodiversity and improve water quality.*
- e) Surface run-off should be discharged as high up the following hierarchy of drainage options as reasonably practicable:*
- i. into the ground (infiltration);*
 - ii. to a surface water body;*
 - iii. to a surface water sewer, highway drain or another drainage system;*
 - iv. to a combined sewer.*
- f) Clear management arrangements and funding for their ongoing maintenance over the lifetime of the development should be proposed. Planning conditions or obligations will be used to secure these arrangements."*

Planning and Climate Change Live Position Statement

Adur & Worthing Councils have prepared a Planning and Climate Change Position Statement which provides reference to relevant planning policies (within the context of climate change) that must be taken into account when formulating development proposals. The document (last published in November 2019) includes references to the flood risk and sustainable drainage policies which are summarised above.

Worthing Borough Council Sequential & Exceptions Test Regulation 18

Worthing Council has prepared guidance and policy setting out how the sequential and exception test is to be applied to new development. The guidance has been prepared to support the new local Plan for Worthing. The document is referred to in relation to the scheme in Section 5.2.

West Sussex LLFA Policy for the Management of Surface Water November 2018

As the Lead Local Flood Authority (LLFA), West Sussex County Council is required under Article 18 of the Town and Country Planning (Development Management Procedure) (England) Order 2015 (the Development Management Procedure Order) to provide consultation response on the surface water drainage provisions associated with major development.

The LLFA has prepared a document titled 'West Sussex LLFA Policy for the Management of Surface Water November 2018', stating that:

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“Planning applications for development should therefore be accompanied by a site-specific drainage strategy that demonstrates that the drainage scheme proposed is in compliance with West Sussex County Council’s sustainable drainage policies, as outlined within this document”.

The LLFA policy sets out 8 policies relating to SUDS, as summarised in Table 5.1 of that document, reproduced as follows:

Policy	Summary
SuDS Policy 1	Follow the drainage hierarchy
SuDS Policy 2	Manage Flood Risk Through Design
SuDS Policy 3	Mimic Natural Flows and Drainage Flow Paths
SuDS Policy 4	Seek to Reduce Existing Flood Risk
SuDS Policy 5	Maximise Resilience
SuDS Policy 6	Design to be Maintainable
SuDS Policy 7	Safeguard Water Quality
SuDS Policy 8	Design for Amenity and Multi-Functionality
SuDS Policy 9	Enhance Biodiversity
SuDS Policy 10	Link to Wider Landscape Objectives

2.3 Other Policy and Guidance Documents

The Preliminary Flood Risk Assessment (2011), Strategic Flood Risk Assessment including associated mapping (2012), Beachy Head to Selsey Bill Shoreline Management Plan (SMP) (various authors, 2006), and West Sussex Local Flood Risk Management Strategy (LFRMS) (WSCC, 2013) provide a summary of the flood risks for the whole of the District and provide best practice, advice and guidance.

Information from the SWMP, SFRA, SMP and LFRMS relevant to the site setting and proposed development is provided and referred to throughout report.

3.0 SITE SETTING

3.1 Site Location

The site is located on the junction of Montague Place and Montague Street in Worthing Town Centre at NGR TQ148024 (postcode BN11 3BE) as shown in Figure 1.1.

3.2 Site Boundaries and Current Site Description

The site comprises part of a 4-storey brick building, located on the end of a Victorian terrace. The ground floor is split into two retail units (occupied by H&M and Mountain Warehouse). The upper two floors (currently not in use) comprise warehousing for the retail unit (third floor) and staff welfare facilities (fourth floor) or the store.

The site also comprises a small parcel of open land (comprising open ground laid to hardcore/rubble) to the rear (south) of no 35 Montague Street. This area is partially occupied by an electricity sub-station, adjoining an emergency escape (stairwell) from the rear of the property to Bath Place via a passageway between 20 and 22 Bath Place. A second passageway (further south) connects the site and fire escapes from the retail units of 21-29 Montague Street to Bath Place.

The site is adjoined mainly by retail units, cafes, restaurants, bars, with a street market located in Montague Street and Montague Place, and restaurants, guest houses and residential property on Marine Parade.

The site location is shown in Figure 1.1.

3.3 Site Topography

A topographic survey dated September 2016 is included in Appendix B. The western site boundary is at 4.98-5.05mAOD, falling to 4.69mAOD in the kerb of Montague Place. The rough ground to the rear of the site is at 4.77mAOD. East of the site in the passageway leading to Bath Place, the ground falls from 4.98 adjacent the site to 4.77mAOD where it meets Bath Place. Montague Street in front of the site falls from 4.9 to 4.8mAOD west to east with the low point being the centre of the pedestrianised street.

3.3 Hydrological Setting

3.3.1 Estuaries and Coastal Watercourses

The site is located approximately 60m north of the esplanade and shingle beach that protects Worthing Town Centre from the English Channel.

3.3.2 Surface watercourses

Two rivers flow through Worthing. The site is 3km east of the Ferring Rife, and Teville Stream (culverted) is 775m to the north at its closest point, flowing in a south easterly direction.

3.3.3 Ground Conditions

The nearest BGS record (accessed online at BGS.ac.uk) to the site is a borehole drilled in 1961 at Marine Parade Car Park, approximately 100m west of the site.

The borehole log shows made ground (2 feet), underlain by soft mottled Clay (7 feet), soft chalk with hard lumps to 41 feet.

BGS mapping shows the site to be underlain by River Terrace deposits (silt, sand and clay), with underlying bedrock of Chalk.

Table 3.1 summarises the EA aquifer classification according to the EA website.

Table 3.1: Summary of main Geology and Hydrogeology

Geology	Aquifer Status	Aquifer Description
River Terrace Deposits	Secondary (B) Aquifer with variable permeability.	These are predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
Chalk	Primary Aquifer	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.

3.3.4 Infiltration potential

Given that the Terrace deposits beneath the site are likely to be clay based on the nearby BGS record, infiltration forms of SUDS are not considered suitable for use at the site.

3.3.5 Groundwater

The site does not lie within a Groundwater Source Protection Zone according to online mapping on the DEFRA website⁴.

Groundwater was encountered at approximately 22 feet below ground level (rising to 13.6 feet below ground level) in the 1961 borehole record.

3.3.6 Artificial Water Bodies

There are no artificial water bodies within the vicinity of the site.

3.3.7 Public sewers

A Southern Water Asset Location Search for the site (included in Appendix C, and on Figure 3.1) indicates that the area in which the site is located is served by both foul and surface water public sewers. It is likely based on observations that the foul sewers are effectively combined due to the age of the public sewer network and historic development of the town.

The asset records show foul sewers in Montague Place and Bath Place (225mm diameter) drain to a foul sewer in Montague Street which runs east, then north up South Street. The foul sewer in Montague Place is also connected on its upstream end to a 1500mm diameter sewer running west to east beneath the promenade.

The foul sewer in Bath Place, extends towards the site, west of MH 8303 (not shown on the map) beneath a passageway south of 20 Bath Place, with an invert level of approximately 1.45mbgl. It is possible that this sewer is combined.

A 375mm diameter surface water sewer runs east to west past the site beneath Montague Street, turning south down Bath Place. The sewer falls from 1.28mbgl in the junction of Montague and Bath Place to 1.91mbgl at manhole 8354 in the junction with Marine Parade.

⁴ Defra Data Services Platform - <https://environment.data.gov.uk/> accessed March 2020

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A second surface water sewer runs north to south past the site in Montague Place, then running east along Marine Parade in a separate network to the first sewer described.

A third surface water sewer (150mm diameter) has its head of run in the turning circle of Montague Place, and joins the first sewer described at MH8354.

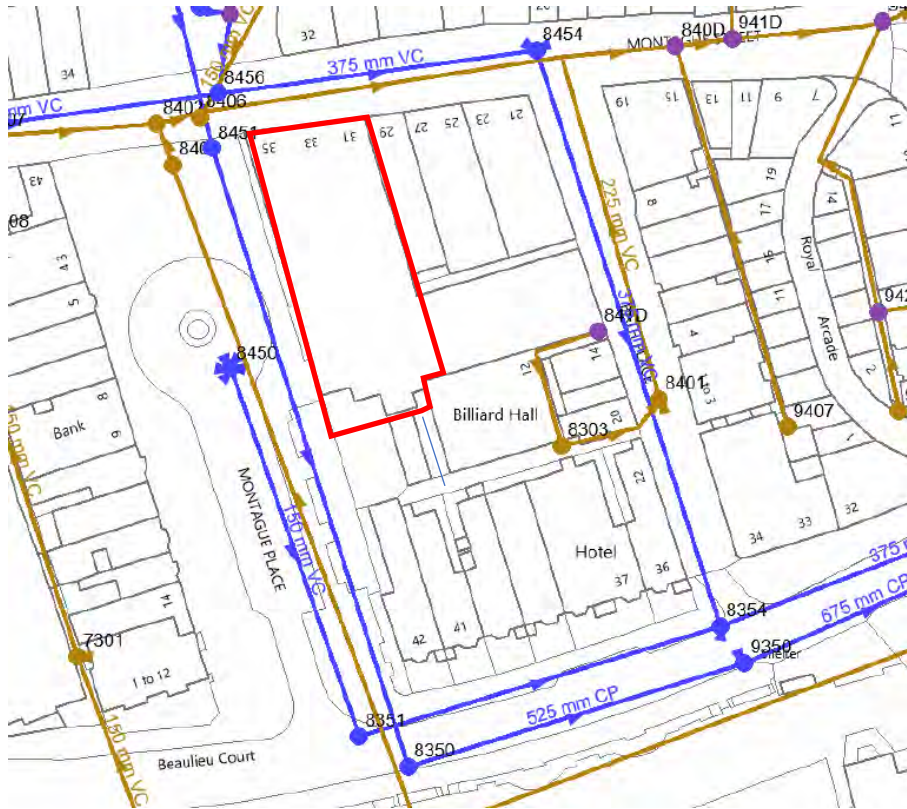


Figure 3.1 Extract of Southern Water sewer asset records

No culverted watercourses are shown on the Southern Water Records.

3.3.8 Site Drainage

The site drainage is assumed to drain to the sewers in Bath Place via two separate networks. The roof runoff from the main building and sinks/toilets from the upper floors are assumed to drain via the combined network in the alley at the rear of 21-29 Montague Street and the site.

On the south of the building, it is assumed that roof runoff from a 2-storey part of the roof drains to the public sewer, along with ground floor kitchen welfare facilities from Unit 35, via a separate connection to the public sewers in Bath Place via the sewer (s) that run past MH 8303.

The compound containing the electricity sub-station is covered in hardcore/crushed material and essentially considered 'free-draining'.

3.3.9 Water Mains

Southern Water records (Appendix C and Figure 3.2) show a 150mm diameter watermain located beneath the hedge/verge adjacent the left side of the site on Montague Place. A valve and spur from this main is shown to enter the property on the far south of the site.

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A 3" cast iron main lies is also located on the far side of Montague Place from the site.

A 100mm ductile iron water main is located in Bath Place, with a 4" CI main in Montague Street.

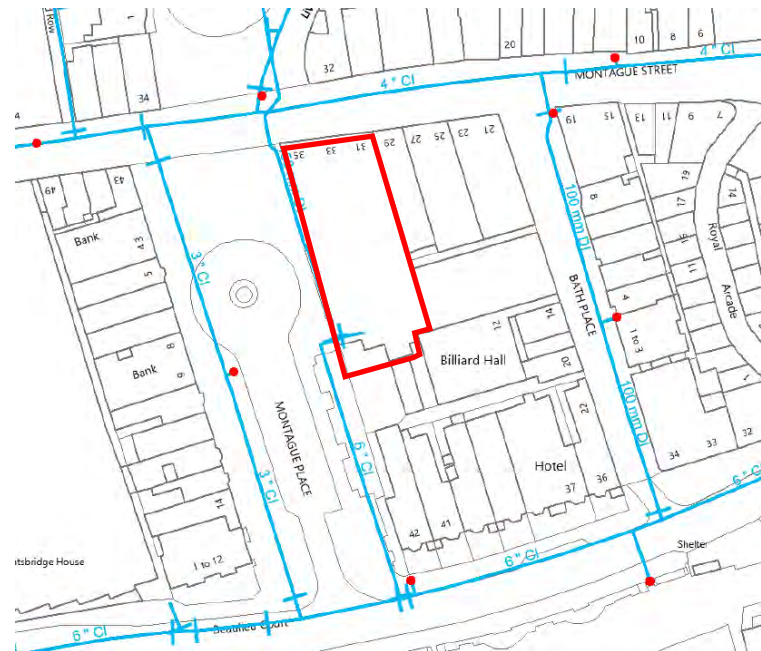


Figure 3.2 Extract of Southern Water clean water asset records

3.3.10 Flood Zones, Flood Levels & Defence Protection – Coastal flooding

Floodzone: The site itself is located within Flood Zone 3 according to the ‘Flood Map for Planning’ accessed on the Gov.uk website, which is the high probability flood risk category⁵ (See Figure 3.3).

Flood defences: The EA Product 4 indicates that there are flood defences protecting the site, comprising sand and shingle beach and groynes. It states that these assets are maintained by Adur and Worthing District Council.

The Worthing and Adur Council Engineering team has confirmed that the beach deposits are maintained to a height of 6mAOD, though it is noted from observations during the site walkover that the beach deposits in the vicinity of the site were a similar height to the promenade, which is understood to be at a height of approximately 4.5mAOD in the vicinity of the site. This is presumably as a result of recent storms which have eroded the level of protection. We understand from the shoreline management plan that the site is located in Policy Unit 4D15 where the policy for the flood defences is to ‘hold the line’.

Table 4.4 of the 2012 SFRA states that the Worthing and Adur Coastline Coastal defences have a Design Standard of 0.5% (1 in 200).

⁵ Floodzones are defined in the NPPG as follows:

- **Floodzone 1 – Low Probability:** Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as ‘clear’ on the flood Map – all land outside Zones 2 and 3)
- **Floodzone 2 – Medium Probability:** Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
- **Floodzone 3a – High Probability:** Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
- **Floodzone 3b – Functional Floodplain:** This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

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Figure 3.3 EA Floodmap for planning accessed via gov.uk (Downloaded March 2020)

The defences are maintained by Adur and Worthing Council by regular inspection and maintenance as well as improvements to ensure compliance of the policies as set out above in the SMP. The policy commitment for this section of coast is “to continue to protect assets along the frontage through holding the line and defending the present position”.

The present-day policy for this area is to continue to protect the town frontage through maintaining and upgrading the existing sections of seawall, revetment breastwork and groynes. For the next 50 years, the plan assumes that defence of the Worthing coastal frontage would most likely be provided through maintaining, replacing and upgrading existing structures, but beyond that, new structures are likely to be required in order to seek to maintain the same level of protection over time to protect property in this part of Worthing from Climate Change..

Modelled flood levels: Table 3.2 sets out the flood levels based on flood modelling output data from the 2012 Arun to Adur Coastal Modelling exercise, provided by the EA as part of the Product 4 request (also see EA email dated 16th April 2020 in Appendix D, which clarifies the scenarios modelled).

Table 3.2: Modelled flood levels based on EA Product 4 data

Year	Modelled tidal flood Level (mAOD*) at the site		Modelled depth at ground level (entrance) on Montague Place in area of proposed extension ***	
	Undefended	Defended	Undefended	Defended
0.5% 2012	Dry	5.05 *	Dry	Dry
0.1% 2012	5.26	5.16 *	0.21	0.11
0.5% 2070	Dry	5.01 **	Dry	Dry
0.5% 2115	Dry	5.21 **	Dry	0.16

* The present day 2012 defended scenarios include overtopping.
 ** These values are based on the old climate change allowances and do not include overtopping. The new climate change values are considered to be lower than the values used in the 2012 model and thus the values here are considered conservative.
 *** Existing ground level at the site south west corner of the site is 5.05mAOD

Mapping in the SFRA “defended scenario” shows that the flood defences are considered adequate to protect the site from flooding during both the 0.5% and 0.1% still water tides (which it is understood allow for storm surge). However the SFRA mapping, confirmed by the flood level data shows that the site is at risk of flooding from wave overtopping even the present day scenario, with a flood level of 5.05m AOD (similar to ground level adjacent to the site) during the 0.5% event (up to 210mm depth on the escape route), and 5.16m AOD (110 mm above adjacent ground level) during the 0.1% event (approximately 310mm depth on the escape route).

When climate change is considered, flood depths will increase during the defended scenario once wave overtopping is considered, though it is assumed that in line with the policy in the SMP, the flood defences will be raised in order to maintain the level of protection to the residential and commercial property located between the high street and Marine Parade.

The impact of a breach/failure in the defences has not been modelled as part of the 2012 SFRA.

However, the site is considered to be at a relatively low residual flood risk from a breach in the defences, based on the ‘undefended’ scenario modelling based on extreme still water levels provided by the EA which consider storm surge, and climate change (old climate change levels), but not wave overtopping. Table 3.2 suggests that no flooding would occur during the present day 1 in 200 year event, 1 in 1000 year event or the 1 in 200 year flood level in 2070, even if no flood defences were present, based on estimated tidal levels for those scenarios. However, floodwaters during the undefended scenario with a 2115 flood level of 5.26m AOD would result in 350mm of flooding in Montague Place at the site based on levels on the southernmost corner.

It is therefore acknowledged that when a breach and wave action is considered, then flood depths could be considerably deeper.

3.3.11 Flood mapping – non-tidal sources of flooding:

According to the gov.uk flood long term flood maps, Montague Place is at a ‘low’ risk of flooding⁶ from surface water (Figure 3.4), with flooding confined to the road (flood depths 300-900mm) in the road and <300mm on the pavements.



Figure 3.4 Surface water flood map – Source: gov.uk website (Long term floodmap)

⁶ Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

- **High risk** means that each year this area has a chance of flooding of greater than 3.3%.
- **Medium risk** means that each year this area has a chance of flooding of between 1% and 3.3%.
- **Low risk** means that each year this area has a chance of flooding of between 0.1% and 1%.
- **Very low risk** means that each year this area has a chance of flooding of less than 0.1%.

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Montague Street and Bath Place are at a low-medium risk of surface water flooding, with flood depths 300-900mm during the design flood. The mapping suggest that flood depths would be <300mm in the medium risk scenario in Montague Street, with flood depths 300-900mm during the low risk scenarios. The mapping shows a surface water flow path west to east past the site.

According to the LFRMS, West Sussex County Council has identified 53 'wet spot' areas in the county. Wet spots have been classified as areas where a significant number (generally greater than ten properties and/or businesses) of adjacent properties may be susceptible to flooding. These property counts include flats above ground floor level. Worthing has been designated a 'priority wetspot area' and the site is shown to be at risk of tidal flooding with surface water flood risk shown in the surrounding streets.

The site is not shown to be at risk of fluvial flooding according to Maps 4-6 of the SFRA.

The 'Areas Susceptible to Groundwater Flooding Map' (Map 15 of the SFRA) shows that there is a strategic scale map showing groundwater flood areas on a 1km square grid. The data is in a 1km grid square where < 25% of the 1km area is susceptible to groundwater flood emergence.

The reservoir flood maps (also accessed online at gov.uk, April 2020) indicates that the site is not considered at risk of flooding from this source.

The site is located in a flood warning area according to the Defra Data Services Platform and confirmed by Worthing Borough Council.

3.3.12 Flood History

Map 3 of the SFRA (2012) shows two sewer flooding records within 30 and 50 m north and northwest of the site (See Figure 3.4). No further details are provided.

The Environment Agency states in the Product 4 response that they hold no record of previous flooding events affecting this site.



Figure 3.4 Historical flooding (extract from Map 3 of the SFRA)

The PFRA includes two records of historic flooding relevant to the site as shown in Table 3.3.

Table 3.3: Relevant flood records from the West Sussex PFRA

Date	Location	Details	Extent of flooding
October 2000	Worthing Town Centre	Commercial properties were flooded as a result of flash flooding arising from the incapacity of surface water and highway drainage to cope with the volume of water and poor maintenance of the system	Approximately 20 non-residential properties
25th June 2007	Worthing	4 inches of rain fell within one hour resulting in widespread flooding. Emergency services received more than 297 calls and Worthing hospital was flooded	Unknown

Extensive flooding took place across West Sussex in Summer 2012 following unprecedented rainfall. The LLFA Flood Investigation report on the flood event (WSCC, 2012), shows that the site is not located in one of the cluster areas which were flooded during this event.

The Council indicated that on 10th February 2020 localised overtopping of the sea defences occurred within this area, which resulted in sea water washing across the promenade and down on to the southern section of footpath on Marine Parade.

4.0 PROPOSED DEVELOPMENT

4.1 Scheme description

The client intends to submit a full detailed planning application to refurbish and change the use of the existing 2nd floor, and to replace the existing upper floor with a new floor covering a larger footprint than present in order to create 14 residential units. In addition to the modifications to the existing building, a small (91m²) 4 storey extension will be constructed on the southeastern corner of the building which will provide access from the residential units to Montague Place (existing ground level at approximately 5.05mAOD at the proposed extension entrance). The extension will include a stairwell, lobby, bin store and an indoor cycle parking store at ground level, and residential accommodation at 1st to 3rd floor. Rooftop gardens and terraces will be provided at 3rd floor level (See Figure 4.1).



Figure 4.1 Image of the proposed development (Source: Design & Access Statement)

The existing ground floor and first floor retail spaces will remain unchanged from existing.

The proposed development plans are shown on Drawings in Appendix A with the proposed drainage strategy shown on Drawing JME.224.DS in Appendix F.

4.2 Drainage Strategy

4.2.1 Overview

This section summarises the planning and policy guidance considerations that have informed the drainage strategy.

As the NPPF states that flood risk should not be increased elsewhere by the development, adequate drainage for the proposed new buildings will need to be provided as part of the redevelopment proposals. Furthermore local planning policy document '*West Sussex LLFA Policy for the Management of Surface Water*' has been considered in the preparation of the strategy.

A 40% increase in rainfall intensity should be allowed for in the design of the drainage line with the latest UK government advice on climate change⁷.

National, regional & local planning policy, Approved Document H of the Building Regulations, and and best practice guidance requires that, where feasible, site drainage should utilise Sustainable

⁷ <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances> - last updated 16th March 2020

urban drainage systems (SuDS) to collect, treat, convey, and dispose of surface water safely. SuDS are a natural approach to managing drainage in and around properties and other developments. They work by slowing and holding back the water that runs off from a site, allowing natural processes to break down pollutants.

In accordance with the SuDS hierarchy and best practice guidance, source control measures such as green roofs should preferably be used in conjunction with infiltration forms of SuDS, such as permeable paving, soakaways, swales and soakage basins being used where viable to manage surface water as close to source as possible. If infiltration is not viable, or if attenuation of surface water is required, then above ground attenuation systems such as detention basins and ponds will ideally need to be used to ensure runoff is attenuated and restricted to greenfield run off rates prior to discharge to a suitable waterbody. Below ground storage, pumped drainage, and below ground attenuation, with an outfall to surface water sewer (or a combined sewer, as a last resort) may be necessary, but will only be considered where infiltration or above ground storage SuDS are not viable.

All new on-site drainage should be separated until the point of connection to the existing sewer network in order to meet Southern Water requirements and best practice/building regulations.

A proposed foul and surface water drainage strategy which considers the scheme in the context of the hydrological setting, information available on the ground conditions, existing drainage regime and site constraints is shown on Drawing JME.224.DS in Appendix F along with supporting calculations, and is summarised below.

4.2.2 Proposed Surface Water Strategy (including SUDS)

The surface water drainage strategy is summarized in this section and on Drawing JME.224.DS in Appendix F.

Pre-development (existing/brownfield) flows for the site have been calculated as summarised in Table 4.1, with Microdrainage calculations in Appendix F.

Table 4.1. Existing Brownfield Runoff Rates

Storm Event	Brownfield runoff Rate (l/s)*
1:1 year	10.4
1:30 year	28
1 in 100 year + 40%CC	50.8

*Based on existing building footprint only (890m²). The area of the proposed extension at ground level is free-draining and has not been included in the calculations.

Greenfield runoff rates for the whole site (are summarised in Table 4.2 with calculations also shown in Appendix F.

Table 4.2. Greenfield Runoff Rates

Storm Event	Greenfield runoff Rate (l/s)
1:1 year	0.15
1:30 year	0.41
1:100 year	0.57

The drainage discharge hierarchy has been considered in preparation of the drainage strategy, as follows:

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- **Infiltration** – The site is underlain by River Terrace Deposits comprising clay based on the closest BGS records, and a building covers the entire footprint of the site and thus infiltration forms of SUDS are not viable.
- **Discharge to surface watercourse** – No existing connections to a surface watercourse is available. The surrounding area is served by separate sewers though from initial sewer inspection, the sewers serving the site may be combined.
- **Discharge to Surface Water sewer** – The proposal is to re-use existing sewer connections, however where feasible, any surface water currently draining to a foul sewer will be diverted to reduce sewer flows and to offset any increases in foul flows.
- **Discharge to Combined Water sewer** – As the site may presently drain via combined sewers, it may be necessary to reuse these connections where it is not viable to disconnect and diver the surface water flows to a surface water sewer. This will be a last resort.

The surface water drainage strategy was informed by a SuDS appraisal which has considered the SuDS hierarchy (Table 4.3). SuDS measures have therefore been implemented where possible within the bounds of the scheme to meet the requirements of the national, regional and local planning policy requirements and best practice guidance.

In summary, the following SUDS features are currently included in the surface water drainage strategy shown on Drawing JME.224.DS in Appendix F:

- Rainwater harvesting butts (4 no.); to minimize potable demand and flows (rate and volumes) to the sewer;
- Raised planters (38m² currently shown on the 2nd floor terrace) will provide basic source control and minimise runoff from the scheme. These will perform similar to intensive green roofs.

Table 4.1: SuDS Options

SuDS Option	Suitability/ Included in the Scheme?	Comments
Rainwater Harvesting	✓	Rainwater harvesting for irrigation of the green landscaped area/raised planters is proposed in the form of several (4 no. currently shown) rainwater butts for use on the 3 rd floor communal terrace.
Soakaways and permeable paving (infiltration)	X	Infiltration is not deemed suitable for use due the lack of space at ground floor – the building covers the entire ground floor.
Green Roofs/Brown Roofs/Blue Roofs	✓	38m ² of raised planters will be included on the second floor terrace. The opportunity to include further areas of planting including a full green roof will be considered at the next stage of design. However given that the existing structure will be extended, it is considered unlikely that a green roof will be viable.
Permeable paving (storage and treatment)	X	No space is available at ground floor within the site boundary.
Swales	X	Swales are not deemed suitable for use due the lack of space at ground floor – the building covers the entire ground floor.
Attenuation Ponds (above ground storage)	X	Attenuation ponds/basins are not deemed suitable for use due the lack of space at ground floor – the building covers the entire ground floor.

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Below ground storage in cellular systems and	X	Not considered viable to accommodate within the site boundary given the site and project constraints. Buildings cover the entire site and services serving multiple developments present in adjoining streets.
Flow control devices	X	Not required.

Key:

- ✓ Suitable for use and included in the scheme
- * Possibly suitable for use – not included in the client and architect design proposal at present – should be considered further as part of the next stage of design
- X Unlikely to be suitable for use

4.2.3 Proposed Foul Strategy

There are two assumed existing foul connections to the public foul sewer in Bath Place. We understand that the one to the south serves the ground floor of the existing retail. The drainage on the existing 2nd and 3rd floors drains to Bath Place via a possibly combined sewer to the rear of unit 21-29 Montague Street. It is proposed to reuse the existing connections as shown on Drawing JME.224.DS in Appendix F.

A Section 106 Application will be submitted to Southern Water to confirm and agree the final discharge rate at the detailed design stage, and to agree any necessary alterations to the existing sewers, following a detailed drainage survey.

4.2.4 Maintenance of the site drainage

None of the proposed site drainage including the attenuation system will be eligible for adoption by Southern Water or WBC, and therefore the site drainage will need to be regularly inspected and maintained by a private maintenance contractor (employed by the site management company).

The site management company will ensure routine inspection and maintenance of the site drainage is undertaken by a private maintenance contractor and ensure that the public sewers are being maintained by the Southern Water for the life of the development.

The regular inspection and maintenance of highway drainage, public and private drainage by Worthing Borough Council, Southern Water, and private maintenance contractor respectively, will minimise the residual risks associated with highway drainage, public and private sewers.

A management plan for the drainage will be prepared for the development once the drainage strategy is finalised at the next stage of design. Based on the current proposals, the following schedule is proposed:

- Green roofs/raised planters on roof terrace
 - In line with manufacturer/landscape architects design

5.0 FLOOD RISK ASSESSMENT

5.1 Scope of Work

The scope of this FRA was refined to meet the objective set in Section 1 of this report and considers the following:

- Suitability of the Proposed Development (sequential/exception test);
- Flood risk to the development from all sources;
- Potential for the design, construction and operation of the site to increase the risk of flooding to neighbouring properties;
- Any necessary mitigation measures to mitigate identified potential flood risks;
- Climate change;
- Residual flood risks.

The approach is consistent with the NPPF, PPG and the requirements of local planning policy.

5.2 Suitability of the Proposed Development (Sequential/Exception Test)

The site is located in Floodzone 3a, and thus in line with national planning policy, it is necessary to demonstrate that the scheme has fully considered the sequential and exception tests.

Worthing Borough Council has prepared a 'Sequential & Exceptions Test Regulation 18' report, dated October 2018 which sets out how developers should consider the suitability of for sites located in Flood Zone 3.

It states that:

"Only a small portion of Worthing is identified as being within Flood Zones 2 and / or 3. However this includes large areas of the Town Centre. In addition given the limited land availability in Worthing the overall housing target within the Local Plan will only meet approximately 32% of the overall housing need. It is therefore considered that all potential windfall sites will need to be developed (where acceptable in terms of planning policy) to meet this need as far as possible. Even if all sites were developed it would not be possible for Worthing to meet its local housing need. It is therefore considered that it is not possible for development to be directed to areas of lowest flood risk. On this basis it is considered that the sequential test is deemed passed for all windfall sites."

As the site is considered a 'windfall site' in this context, it is considered that the sequential test is deemed to be passed.

Furthermore, as the retail space will be retained on the ground and first floor ('less vulnerable'), with only residential use on the upper floor ('more vulnerable'), then the scheme is considered to be laid out in accordance with a sequential approach.

Table 3 from National Planning Practice Guidance states in relation to 'more vulnerable' development that the exception test is required.

For the exception test to be passed, it must be demonstrated that:

- "a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and*
- b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall".*

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A sustainability appraisal for the site is included in Appendix I in order to demonstrate Part a) of the exception test can be met.

The remainder of this report sets out to demonstrate that the requirements of Part b) of the exception test are met.

5.3 Flood risk to the development

Based on our understanding of the scheme, current level of design and the site setting, the potential sources of flooding have been identified and assessed in Table 5.1.

Table 5.1 Sources of Flooding

Source of Flooding	Pathway	Potential Linkage to Site	Justification
Coastal	Overtopping/ breach of the flood defences and overland flow	Yes	<p>The site is protected from coastal flooding by a combination of beach groynes, a shingle beach and a promenade maintained by Adur and Worthing Council. The defences are considered adequate to protect the site from flooding due to extreme tides, but the site and surroundings are vulnerable to flooding from overtopping when wave action is considered based on the current best available data (i.e. the flood data provided by the EA).</p> <p>Modelling suggests that during the present day scenario, floodwater would reach the FFL of the ground floor entrance (5.05mAOD) during the 0.5% event, with up to 210mm depth on the escape route), and 5.16mAOD (110 mm above adjacent ground level) during the 0.1% event (approximately 310mm depth on the escape route).</p> <p>In the event of a breach in the defences, floodwater would be deeper when wave action is considered.</p> <p>Appropriate mitigation measures are discussed in Table 5.4.</p>
Groundwater (shallow)	Potential for shallow/perched groundwater	Yes	There is potentially shallow groundwater which is unlikely to pose a significant flood risk given the nature of the proposals, but may affect foundation design, Appropriate mitigation measures are discussed in Table 5.2.
Artificial water Bodies	Breach of reservoir embankments and overland flow	No	No significant sources of flooding identified. Flooding from this source is not considered further in this report.
Infrastructure failure from burst/damaged water mains and internal water supply system	Failure of the Southern Water network and/or internal water supply and distribution system may result in flooding of the internal building as well as the surrounding area	Yes	The exact location of existing services is not known, but it is understood that a watermain is located along the western edge of the building. Flood risk from this source is considered to be a residual risk with the main threat being from internal pipe work during any construction during the extension/refurbishment or maintenance during the life of the development. Appropriate mitigation measures are discussed in Table 5.4.
Sewer flooding from Southern	Surcharge in site drainage	Yes	Sewer flooding from blockage of internal building drainage, as well as the Southern Water network, is a residual risk managed

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Source of Flooding	Pathway	Potential Linkage to Site	Justification
Water assets, highway drainage and private site drainage	and the public sewer network due to blockage or exceedance of capacity		by the design of the site drainage and regular inspection, and maintenance of the public and private sewer network. The flood risk associated with this source may also increase over time due to the effects of climate change. Appropriate mitigation measures are discussed in Table 5.4.
Surface water flooding as a result of extreme rainfall and runoff from overland flow	Flooding of the surrounding roads due to extreme rainfall	Yes	The EA surface water flood mapping indicates the site is at low risk of surface water flooding and therefore flooding from this source is not pose a significant risk of flooding to the scheme, but may affect the ability to access the site during extreme events. Appropriate mitigation measures are discussed in Table 5.4.

In summary, the site and the surroundings are at a potential risk of flooding from various sources, and a number of mitigation measures are recommended to address and manage the risk from these forms of flooding in Table 5.4.

5.4 Flood Risk from the Proposed Development – including drainage assessment

This section assesses the impact of the proposed development and the drainage strategy on the receiving sewer environment.

5.4.1 Change in Surface Water Runoff

The majority of the site is impermeable (93.6% of the site is covered by buildings) and drained formally to the public sewer network which is combined in the vicinity of the site. The existing building will be retained and extended such that following development, 100% of the site will be hardstanding.

As set out in Section 4, SUDS in the form of raised planters at roof level, along with rainwater butts has been included at second floor level to minimise runoff from the site following development.

Runoff calculations for the change in peak surface water runoff are summarized in Table 5.2.

Table 5.2 Change in sewer flows – Peak flows

Receiving Sewer	Scenario	Existing brownfield runoff rate l/s ^{*1}	Proposed runoff rate l/s ^{*2}
Sewers in Bath Road	1 in 1 yr	10.4 l/s	12.1 l/s
	1 in 30 yr	28 l/s	29.5 l/s
	1 in 100 yr + 40% cc	50.8 l/s	53.2 l/s

^{*1} Based on 890m² of hardstanding (existing building footprint).

^{*2} Proposed rates allow for increase in building arising from the proposed development to 950m².

Note: Connection points to be confirmed at next stage of design, following a detailed drainage survey and liaison with Southern Water.

As a result of development surface water flows will increase slightly compared to existing following development.

5.4.2 Changes in Foul Flows

Using the method described in Sewers for Adoption 7th Edition and industry accepted methodologies (including guidance in BS EN 752/sewers for adoption and Butler & Davies, 2011), the proposed

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development will increase peak foul sewer flows to the public sewer network by approximately 0.42/s from 0.75l/s to 1.17l/s.

The proposed development will therefore slightly increase overall foul flows to the local sewer network.

5.4.3 Changes in Sewer Flows – Impact on sewer network

Overall, the combined sewer flows will increase very slightly due as shown in Table 5.3, though this impact has been minimised by the inclusion of rainwater harvesting (water butts) and green roof/planters.

Table 5.3 Change in peak sewer discharge rates (foul and surface water) – 1 in 100 year event

Modelled Scenario	Surface Water Discharge Rate (1 in 100 yr storm)	Foul Water Discharge Rate	Total Peak flow	Increase/Reduction
Existing Site (40% Climate Change allowance)	50.8/s	0.75 l/s	51.55 l/s	+2.82l/s (+5.47%)
Following development (40% Climate Change allowance)	53.2/s*	1.17l/s	54.37 l/s	

*based on increased in footprint due to the extension (offset by reduction due to inclusion of SUDS).

The impact will be further mitigated by any viable separation of foul and surface water flows that can be achieved at the next stage of design, subject to further drainage survey, detailed design and agreement with Southern Water, and approval from the LLFA and Building Control in relation to the detail of the connection(s).

Further opportunities to reduce the impact of the site on the public sewer network are discussed in in Table 5.4.

5.4.4 Changes in overland flow routes

5.5 Mitigation Measures

Table 5.4 sets out appropriate mitigation measures to minimise the identified flood risks.

Table 5.4: Mitigation Measures

Type of Flooding	Summary of Issue	Mitigation Measures	Justification	Residual Risk * 8
Tidal flooding	<p>The site is protected from coastal flooding by raised coastal defences that provide some protection to the site and surroundings from overtopping.</p> <p>It is noted that the performance of the defences varies over time, with the shingle beach being significantly eroded following high tides and heavy storms such as the succession of storms earlier this year. Therefore the degree of protection relies heavily on regular beach replenishment by the council.</p>	<ul style="list-style-type: none"> The new building should be designed to withstand flooding to and waterproofed to at least 1m above the FFL (6.05mAOD). All plant should ideally be located on the upper floors, or appropriately raised/waterproofed. The site management company must prepare and implement an appropriate flood response plan setting out procedures for flood warning, evacuation and/or safe refuge. The plan should be considered a living document and should be reviewed periodically as changes to the understanding of flood risk management will occur over time. The site residents should subscribe to the EA flood warning service and be prepared to implement the flood response plan. 	These measures will ensure flood risk from these sources is minimised.	Low

⁸ Following adoption of the proposed mitigation measures

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Type of Flooding	Summary of Issue	Mitigation Measures	Justification	Residual Risk * 8
	<p>Assuming the height of the defences are maintained, modelling suggest that floodwater from overtopping are likely to be at a similar level to the proposed ground floor of the property (5.05mAOD) during the design flood (0.5% AEP event), and slightly deeper, 300mm in the escape route to higher ground during this event.</p> <p>Flood depths will be approximately 200mm deeper during extreme flooding (0.1% AEP with overtopping, and/or in the event of a breach. No modelling is available that considers the overtopping scenario when climate change is considered, but flooding could be considerably deeper.</p> <p>However, given that all habitable accommodation is on the upper floors, the two main risks are that safe dry escape may not be available during the design flood, more extreme events, and that flooding of the ground floor entrance and bike store may occur.</p> <p>Without regular maintenance (beach replenishment) and improvements to the defences over time (maintenance and future raising/replacement of the existing defences) the proposed scheme is likely to become more vulnerable to flooding from overtopping and breach over time due to climate change. The SMP policies are such that residents should be able to rely on the council striving to maintain an adequate level of protection over time.</p>	<ul style="list-style-type: none"> • Regular inspection and maintenance of the Coastal defences by Adur and Worthing Council. • Safe dry refuge is provided on the upper floors of the buildings at all times should evacuation not be possible in time. • Adopt a flood resistant/resilient approach to design/finish for the ground floor and the building services where practicable. Suggested resilience measures are included in Section 6.7. • Demountable flood barriers should be included on the site entrances (with the doors designed to open inwards). The procedures for placement should be set out in the flood response plan. • The clients design team should monitor future flood modelling studies as the design progresses, to ensure any changes to flood risk assessment and management can be reflected in the design/risk management procedures. Note a new strategic flood risk assessment is due for release in the near future. 		
Flooding from groundwater	There is a potential for shallow groundwater to be present.	<ul style="list-style-type: none"> • Ensure design of the substructure/services considers the potential for shallow groundwater. • Consider the need for de-watering during as part of the temporary works design and agree any temporary requirements for dewatering with Southern Water. 	Will ensure the risk of water ingress into basement level is minimised and impacts on sewer network are minimal.	Low
Flooding from surface and foul water – sewer	Blockages, surcharges or failure of pumped drainage in the site drainage or the public sewer network in the site vicinity may	<ul style="list-style-type: none"> • Routine inspection and maintenance of the site and public drainage systems by the site owner and Southern Water. 	These measures will ensure flood risk from these	Low

Flood Risk Assessment & Drainage Strategy
Redevelopment of Upper Floors - 31-35 Montague Street, Worthing, BN11 3BE

Type of Flooding	Summary of Issue	Mitigation Measures	Justification	Residual Risk * 8
blockage/ surcharging and intense rainfall	<p>result in backing up of the site drainage/drainage serving the site which may result in flooding of the site drainage, external areas and site surroundings.</p> <p>Flooding from this source is considered to pose residual risk to the proposed development.</p>	<ul style="list-style-type: none"> • Monitor flood risk throughout the life of the development in order to confirm the risk posed to the scheme over time. • A drainage survey should be undertaken to confirm the condition of the existing drainage, to the inform the need for any localised upgrades to the network, focussed on the location of the proposed outfall connections. Opportunities to divert any surface water flows from any combined systems serving the site should be sought. • Adopt a flood resistant/resilient approach to design/finish for the ground floor and basement and the building services where practicable. • It is recommended that the detailed design of the drainage further explores opportunities to incorporate rainwater harvesting and elements of green roofs/raingardens and raised planters to minimise the amount of water entering the public sewer network. • The drainage strategy will need to be developed and agreed with Southern Water and Building Control as the design progresses. 	sources is minimised.	
Flooding from Water mains	<p>Flooding from burst water mains and leaks in the internal distribution system may result in flooding of the external area and the property respectively.</p>	<ul style="list-style-type: none"> • Protection of the water mains in Montague Place from abnormal loads to be assessed and managed by the main contractor throughout the works. • Routine inspection of the site and public water supply and distribution system by the site owner and Southern Water. Contractors to take care during any future maintenance/ refurbishments. 	Will ensure the risk of flooding is minimised.	Low
Increased sewer flows increasing flood risk in the public sewer network	<p>The development will increase peak foul sewer flows in the public sewer network. Peak surface water flows will be minimised due to the inclusion of SuDS which will provide attenuation and minimise any impacts.</p>	<ul style="list-style-type: none"> • Agree drainage strategy with the LLFA, Southern Water and building Control as the design progresses. Any changes to existing flows should be agreed by the flood risk officer/LLFA and Southern Water. • Opportunities to divert any surface water flows from any combined systems serving the site should be sought. • Seek opportunities to further reduce run-off at the next stage of design, through additional measures such as rainwater harvesting, green roofs and maximising of green space. • Include water saving devices. • Ensure regular maintenance of the site drainage. 	Will ensure the impact of the development is minimised.	Low

5.6 Residual Risk

A number of residual risks have been identified, associated with overtopping and breach of the coastal defences, flooding from blockage/surcharge of public sewers and site drainage, burst water supply pipes, groundwater and intense rainfall.

Appropriate mitigation measures have been provided in Table 5.4 to address and manage the residual risk from these forms of flooding. In summary, as long as the coastal defences, reservoirs, public sewer networks, site drainage/water supply infrastructure are regularly inspected by maintained by Adur and Worthing Council, Southern Water and site management respectively then the residual risk will be minimised.

Flood resilient and resistant design and preparation and implementation of a flood warning and evacuation plan will be used to manage residual risks to site users and property. Further details of the mitigation measures necessary to reduce the consequences associated with the residual risks and climate change are set out in paragraphs 5.7 to 5.9.

These risks are typical of a site like this in coastal urban areas like Worthing.

5.7 Flood Resilient Design

Flood resilient design should be incorporated in the design of the ground floor as high as reasonably practical to mitigate the residual tidal flood risk to the building (minimum 1m above the FFL i.e. 6.05mAOD). This would ensure that in the unlikely event of flooding occurring, the site can be returned to use once floodwaters have subsided.

Where practicable, further flood resilient design measures could be included on the ground floor in order to address uncertainty associated with climate change. These measures could include, but are not limited to, the following:

- All walls at risk of coming into contact with flood water could be lime plastered or finished with waterproof screed,
- When installing plasterboard, it should be installed lengthways to minimise the amount of plasterboard that would need to be replaced in the event of flooding.
- Electric sockets could be raised to a suitable height above the flood level.
- Electrical units, including any plant should be raised.
- Concrete floor coverings should be used where practicable on the ground floor, avoiding the use of carpeting/timber etc.
- All floors and wall tiles should be laid with waterproof adhesive.
- Cables, junction boxes and meters for phone, electric and gas should be appropriately placed (preferably first floor or in watertight cabinets) to minimize damage during a flood and to provide continuity of safe supply during a flood event if at all possible.
- No chipboard or MDF should be used, instead metal or plastic alternatives to be used for all ground floor finishes where practicable.

5.8 Flood Resistant Design

The existing and new structure should be assessed/designed confirmed to withstand flooding to a depth to at least 6.05m AOD which is 1m above ground level at the site.

As a precautionary measure, and to protect property stored on the ground floor, a 600mm demountable flood barrier will be added to the outside of the ground floor entrance, and the bin store in order to provide additional protection to aid with emergency evacuation in the event that the

defences are overtopped or breached (See Drawing JME.224.FMS in Appendix H). The barrier will need to be stored in an accessible place on the ground floor. The main entrance doors will need to be designed to open inwards to enable emergency evacuation in the event of a flood and the barriers being in place.

5.9 Flood Response Plan

This section summarises an outline of the proposed flood response procedures recommended for the site. These should be reviewed by the local planning authority, formalised into a standalone document and made available to all future residents. The document should be considered a living document and should be updated periodically by the site management company.

5.9.1 Information for Residents

There is a risk that tidal flooding (from wave overtopping and/or extreme tides) could flood Montague Place and Bath Place and water may flood the level of the ground floor and/or prevent safe dry escape from the property. At all times however, a safe dry refuge should be available on the upper floors in all the residential units.

It should be noted that flood depths may increase overtime as a result of climate change and the EA should be contacted periodically to check whether the flood levels and/or degree of protection has changed as this may affect the risk to your property or safety in a flood.

Demountable flood barriers have been provided for the bin store and the main entrance.

5.9.2 Summary of Flood Warning Procedures

The following summarises the flood warning system and sets out the recommended procedures for responding to flood warnings and for evacuation during a flood:

- The area is located in an EA flood warning area, where flood warnings are issued by phone, email or text message through a subscription service via the Environment Agency website. All residents should subscribe to the EA flood warning scheme at <https://www.fws.environment-agency.gov.uk/app/olr/register>;
- All residents should prepare a flood plan and a pre-prepared Flood Kit as outlined below and should be prepared for refuge in their dwelling in the event evacuation cannot be carried out due to rapid onset of flood waters. In this instance, the onset of flooding could be fast. Further guidance on preparing flood plans can be found here: https://www.westsussex.gov.uk/media/2184/guide_to_flooding.pdf
- Upon receipt of a flood alert, residents should consider the need to install flood barriers on the ground floor entrance, and be prepared for evacuation. If you have an alternative place of residence that you can safely relocate to, you may wish to do so. Alternatively you should remain in your property and monitor local media outlets for more information.
- If residents hear through local media outlets (e.g. local TV/Radio stations) that they should evacuate their property, this should be undertaken only to the advice of the emergency services and/or or the under the instruction of the emergency planner.
- In general, residents should evacuate to the north, away from the coastline to a local emergency centre designated by the emergency services/local Emergency Planning Officer at the time.
- Occupants should, if safe to do so, isolate all gas, electricity and water supplies to the site before they evacuate.
- Under no circumstances should residents evacuate towards the coastline to the south or east as flood waters will emanate from this point.

Flood Risk Assessment & Drainage Strategy

Redevelopment of Upper Floors - 31-35 Montague Street, Worthing, BN11 3BE

- If flood waters have progressed on to the site all occupants should not progress through the potentially dangerous flood waters. Instead they should take refuge within the building on the upper floors.
- If taking refuge all occupants should remain in contact with the emergency services by phone and cooperate with any instructions issued by the police or other emergency services. As long as residents make themselves known to the emergency services they will be rescued.
- Occupants should not turn services such as gas supply back on again until the service provider confirms it is safe to do so.

5.9.3 Flood Kit

In the event of an evacuation all residents should have a pre-prepared Flood Kit when the Environment Agency's warnings reach 'Flood Alert'. This could include the following:

- A copy of the Flood Response Plan
- Passports
- Insurance policies
- Toiletries
- Asthma and respiratory aids
- Home and car keys
- Change of clothes
- Supplies for babies and small children
- First aid kit
- Mobile phone and charger together with phone numbers for the emergency services and the EA Floodline
- Prescribed medication
- Driving licenses
- Mobility aids
- Warm clothing
- Pet supplies

As well as this all residents should be prepared for a period of refuge and therefore should keep the following property:

- A copy of the Flood Risk Response Plan
- Non-perishable food to last for 48 hours (and suitable can opener)
- Drinking water to last 48 hours
- Gas stove
- Battery/wind-up torch and radio
- Spare batteries
- Candles and matches
- First aid kit

All residents should keep the Flood Response Plan together with their Flood Kit and emergency supplies on the upper floors.

5.10 Climate Change

Climate change has important implications for the assessment of flood risk. The NPPF requires that the effect of climate change is considered when assessing flood risk posed to development.

Climate change has the potential to affect all sources of flooding. The likely impacts of climate change relevant to the scheme could include increased severity and frequency of storms, wetter winters leading to higher groundwater levels, increased rainfall intensity, increased waves and tide levels due to more intense weather systems, and an increase in the frequency of sewer flooding incidents.

The EA product 4 data includes design flood levels for 2070 and 2115 which allow for climate change, but it is noted that the values do not allow for overtopping, so it is not possible to make a direct comparison between these and the present day levels. Furthermore, it is assumed that the flood defences will be improved.

In order to ensure that there is a suitable freeboard to which will also account for climate change, a 600mm demountable flood barrier will be provided, and flood resilient design will be incorporated to at least 1m above the FFL. Furthermore, given that there is no habitable accommodation on the ground floor, this is deemed to be an acceptable approach and has been discussed with the Flood risk team responsible for Adur and Worthing Borough Councils.

In addition, to accommodate for climate change, site drainage will be designed to accommodate for a 40% increase in rainfall intensity in line with the latest UK Government guidance (dated December 2019).

The future monitoring of local flood risk studies by site management (including SFRA and LFRMS) for any changes in flood risk status will increase knowledge over flood depths and help to manage as far as possible the increased risks from climate change.

6.0 CONCLUSIONS AND RECOMMENDATIONS

A flood risk assessment (including drainage assessment) has been undertaken for the proposed development. Flood risks have been identified in the local area based on an initial desktop assessment, and recommendations have been made for a number of mitigation measures to be incorporated at the next stage of design and throughout the operation of the site as set out in Table 5.2.

A number of residual risks have been identified, associated with breach/overtopping of the Worthing Coastal defences, flooding from blockage/surcharge of public sewers and site drainage, burst water supply pipes, groundwater and intense rainfall, and appropriate mitigation measures have been provided in Table 5.2 to address and manage the residual risk from these forms of flooding.

Flood resilient and resistant design and preparation and implementation of a flood warning and flood response plan have been recommended to manage residual risks to site users and property in the event of overtopping and/or the breach in the coastal defences protecting the site.

It should be noted however that the level of residual risk from sewer flooding, and fluvial/tidal flooding (i.e. during overtopping or a breach flood event) will increase over time as a result of climate change and therefore predictions of modelled breach levels may increase which therefore may significantly increase flood depths in the event of a breach scenario. Therefore extreme caution is advised in the event of a breach as flooding may be more excessive and depths of surface water flooding may be deeper than predictions in this report.

Given that opportunity to include SUDS is difficult given the site constraints, the nature of the proposals (conversion with extension mainly at roof level), and the building covering the entire footprint, it has been acknowledged by the engineering team at Adur and Worthing Council that the detailed design will seek to achieve 'no net increase in runoff rates from the site following development', but note that this may not be achievable given the site and project constraints. Raised planters at roof level will be incorporated, with 38m² currently shown, and will function like green roofs. Calculations in Appendix F show that this will partially offset the increased building footprint.

Opportunities to divert any existing surface water runoff from the site that drains to the foul sewer network will also be sought and informed by detailed drainage surveys, and in consultation with Southern Water, at the next stage of design.

Opportunities to further reduce flows should be sought at the next stage of design, though it has been acknowledged by the Flood risk team at Adur and Worthing Council, that this may not be achievable due to site and project constraints.

We recommend that the assessment of residual risks should be reviewed by the design team as the design progresses, and the and as any new flood risk information becomes available, especially in light of the latest SFRA which is shortly to be published. Changes to the level of risk should be incorporated into the scheme design and/or site management procedures during the operation phase and all future residents should be provided with a copy of a flood response plan which should be prepared and agreed with Worthing Borough Council. The flood plan will be considered a live document and should be periodically updated on behalf of residents by the site management company.

APPENDICES

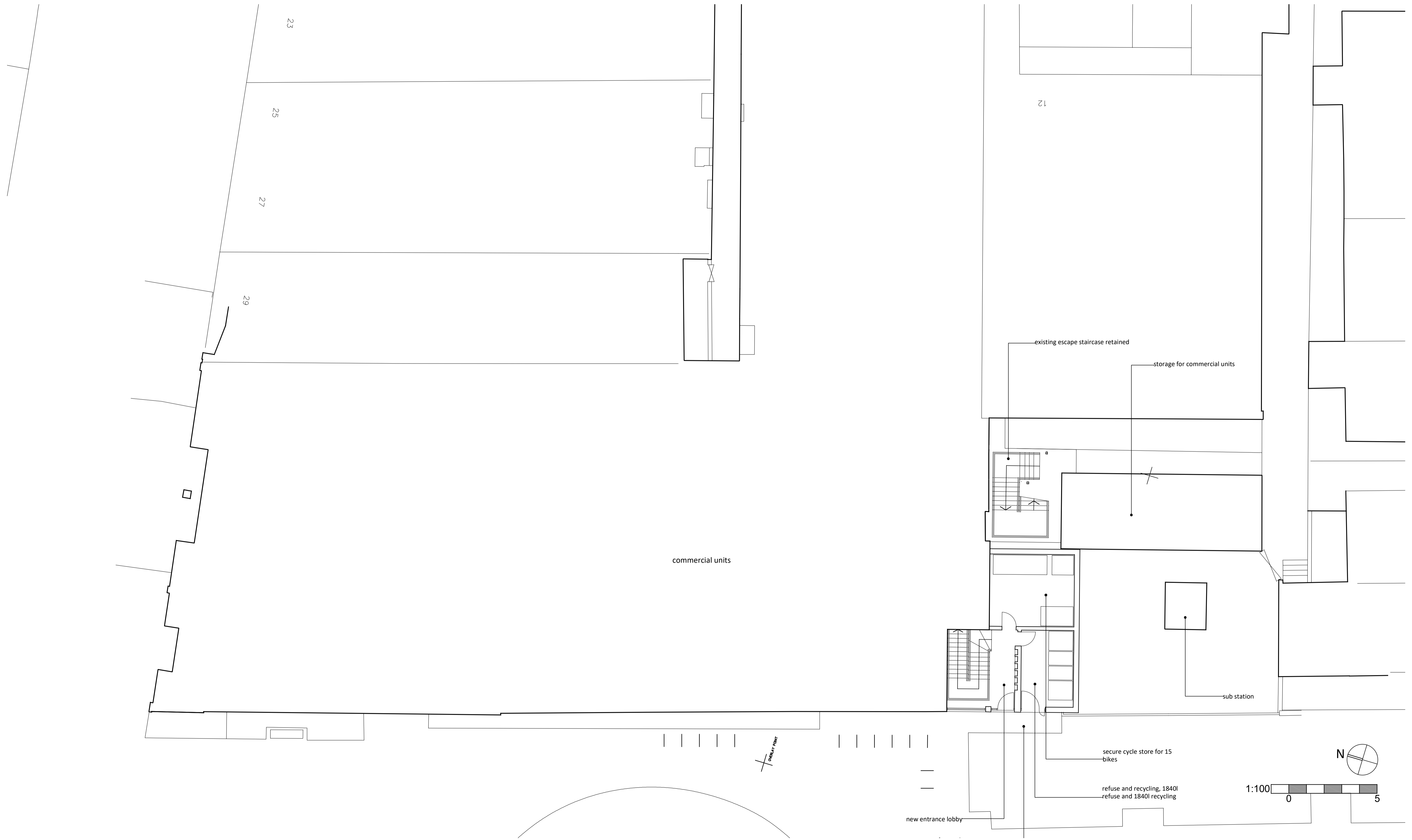
APPENDIX A
Architect Drawings

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Redevelopment of upper floors
31-35 Montague Street
As proposed ground floor/block plan

DRAWING STATUS

Preliminary
For Approval
Information

Tender
Construction
As-Built

Revisions

Project Redevelopment of upper floors
Client Wothing Investments Ltd
Site 31-35 Montague Street
Title As proposed ground floor/block plan
Scale at A1 1:100
Date Jan 2019

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architecture

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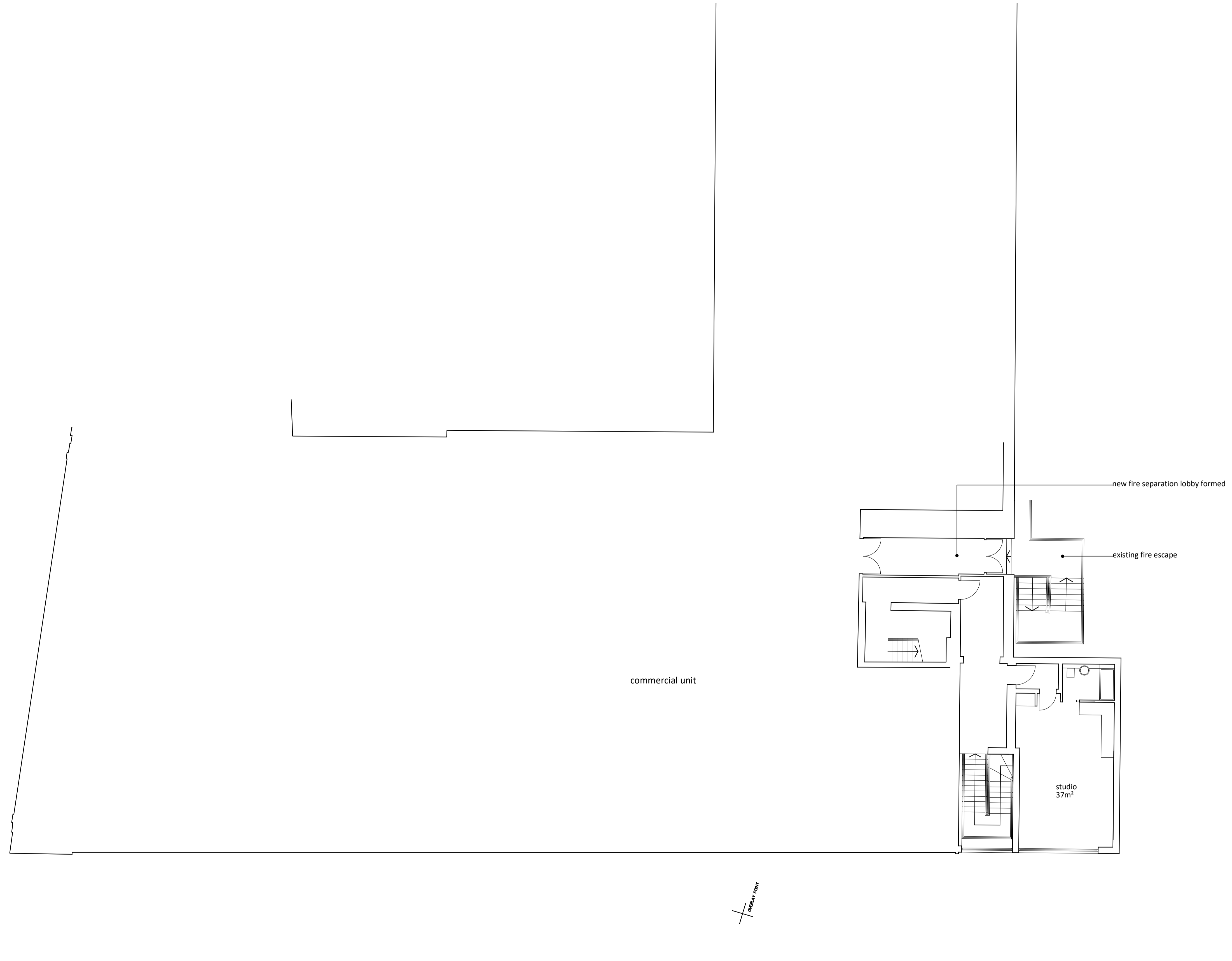
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Space Standards		
Flat no.	Type	GIA
1	studio	37m ²
2	1bed/2person	55m ²
3	2bed/4person	105m ²
4	2bed/4person	88m ²
5	2bed/4person	88m ²
6	3bed/6person	116m ²
7	1bed/2person	51m ²
8	1bed/2person	55m ²
9	1bed/2person	64m ²
10	2bed/4person	81m ²
11	2bed/4person	81m ²
12	2bed/4person	81m ²
13	2bed/4person	73m ²
14	1bed/2person	54m ²

Redevelopment of upper floors
31-35 Montague Street
As proposed first floor

DRAWING STATUS

Preliminary
For Approval
Information

Tender
Construction
As-Built

Revisions

Project

Redevelopment of upper floors
Client: Wothing Investments Ltd
Site: 31-35 Montague Street
Title: As proposed first floor
Scale at A1: 1:100
Date: Jan 2019

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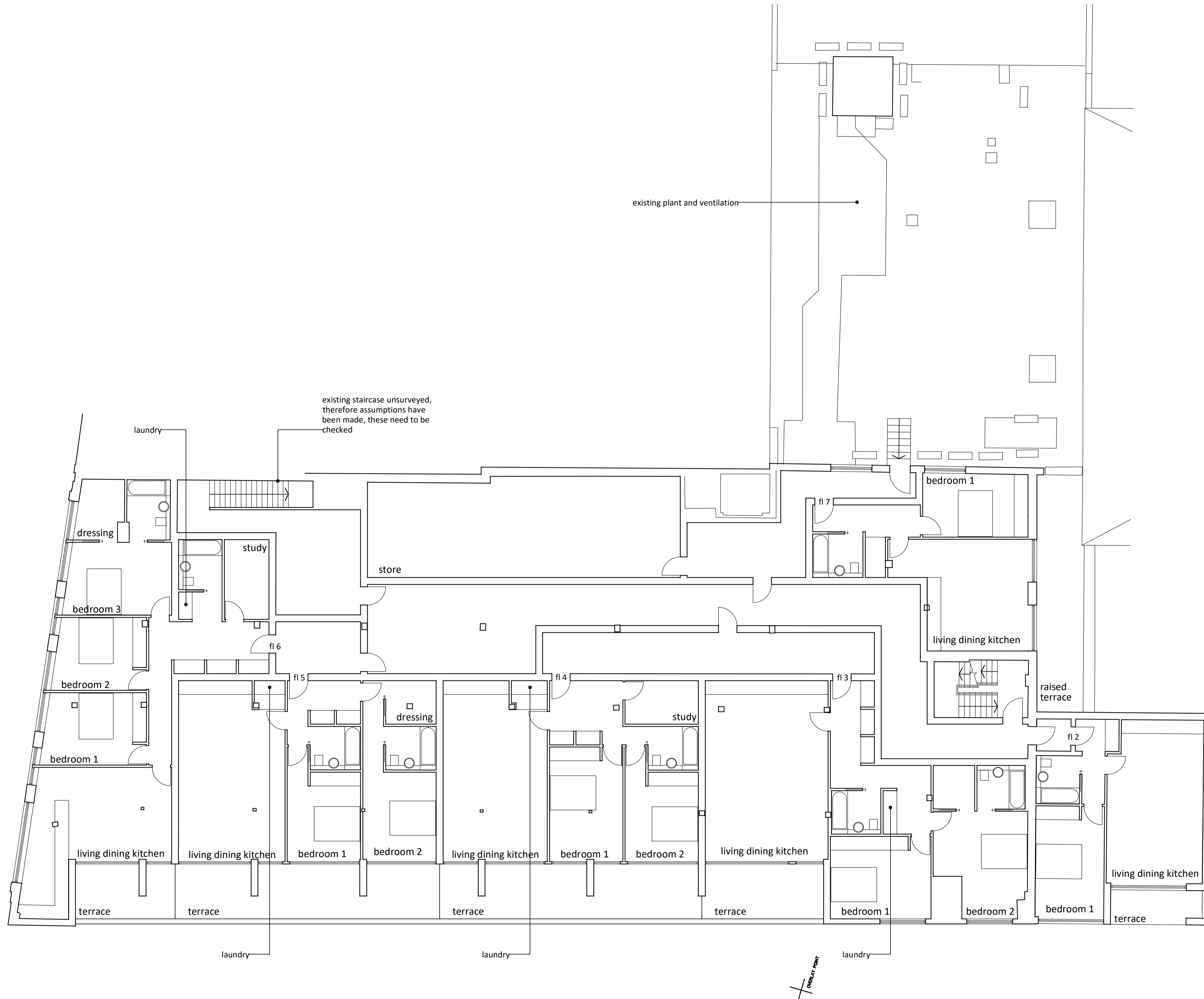
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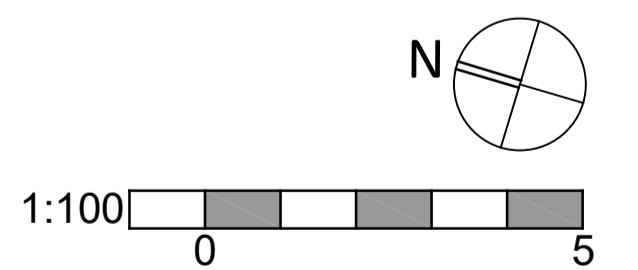
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4	2bed/4person	88m ²
5	2bed/4person	88m ²
6	3bed/6person	116m ²
7	1bed/2person	51m ²
8	1bed/2person	55m ²
9	1bed/2person	64m ²
10	2bed/4person	81m ²
11	2bed/4person	81m ²
12	2bed/4person	81m ²
13	2bed/4person	73m ²
14	1bed/2person	54m ²



Redevelopment of upper floors
31-35 Montague Street
As proposed second floor

DRAWING STATUS

Preliminary
For Approval
Information

Tender
Construction
As-Built

Revisions

Project Redevelopment of upper floors
Client Wothing Investments Ltd
Site 31-35 Montague Street
Title As proposed second floor
Scale at A1 1:100
Date Jan 2019

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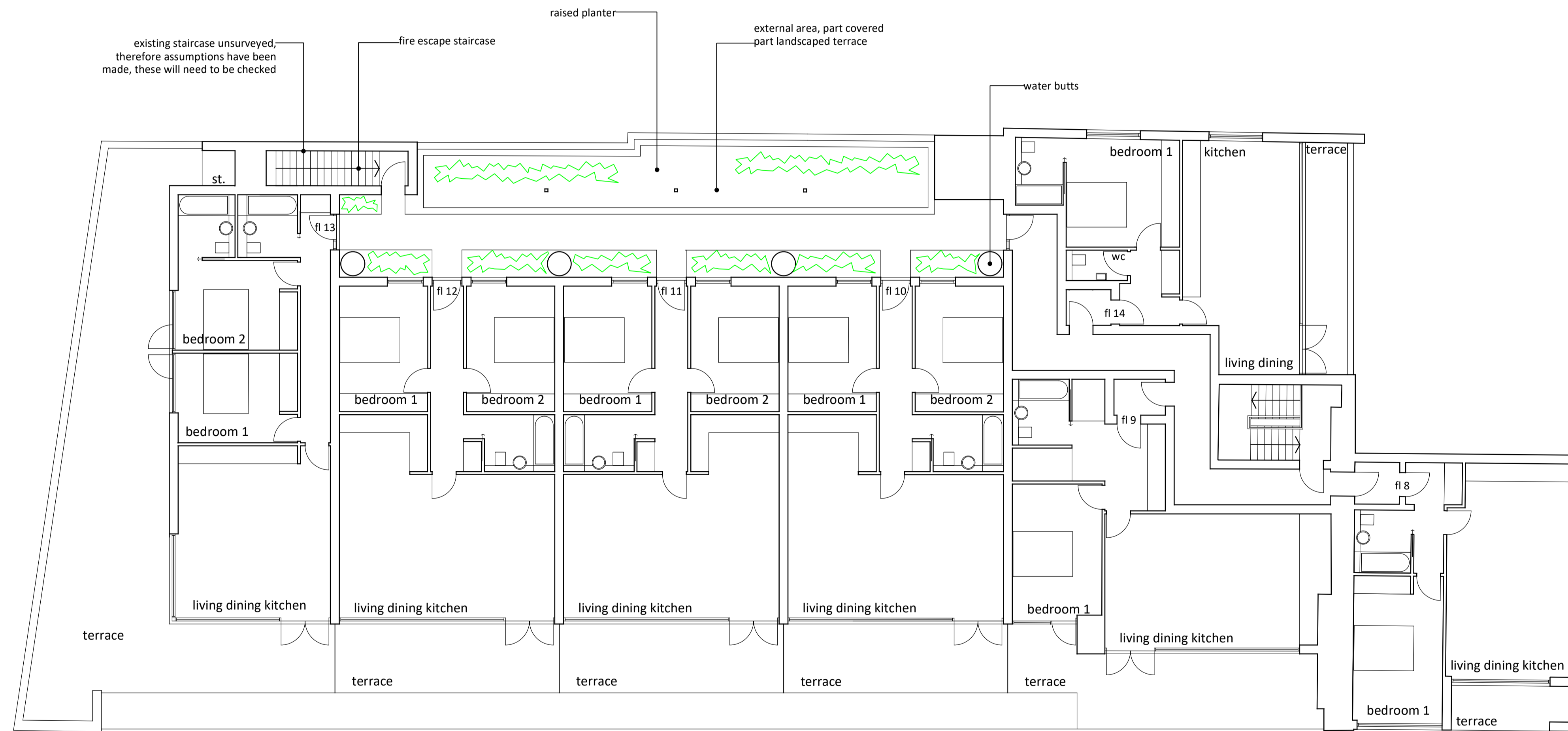
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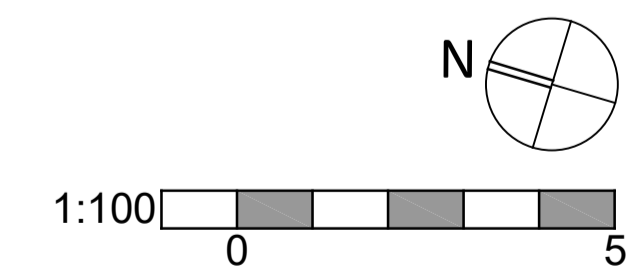
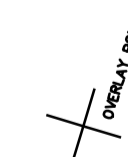
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Space Standards		
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4	2bed/4person	88m ²
5	2bed/4person	88m ²
6	3bed/6person	116m ²
7	1bed/2person	51m ²
8	1bed/2person	55m ²
9	1bed/2person	64m ²
10	2bed/4person	81m ²
11	2bed/4person	81m ²
12	2bed/4person	81m ²
13	2bed/4person	73m ²
14	1bed/2person	54m ²



Redevelopment of upper floors
31-35 Montague Street
As proposed third floor

DRAWING STATUS

Preliminary
For Approval
Information
Tender
Construction
As-Built

Revisions

Project Redevelopment of upper floors
Client Wothing Investments Ltd
Site 31-35 Montague Street
Title As proposed fourth floor
Scale at A1 1:100
Date Jan 2019

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west elevation



east elevation

1:100
0 5

Redevelopment of upper floors
31-35 Montague Street
Elevations 1

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Preliminary
For Approval
Information
Tender
Construction
As-Built

Revisions

Project Redevelopment of upper floors
Client Wothing Investments Ltd
Site 31-35 Montague Street
Title Elevations 1
Scale at A1 1:100
Date Mar 20

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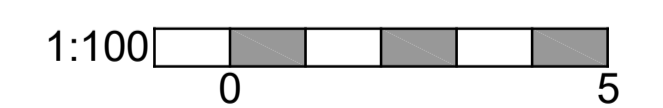
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north elevation



sectional south elevation elevation



Redevelopment of upper floors
31-35 Montague Street
Elevations 2

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Project Redevelopment of upper floors
Client Wothing Investments Ltd
Site 31-35 Montague Street
Title Elevations 2
Scale at A1 1:100
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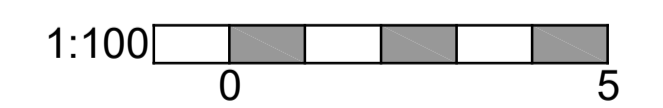
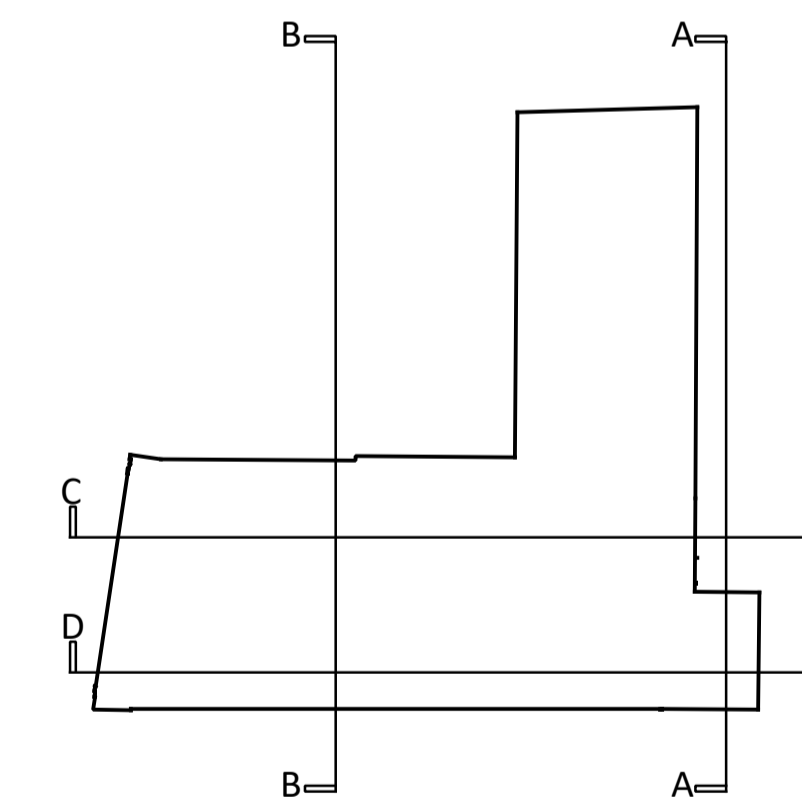
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Redevelopment of upper floors
31-35 Montague Street
Sections 1

DRAWING STATUS

Preliminary
For Approval
Information

Tender
Construction
As-Built

Revisions

Project Redevelopment of upper floors
Client Wothing Investments Ltd
Site 31-35 Montague Street
Title Sections 1
Scale at A1 1:100
Date Mar 20

sub rosa
architecture
Sub Rosa Architecture Ltd
The Studio 52 Pine Avenue Gravesend DA12 1QZ
t: 01474 747707
e: curious@subrosaa.co.uk
DRAWING NUMBER

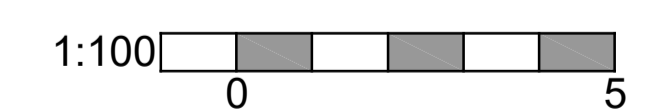
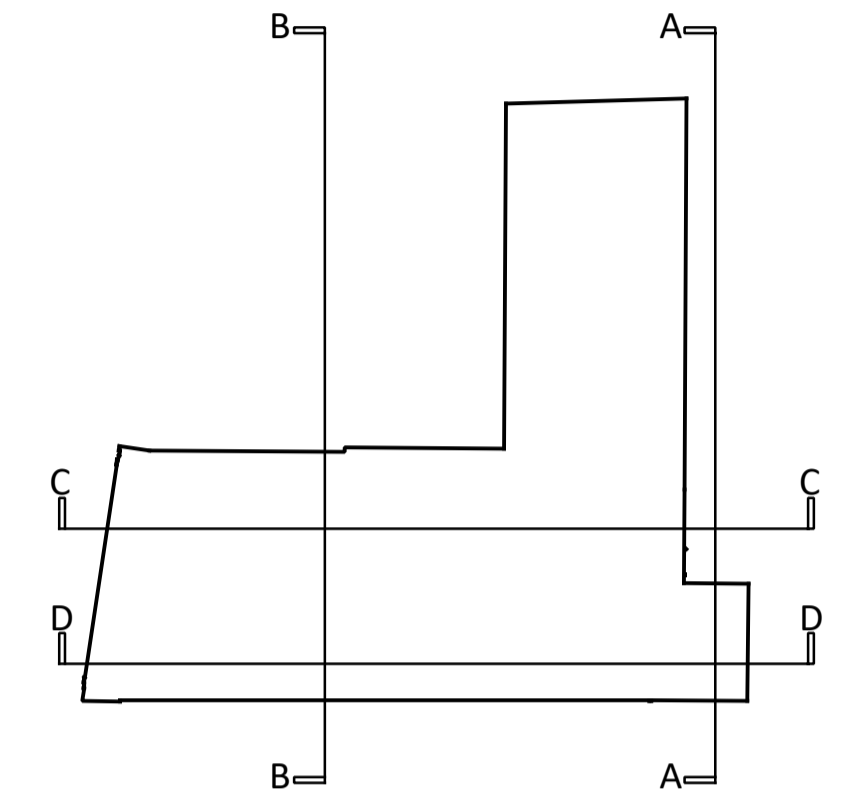
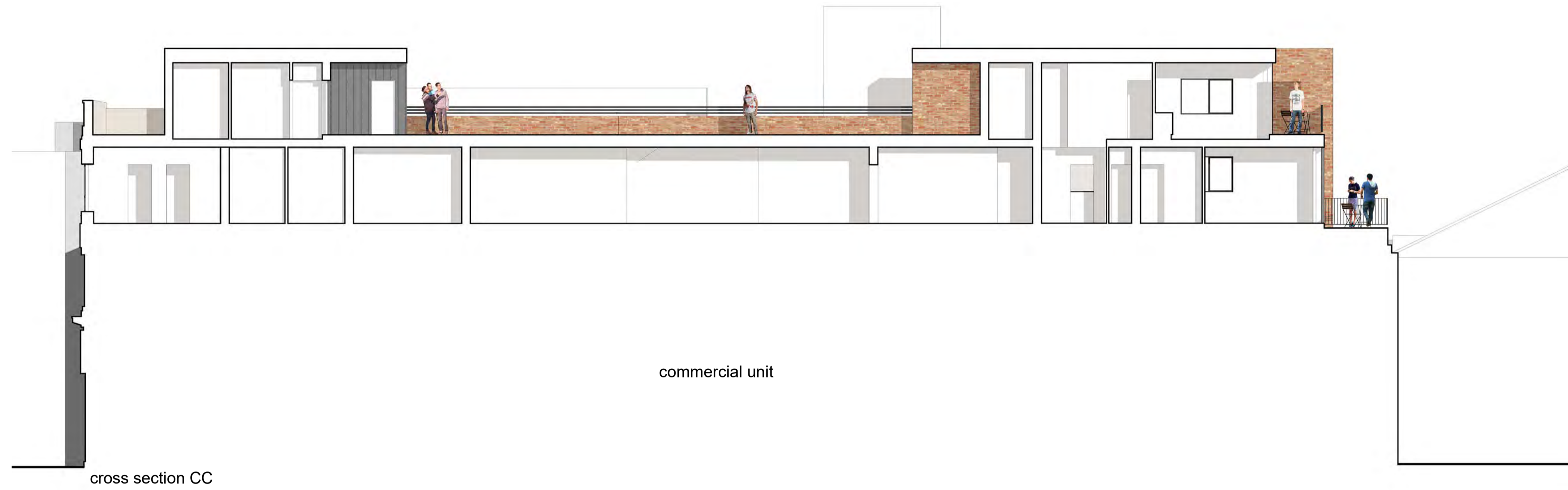
18 - 1338 - 08

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Redevelopment of upper floors
31-35 Montague Street
Section 2

DRAWING STATUS

Preliminary
For Approval
Information

Tender
Construction
As-Built

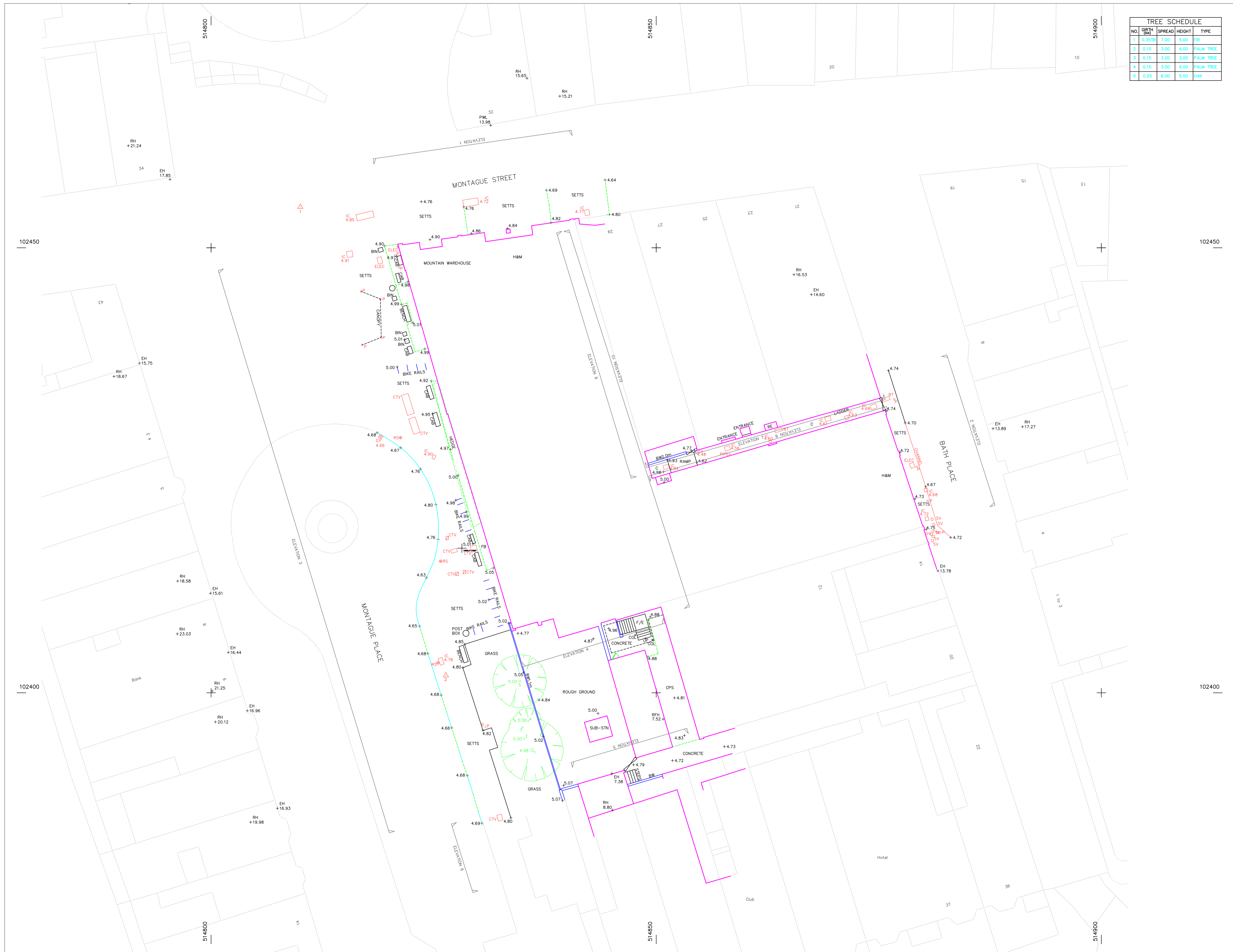
Revisions

Project Redevelopment of upper floors
Client Wothing Investments Ltd
Site 31-35 Montague Street
Title Sections 2
Scale at A1 1:100
Date Jan 2019Mar 20

sub rosa
architecture
Sub Rosa Architecture Ltd
The Studio 52 Pine Avenue Gravesend DA12 1QZ
t: 01474 747707
e: curious@subrosaa.co.uk
DRAWING NUMBER

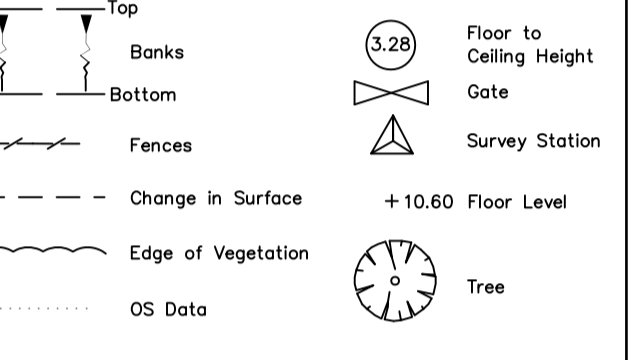
18 - 1338 - 09

APPENDIX B
Topographic Survey



TREE SCHEDULE				
NO.	QRTY (BA)	SPREAD	HEIGHT	TYPE
1	0.35TB	7.00	5.00	FR
2	0.15	3.00	4.00	PALM TREE
3	0.15	3.00	3.00	PALM TREE
4	0.15	3.00	4.00	PALM TREE
5	0.25	6.00	5.00	DAK

ABBREVIATIONS	
ABH Arched Beam Height	KO Kerb Outlet
B Brick	L Light
BAL Balcony	LP Lamp Post
BB Balustrade Beacon	MH Manhole
BD Bollard	MKR Marker
BH Beam Height	MSF Metal Security Fence
BL Bed Level	N/A No Access
BP Brick Pier	OHC Overhead Cables
BRW Brick Retaining Wall	P Post
BS Bus Stop	PALF Palisade Fence
BT British Telecom	PF Picket Fence
BW Brick Wall	PT Trial Pit
BWF Barbed Wire Fence	PL Pavement Light
C Concrete	PM Parking Meter
CAB Cabinet	PRF Post & Rail Fence
CBF Close Boarded Fence	PRF Post & Wire Fence
CBW Concrete Block Wall	R Road Sign
CIF Corrugated Iron Fence	RAD Radiator
CL Cover Level	RE Rodding Eye
CLF Chain Link Fence	RH Ridge Height
COL Column	RS Road Sign
CPF Concrete Panel Fence	RWP Rain Water Pipe
CPS Concrete Paving Slabs	S Stone
CRW Concrete Retaining Wall	SV Stop Valve
CSU Ceiling Slopes Up	SL Skylight
CTV Cable Television	SP Soil Pipe
CW Concrete Wall	SPS Stone Paving Slabs
CZY Crazy Paving	SRW Stone Retaining Wall
D Door	SW Stone Wall
DH Door Height	SWS Surface Water Sewer
EC Electricity Cover	TJ Top of Joist
ESG Electrical Switch Gear	T TILE
EH Eave Height	TB Telephone Box
EP Electricity Pole	TRW Timber Retaining Wall
FB Flower Bed	UJ Underside of Joist
FC False Ceiling	UR Underside of Ridge Board
F/E Fire Escape	UMP Underside of Wall Plate
FH Fire Hydrant	V Vent
FL Floor Level	VP Vent Pipe
GY Gully	W Window
GV Gas Valve	WL Water Level
HA Hatch	WM Water Meter
IC Inspection Cover	WMF Wire Mesh Fence
IL Invert Level	WPF Wooden Panel Fence
IRF Iron Rolling Fence	WCL Window Cill Height
IWF Interwoven Fence	WHL Window Head Height
	WRW Wooden Retaining Wall



STATION CO-ORDINATE TABLE			
Ref.	East	North	Elevation
1	514810.021	102454.578	4.933
2	514826.379	102401.948	4.799

- NOTES**
- ALL LEVELS SHOWN ARE RELATED TO ORDNANCE SURVEY GPS DATUM.
 - TREE TYPES SHOWN ON THIS DRAWING CANNOT BE GUARANTEED AND IF CRITICAL SHOULD BE VERIFIED BY A TREE SPECIALIST. TREE SPREADS ARE AVERAGES UNLESS OTHERWISE INDICATED. TREE HEIGHTS ARE APPROXIMATE.
 - ALTHOUGH CARE HAS BEEN TAKEN, DUE TO ACCESS LIMITATIONS ALL HIGH LEVEL DETAIL HAS BEEN SURVEYED REMOTELY AND NOT CHECKED BY PHYSICAL MEASUREMENTS.
 - ALL CRITICAL MEASUREMENTS MUST BE CHECKED / VERIFIED.
 - ALL CO-ORDINATES SHOWN RELATE TO AN ORDNANCE SURVEY DERIVED GRID.

REVISIONS _____ DATE _____

SCALE: 1:200@A1
 DATE: OCTOBER 2018
 DRAWN: JL / GR
 JOB No: _____

TITLE: **SITE SURVEY**

JOB: **MONTAGUE PLACE, WORTHING**

CLIENT: **WORTHING INVESTMENTS LTD.**

DWG. No: **DAT / 9.1**



BRICKFIELD HOUSE
 HIGH ROAD
 THORNWOOD
 EPPING
 ESSEX
 CM16 6TH

T: 01992 566698
 M: 07977 112286
 M: 07977 111935



APPENDIX C
Water Company Records & Correspondence

From: [PSO West Sussex](#)
To: [Julian Moore](#)
Cc: [SSD Enquiries](#)
Date: 16 April 2020 16:42:03
Attachments: [image006.png](#)
[image008.png](#)
[Levels and Depths Tables_P4_SSD163194_BN11_1BE.pdf](#)

Hi Julian,

I've picked up your request from Chris as she is on leave this week, apologies we haven't got in touch sooner!

I have amended the levels and depths table and added it to this email, it seems there was a couple of errors and you were totally right with the comments you made. I hope that it reads clearer now.

The present day scenario does have an allowance for overtopping, but it is only run for the defended scenario.

I can confirm that if the '-' symbol denotes that there is no flooding at that specific node.

If you have any further queries about this request, please do not hesitate to contact us at psowestsussex@environment-agency.gov.uk.

Kind regards,

Tom Lamboo

FCRM Officer, Partnership & Strategic Overview West Sussex, Solent and South Downs

Environment Agency, Guildbourne House, Chatsworth Road, Worthing, West Sussex, BN11 1LD

From: Julian Moore [mailto:julian@jmenviro.co.uk]
Sent: 16 April 2020 16:16
To: PSO West Sussex <PSOWestSussex@environment-agency.gov.uk>
Cc: SSD Enquiries <SSDEnquiries@environment-agency.gov.uk>
Subject: RE: 200227 SSD163194 action by 18 MARCH - 31-35 Montague Street, Worthing BN11 3BE

Hi Chris,

Please can you advise when you can come back to me on my follow up queries below please. I need to issue my report next week

Kind regards,

Julian

From: Julian Moore
Sent: 06 April 2020 17:02
To: PSO West Sussex <PSOWestSussex@environment-agency.gov.uk>
Cc: SSD Enquiries <SSDEnquiries@environment-agency.gov.uk>
Subject: RE: 200227 SSD163194 action by 18 MARCH - 31-35 Montague Street, Worthing BN11

3BE

Hi Chris,

Thanks for sending this across. Having reviewed the data, I have a number of queries.

The sequence of numbers in Table 2 does not follow the expected pattern (i.e. increasing height over time – you'll see that the 0.5% for 2115 is lower than the 2070 value.

I recall from earlier experience in the area that the present day scenario allowed for overtopping – Is this the case here, or is there an improvement to the Defences taken into account by the model?

Please can you also confirm if the '-' symbol denotes that there is no flooding at the node or whether that scenario has not been modelled

Kind regards,

Julian
07944 999980

From: PSO West Sussex <PSOWestSussex@environment-agency.gov.uk>

Sent: 26 March 2020 16:48

To: Julian Moore <julian@jmenviro.co.uk>

Cc: SSD Enquiries <SSDEnquiries@environment-agency.gov.uk>

Subject: RE: 200227 SSD163194 action by 18 MARCH - 31-35 Montague Street, Worthing BN11 3BE

Hello Julian

I apologise for not attaching the levels and depths information before but please find it attached now.

The values do include an allowance for storm surge.

If you would like information for the crosses you have added, you will need to make a new application quoting the above reference, via our enquiries team. This will be processed as a new request. The maximum nodes we give information on in any one request is ten.

I hope that helps.

Kind regards

Chris Brown

Flood and Coastal Risk Management Officer, Partnerships & Strategic Overview, West Sussex, Environment Agency, Guildbourne House, Chatsworth Road, Worthing, West Sussex, BN11 1LD

Please note that I do not work on a Wednesday

psowestsussex@environment-agency.gov.uk

External: 0208 4748947



cid:image006.png@01D4EBA4.F1038290



From: Julian Moore [<mailto:julian@jmenviro.co.uk>]

Sent: 24 March 2020 10:34

To: PSO West Sussex <PSOWestSussex@environment-agency.gov.uk>

Cc: SSD Enquiries <SSDEnquiries@environment-agency.gov.uk>

Subject: RE: 200227 SSD163194 action by 18 MARCH - 31-35 Montague Street, Worthing BN11 3BE

Dear Chris,

Thanks for sending the data across. I note however that there are no flood levels shown on the mapping or in tables, but that the site is shown to be located within a flood extent.

I assume that the flood level info has been omitted in error?

If it helps, I've marked up a plan showing the nodes I'm particularly interested in, In addition to the notes which you identified (1-3 on the plan below) which I would expect to be dry in any case.

cid:image007.jpg@01D6140D.B2060E40



Assuming you are able to provide flood levels, please can you confirm whether the values includes an allowance for storm surge?

Kind regards,

Julian

Julian Moore
julian@jmenviro.co.uk
07944 999980

JM Enviro Limited
Environmental Consulting
Water, Air & Land
<http://www.jmenviro.co.uk/>

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From: PSO West Sussex <PSOWestSussex@environment-agency.gov.uk>
Sent: 17 March 2020 17:26
To: Julian Moore <julian@jmenviro.co.uk>
Cc: SSD Enquiries <SSDEnquiries@environment-agency.gov.uk>
Subject: RE: 200227 SSD163194 action by 18 MARCH - 31-35 Montague Street, Worthing BN11 3BE

Dear Julian Moore,

Thank you for your Product 4 request for **31-35 Montague Street, Worthing, BN11 1BE**. Please find attached the flood risk data.

For FRA and pre-planning advice please see attached 'FRA Advisory Text' and 'SSD Pre-app advice note September 2019'.

For information on flooding from other sources such as surface water please contact the Lead Local Flood Authority, West Sussex County Council.

The flood risk data provided is based on existing EA hydraulic models for existing 0.5% annual probability events with an allowance for climate change. Please note the climate change allowances provided are not up to date. These were updated on 17 December 2019.

You should refer to '[Flood risk assessments: climate change allowances](#)' for the most up to date allowances. You will need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence.

Guidance on climate change allowances and how to use them in Flood Risk Assessments can be found [here](#).

For future reference, detailed flood information and maps can be viewed using the [Long Term Flood Risk Information](#) service and [Flood Map for Planning](#) service. Flood and Coastal Risk Management asset information, and details of all planned maintenance activities can be viewed using the [Asset](#)

[Management](#) Service.

If you have any further queries about this request, please do not hesitate to contact us at psowestsussex@environment-agency.gov.uk.

Kind regards,

Chris Brown

**FCRM Officer, Partnership & Strategic Overview West Sussex, Solent and South Downs
Environment Agency, Guildbourne House, Chatsworth Road, Worthing, West Sussex, BN11
1LD**



Does Your Proposal Have Environmental Issues or Opportunities?

Speak To Us Early!

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From: Julian Moore [<mailto:julian@jmenviro.co.uk>]

Sent: 25 February 2020 17:08

To: SSD Enquiries <SSDEnquiries@environment-agency.gov.uk>

Subject: 200225 SSD163194 - 31-35 Montague Street, Worthing BN11 3BE

Dear Enquiries team,

Please can you provide me with a product 4 for the above site. Approximate site boundary shown in red.

Julian Moore
JM Enviro Limited

Our ref: SSD163194
Date: 17/03/2020

Dear Julian Moore,

Enquiry Regarding Product 4 for Flood Risk Assessment for 31 – 35 Montague Street, Worthing, West Sussex, BN11 3BE

Thank you for your enquiry which was received on 25 February 2020.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004. The information is attached.

The information on Flood Zones in the area relating to this address is as follows:

The site is in an area located within Flood Zone 3 as shown on our Flood Map for Planning (Rivers and Sea).

Note - This information relates to the area that the above named property is in and is not specific to the property itself as it is influenced by factors such as the height of door steps, air bricks or the height of surrounding walls. We do not have access to this information and is not currently used in our flood modelling.

Flood Zone definitions can be found at www.gov.uk/guidance/flood-risk-and-coastal-change#Table-1-Flood-Zones

Flood Defences

There are flood defences in the form of a sand and shingle beach and groynes. These assets are maintained by Adur and Worthing District Councils.

Model Information

The model used was the Arun to Adur Coastal Modelling which was completed by JBA Consulting in 2012.

Flood History

We hold no record of previous flooding events affecting this site.

Please note our records are not comprehensive and may not include all events. I recommend contacting the Lead Local Flood Authority, **West Sussex County Council** or the Local Authority, **Adur And Worthing District Councils** for a more comprehensive flood history check.

[FRA advisory text](#)

Name	Product 4
Description	Detailed Flood Risk Assessment Map for 31-35 Montague Street, Worthing, West Sussex, BN11 3BE.
Licence	Open Government Licence
Information Warnings	The flood risk data provided is based on existing EA hydraulic models for existing 0.5% annual probability events with an allowance for climate change. Please note the climate change allowances provided are not up to date. These were updated on 17 December 2019. You should refer to ' Flood risk assessments: climate change allowances ' for the most up to date allowances. You will need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence.
Information Warning - OS background mapping	<i>The mapping of features provided as a background in this product is © Ordnance Survey. It is provided to give context to this product. The Open Government Licence does not apply to this background mapping. You are granted a non-exclusive, royalty free, revocable licence solely to view the Licensed Data for non-commercial purposes for the period during which the Environment Agency makes it available. You are not permitted to copy, sub-license, distribute, sell or otherwise make available the Licensed Data to third parties in any form. Third party rights to enforce the terms of this licence shall be reserved to OS.</i>
Attribution	Contains Environment Agency information © Environment Agency and/or database rights. Contains Ordnance Survey data © Crown copyright 2020 Ordnance Survey 100024198.

Data Available Online

Many of our flood datasets are available online:

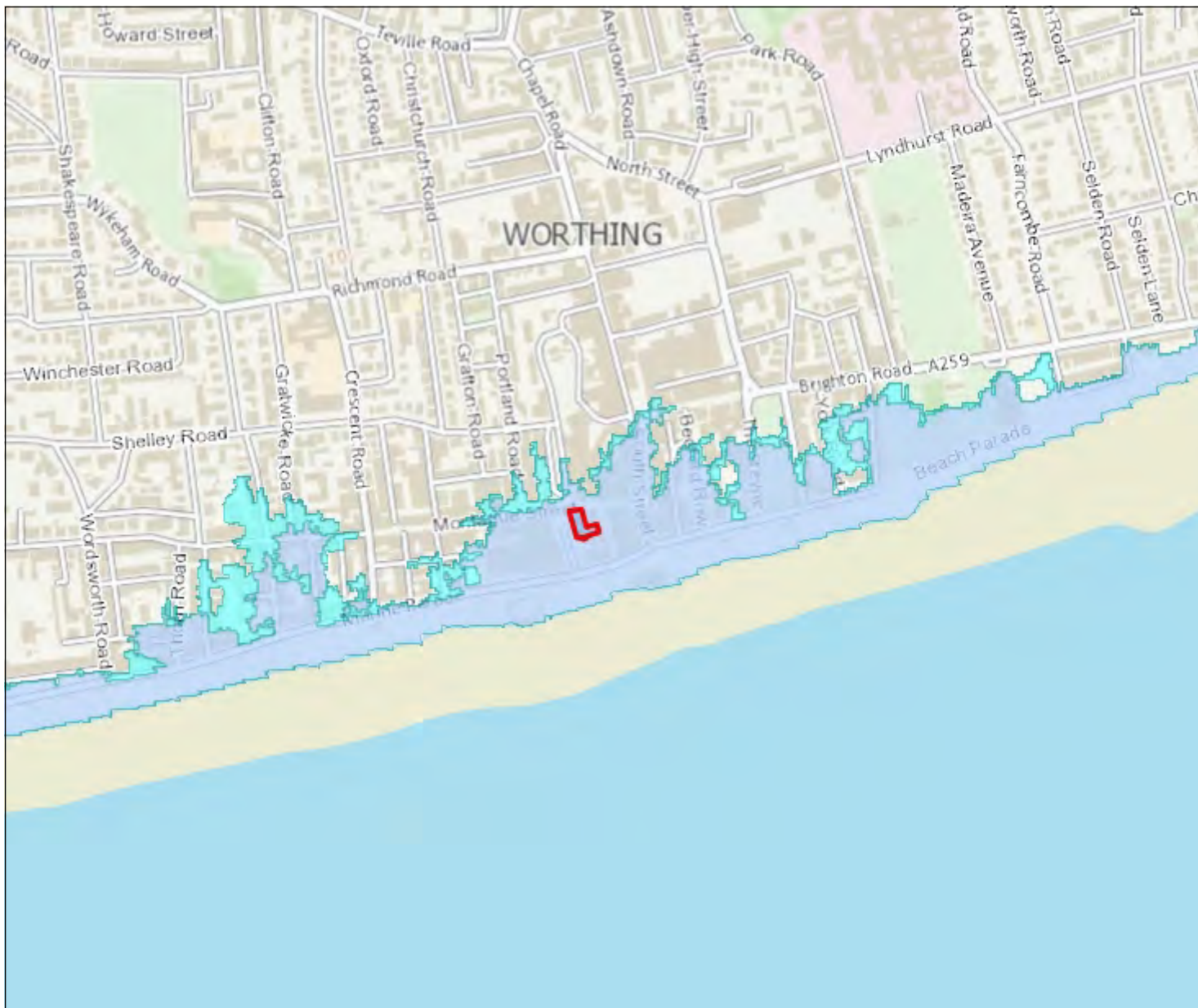
- Flood Map For Planning ([Flood Zone 2](#), [Flood Zone 3](#), [Flood Storage Areas](#), [Flood Defences](#), [Areas Benefiting from Defences](#))
- [Risk of Flooding from Rivers and Sea](#)
- [Historic Flood Map](#)
- [Current Flood Warnings](#)

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Yours sincerely,

Chris Brown
FCRM Officer, Partnership & Strategic Overview West Sussex, Solent and South Downs
Environment Agency, Guildbourne House, Chatsworth Road, Worthing, West Sussex, BN11 1LD

Flood Map for Planning (Rivers and Sea). Centred on BN11 3BE. Created 17-03-2020.



1: 10,000

0 Metres 250



Flood Map for Planning (Rivers & Sea)

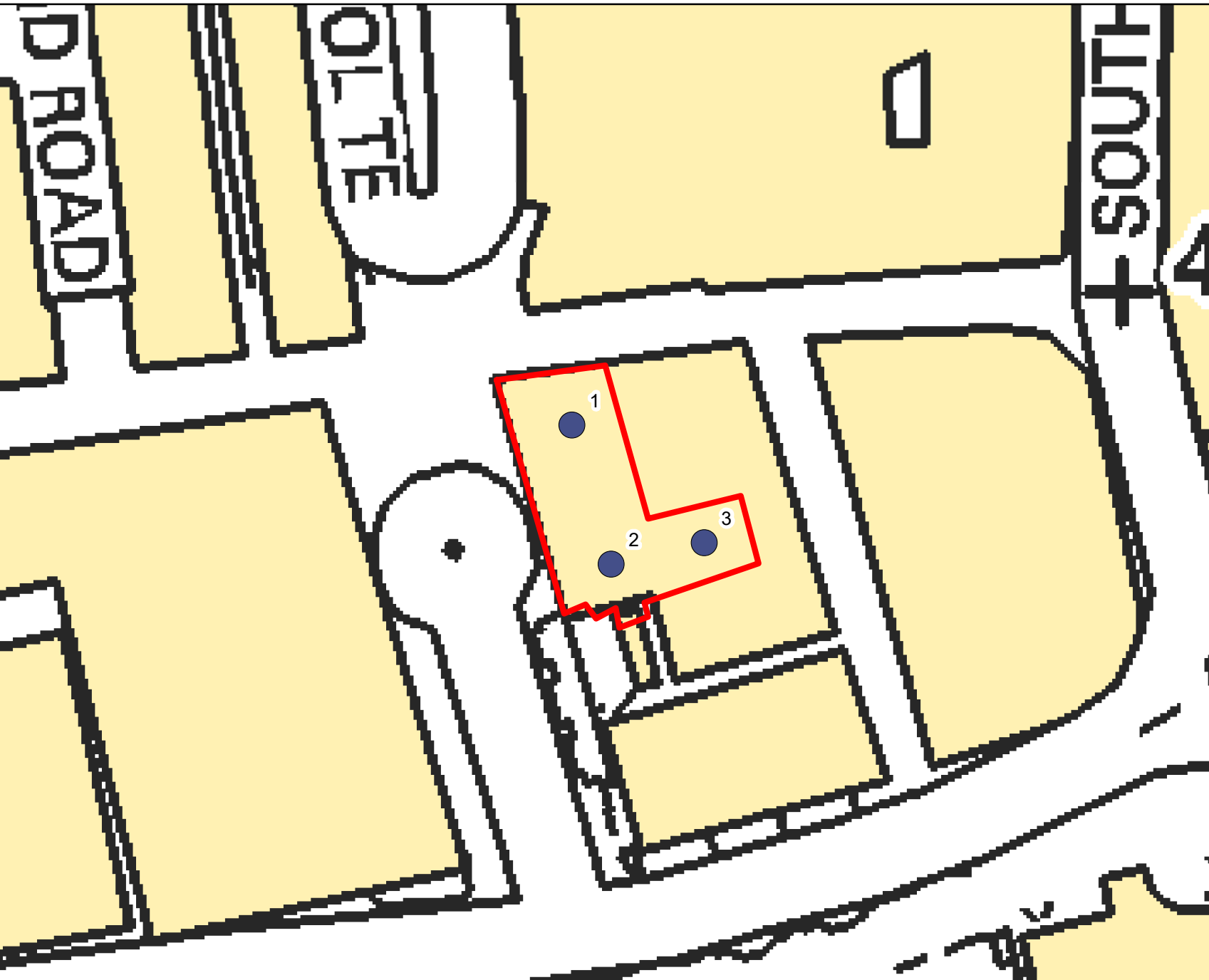
- Defences
- Flood Storage Areas
- Areas benefiting from flood defences
- Flood Zone 3
- Flood Zone 2

Flood Map Areas (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:

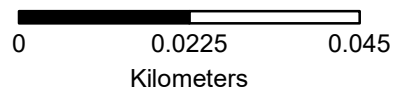
- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.



- Legend**
- Site Nodes
 - Site Boundary

Scale: 1:1,000



Product 4 Flood Risk Data Requested by: JM Enviro Limited

Site: 31-35 Montague Street, Worthing, West Sussex, BN11 3BE

Table 1: Water Levels: Tidal Undefended

Node Ref	NGR		Modelled Flood Levels in Metres AOD			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			0.5%	0.5% (2070)*	0.5% (2115)*	0.1%
1	514835	102442	-	-	5.26	-
2	514842	102416	-	-	5.25	-
3	514860	102420	-	-	5.25	-

Table 2: Water Levels: Tidal Defended

Node Ref	NGR		Modelled Flood Levels in Metres AOD			
	Eastings	Northings	Defended Annual Exceedance Probability			
			0.5%	0.5% (2070)*	0.5% (2115)*	0.1%
1	514835	102442	5.05	5.01	5.21	5.16
2	514842	102416	5.05	5.01	5.21	5.16
3	514860	102420	5.05	5.01	5.21	5.16

Table 3: Water Depths: Tidal Undefended

Node Ref	NGR		Modelled Flood Depths in Metres			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			0.5%	0.5% (2070)*	0.5% (2115)*	0.1%
1	514835	102442	-	-	0.35	-
2	514842	102416	-	-	0.43	-
3	514860	102420	-	-	0.55	-

Table 4: Water Depths: Tidal Defended

Node Ref	NGR		Modelled Flood Depths in Metres			
	Eastings	Northings	Defended Annual Exceedance Probability			
			0.5%	0.5% (2070)*	0.5% (2115)*	0.1%
1	514835	102442	-	0.28	0.28	0.23
2	514842	102416	0.26	0.22	0.42	0.37
3	514860	102420	0.34	0.27	0.50	0.45

All levels taken from: Arun to Adur Coastal Modelling

Produced on: 16/04/2020

*** The flood risk data provided is based on existing EA hydraulic models for existing 0.5% annual probability events with an allowance for climate change. Please note the climate change allowances provided are not up to date. These were updated on 17 December 2019.**

You should refer to ['Flood risk assessments: climate change allowances'](#) for the most up to date allowances. You will need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence.






There is no additional information or health warnings for these levels/depths or the model from which they have been produced.



N

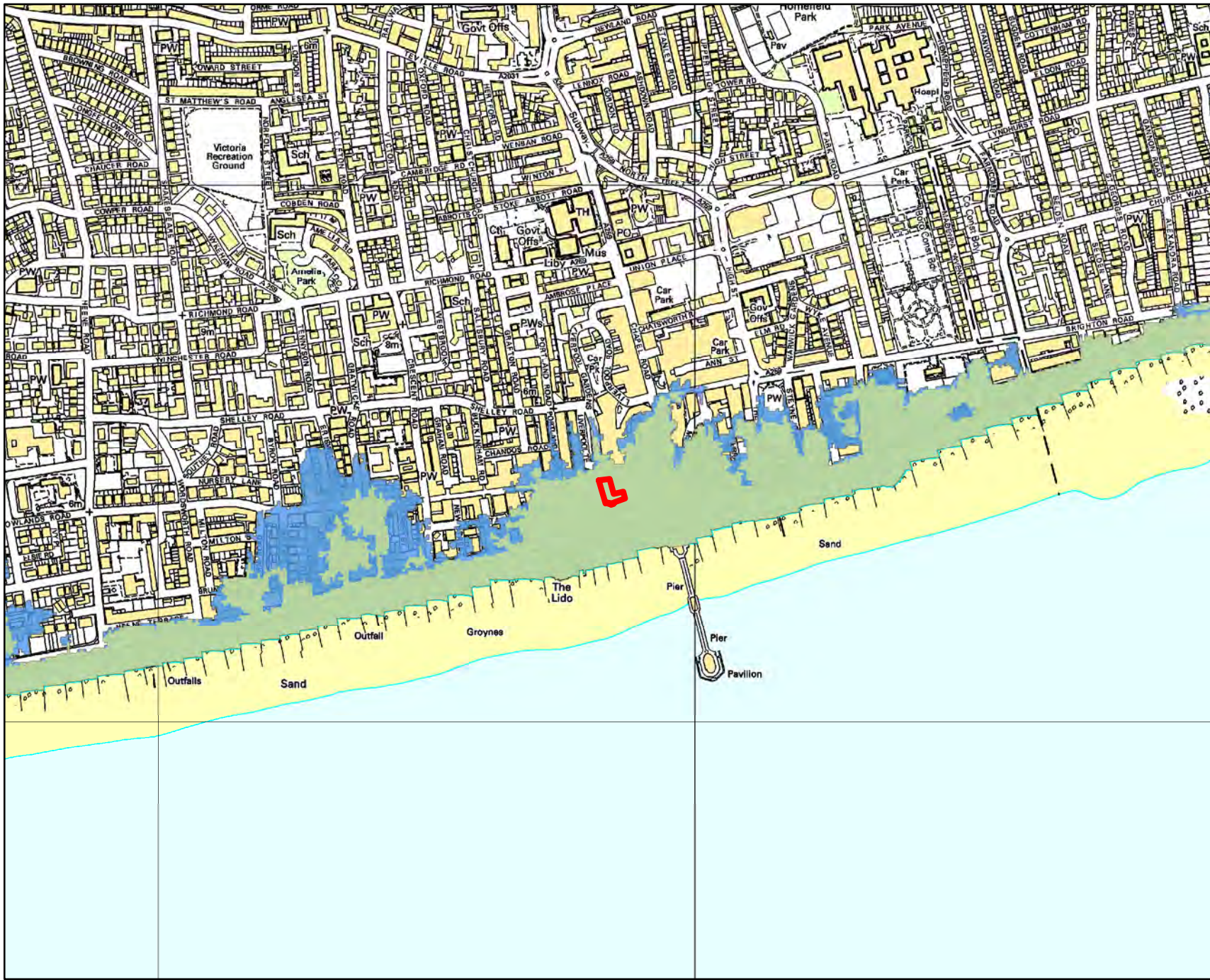
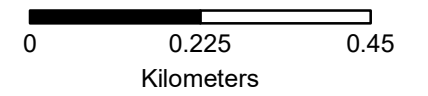


Legend

-  Site Boundary
-  0.5% AEP (2012) (Defended)
-  0.5% AEP (2070) (Defended)
-  0.5% AEP (2115) (Defended)
-  0.1% AEP (2012) (Defended)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:10,000



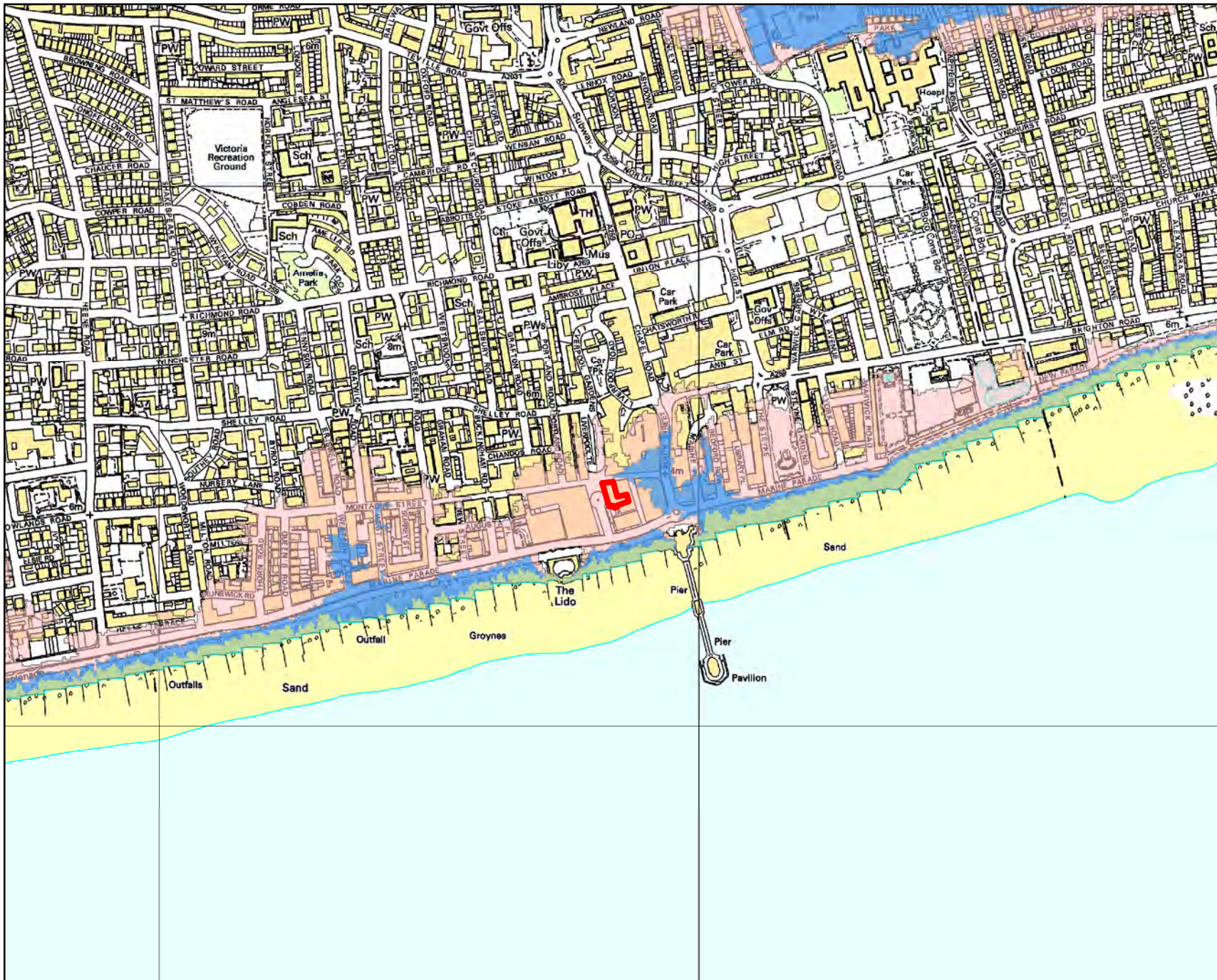
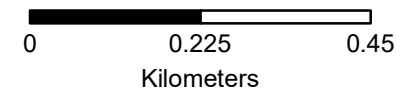


Legend

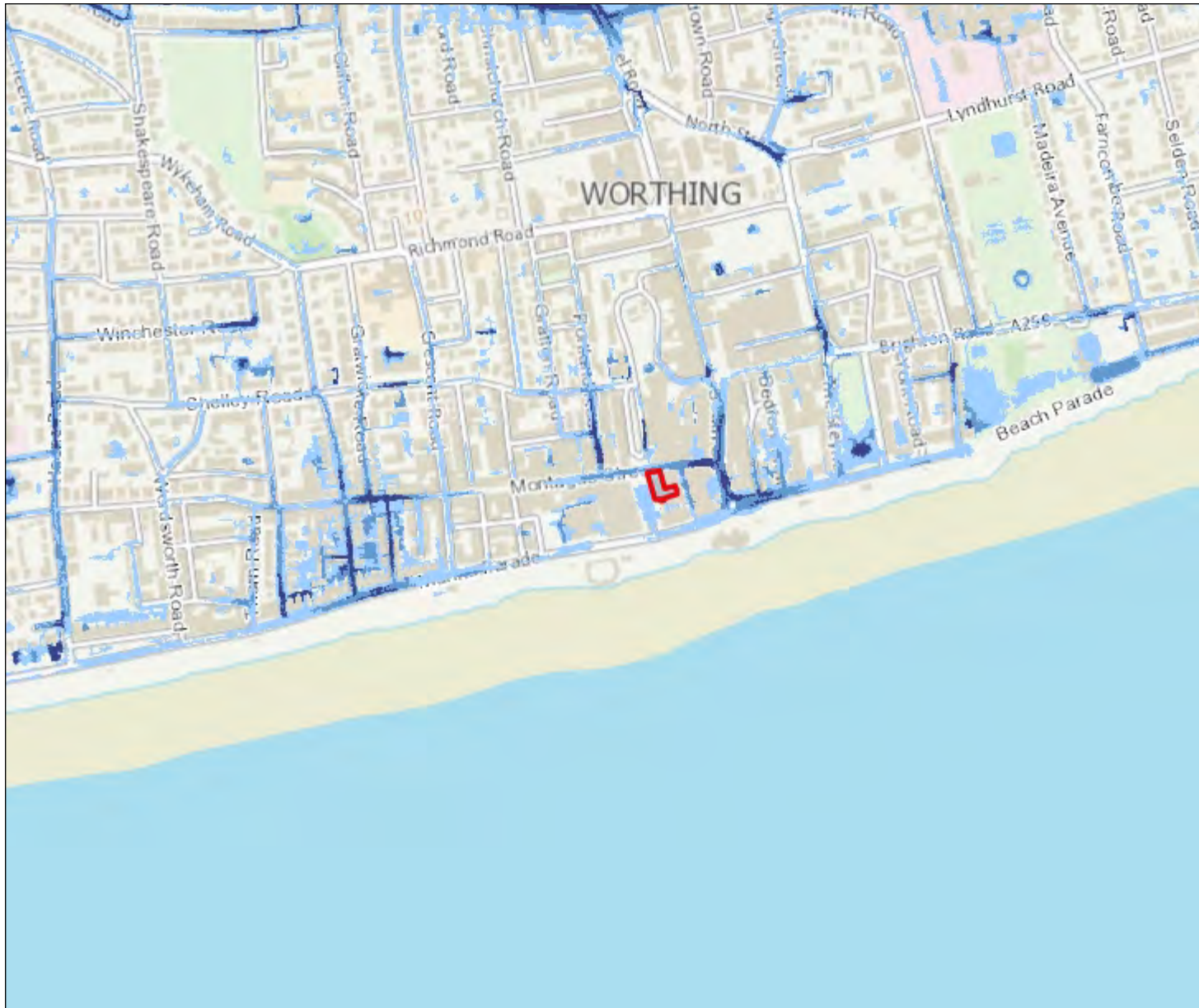
- Site Boundary
- 0.5% AEP (2012) (Undefended)
- 0.5% AEP (2070) (Undefended)
- 0.5% AEP (2115) (Undefended)
- 0.1% AEP (2012) (Undefended)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:10,000



Risk of flooding from Surface Water. Centred on Bn11 3BE. Created 17-03-2020.



1: 10,000

0 Metres 250



Likelihood of flooding from Surface Water

- High ($\geq 3.3\%$)
- Medium (3.3% - 1%)
- Low (1% - 0.1%)
- Very Low

Likelihood of flooding from Surface Water

- High:** Greater than or equal to 3.3% (1 in 30) chance in any given year
- Medium:** Less than 3.3% (1 in 30) but greater than or equal to 1% (1 in 100) chance in any given year
- Low:** Less than 1% (1 in 100) but greater than or equal to 0.1% (1 in 1,000) chance in any given year
- Very Low:** Less than 0.1% (1 in 1,000) chance in any given year

This information is shown on the Risk of Flooding from Surface Water map on GOV.UK.

APPENDIX D
EA Data &
Correspondence

From: [PSO West Sussex](#)
To: [Julian Moore](#)
Cc: [SSD Enquiries](#)
Date: 16 April 2020 16:42:03
Attachments: [image006.png](#)
[image008.png](#)
[Levels and Depths Tables_P4_SSD163194_BN11_1BE.pdf](#)

Hi Julian,

I've picked up your request from Chris as she is on leave this week, apologies we haven't got in touch sooner!

I have amended the levels and depths table and added it to this email, it seems there was a couple of errors and you were totally right with the comments you made. I hope that it reads clearer now.

The present day scenario does have an allowance for overtopping, but it is only run for the defended scenario.

I can confirm that if the '-' symbol denotes that there is no flooding at that specific node.

If you have any further queries about this request, please do not hesitate to contact us at psowestsussex@environment-agency.gov.uk.

Kind regards,

Tom Lamboo

FCRM Officer, Partnership & Strategic Overview West Sussex, Solent and South Downs

Environment Agency, Guildbourne House, Chatsworth Road, Worthing, West Sussex, BN11 1LD

From: Julian Moore [mailto:julian@jmenviro.co.uk]
Sent: 16 April 2020 16:16
To: PSO West Sussex <PSOWestSussex@environment-agency.gov.uk>
Cc: SSD Enquiries <SSDEnquiries@environment-agency.gov.uk>
Subject: RE: 200227 SSD163194 action by 18 MARCH - 31-35 Montague Street, Worthing BN11 3BE

Hi Chris,

Please can you advise when you can come back to me on my follow up queries below please. I need to issue my report next week

Kind regards,

Julian

From: Julian Moore
Sent: 06 April 2020 17:02
To: PSO West Sussex <PSOWestSussex@environment-agency.gov.uk>
Cc: SSD Enquiries <SSDEnquiries@environment-agency.gov.uk>
Subject: RE: 200227 SSD163194 action by 18 MARCH - 31-35 Montague Street, Worthing BN11

3BE

Hi Chris,

Thanks for sending this across. Having reviewed the data, I have a number of queries.

The sequence of numbers in Table 2 does not follow the expected pattern (i.e. increasing height over time – you'll see that the 0.5% for 2115 is lower than the 2070 value.

I recall from earlier experience in the area that the present day scenario allowed for overtopping – Is this the case here, or is there an improvement to the Defences taken into account by the model?

Please can you also confirm if the '-' symbol denotes that there is no flooding at the node or whether that scenario has not been modelled

Kind regards,

Julian
07944 999980

From: PSO West Sussex <PSOWestSussex@environment-agency.gov.uk>

Sent: 26 March 2020 16:48

To: Julian Moore <julian@jmenviro.co.uk>

Cc: SSD Enquiries <SSDEnquiries@environment-agency.gov.uk>

Subject: RE: 200227 SSD163194 action by 18 MARCH - 31-35 Montague Street, Worthing BN11 3BE

Hello Julian

I apologise for not attaching the levels and depths information before but please find it attached now.

The values do include an allowance for storm surge.

If you would like information for the crosses you have added, you will need to make a new application quoting the above reference, via our enquiries team. This will be processed as a new request. The maximum nodes we give information on in any one request is ten.

I hope that helps.

Kind regards

Chris Brown

Flood and Coastal Risk Management Officer, Partnerships & Strategic Overview, West Sussex, Environment Agency, Guildbourne House, Chatsworth Road, Worthing, West Sussex, BN11 1LD

Please note that I do not work on a Wednesday

psowestsussex@environment-agency.gov.uk

External: 0208 4748947



cid:image006.png@01D4EBA4.F1038290



From: Julian Moore [<mailto:julian@jmenviro.co.uk>]

Sent: 24 March 2020 10:34

To: PSO West Sussex <PSOWestSussex@environment-agency.gov.uk>

Cc: SSD Enquiries <SSDEnquiries@environment-agency.gov.uk>

Subject: RE: 200227 SSD163194 action by 18 MARCH - 31-35 Montague Street, Worthing BN11 3BE

Dear Chris,

Thanks for sending the data across. I note however that there are no flood levels shown on the mapping or in tables, but that the site is shown to be located within a flood extent.

I assume that the flood level info has been omitted in error?

If it helps, I've marked up a plan showing the nodes I'm particularly interested in, In addition to the notes which you identified (1-3 on the plan below) which I would expect to be dry in any case.

cid:image007.jpg@01D6140D.B2060E40



Assuming you are able to provide flood levels, please can you confirm whether the values includes an allowance for storm surge?

Kind regards,

Julian

Julian Moore
julian@jmenviro.co.uk
07944 999980

JM Enviro Limited
Environmental Consulting
Water, Air & Land
<http://www.jmenviro.co.uk/>

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From: PSO West Sussex <PSOWestSussex@environment-agency.gov.uk>
Sent: 17 March 2020 17:26
To: Julian Moore <julian@jmenviro.co.uk>
Cc: SSD Enquiries <SSDEnquiries@environment-agency.gov.uk>
Subject: RE: 200227 SSD163194 action by 18 MARCH - 31-35 Montague Street, Worthing BN11 3BE

Dear Julian Moore,

Thank you for your Product 4 request for **31-35 Montague Street, Worthing, BN11 1BE**. Please find attached the flood risk data.

For FRA and pre-planning advice please see attached 'FRA Advisory Text' and 'SSD Pre-app advice note September 2019'.

For information on flooding from other sources such as surface water please contact the Lead Local Flood Authority, West Sussex County Council.

The flood risk data provided is based on existing EA hydraulic models for existing 0.5% annual probability events with an allowance for climate change. Please note the climate change allowances provided are not up to date. These were updated on 17 December 2019.

You should refer to '[Flood risk assessments: climate change allowances](#)' for the most up to date allowances. You will need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence.

Guidance on climate change allowances and how to use them in Flood Risk Assessments can be found [here](#).

For future reference, detailed flood information and maps can be viewed using the [Long Term Flood Risk Information](#) service and [Flood Map for Planning](#) service. Flood and Coastal Risk Management asset information, and details of all planned maintenance activities can be viewed using the [Asset](#)

[Management](#) Service.

If you have any further queries about this request, please do not hesitate to contact us at psowestsussex@environment-agency.gov.uk.

Kind regards,

Chris Brown

**FCRM Officer, Partnership & Strategic Overview West Sussex, Solent and South Downs
Environment Agency, Guildbourne House, Chatsworth Road, Worthing, West Sussex, BN11
1LD**



Does Your Proposal Have Environmental Issues or Opportunities? Speak To Us Early!

If you are planning a new project or development, we want to work with you to make the process as smooth as possible. Early engagement can improve subsequent planning applications to you and your clients' benefit and deliver environmental outcomes. For a cost recovery fee of £100 per hour plus VAT we will provide you with a project manager who will coordinate all meetings and reviews in order to give you detailed specialist advice with guaranteed delivery dates. More information can be found on our website [here](#).

From: Julian Moore [<mailto:julian@jmenviro.co.uk>]

Sent: 25 February 2020 17:08

To: SSD Enquiries <SSDEnquiries@environment-agency.gov.uk>

Subject: 200225 SSD163194 - 31-35 Montague Street, Worthing BN11 3BE

Dear Enquiries team,

Please can you provide me with a product 4 for the above site. Approximate site boundary shown in red.

Julian Moore
JM Enviro Limited

Our ref: SSD163194
Date: 17/03/2020

Dear Julian Moore,

Enquiry Regarding Product 4 for Flood Risk Assessment for 31 – 35 Montague Street, Worthing, West Sussex, BN11 3BE

Thank you for your enquiry which was received on 25 February 2020.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004. The information is attached.

The information on Flood Zones in the area relating to this address is as follows:

The site is in an area located within Flood Zone 3 as shown on our Flood Map for Planning (Rivers and Sea).

Note - This information relates to the area that the above named property is in and is not specific to the property itself as it is influenced by factors such as the height of door steps, air bricks or the height of surrounding walls. We do not have access to this information and is not currently used in our flood modelling.

Flood Zone definitions can be found at www.gov.uk/guidance/flood-risk-and-coastal-change#Table-1-Flood-Zones

Flood Defences

There are flood defences in the form of a sand and shingle beach and groynes. These assets are maintained by Adur and Worthing District Councils.

Model Information

The model used was the Arun to Adur Coastal Modelling which was completed by JBA Consulting in 2012.

Flood History

We hold no record of previous flooding events affecting this site.

Please note our records are not comprehensive and may not include all events. I recommend contacting the Lead Local Flood Authority, **West Sussex County Council** or the Local Authority, **Adur And Worthing District Councils** for a more comprehensive flood history check.

[FRA advisory text](#)

Name	Product 4
Description	Detailed Flood Risk Assessment Map for 31-35 Montague Street, Worthing, West Sussex, BN11 3BE.
Licence	Open Government Licence
Information Warnings	The flood risk data provided is based on existing EA hydraulic models for existing 0.5% annual probability events with an allowance for climate change. Please note the climate change allowances provided are not up to date. These were updated on 17 December 2019. You should refer to ' Flood risk assessments: climate change allowances ' for the most up to date allowances. You will need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence.
Information Warning - OS background mapping	<i>The mapping of features provided as a background in this product is © Ordnance Survey. It is provided to give context to this product. The Open Government Licence does not apply to this background mapping. You are granted a non-exclusive, royalty free, revocable licence solely to view the Licensed Data for non-commercial purposes for the period during which the Environment Agency makes it available. You are not permitted to copy, sub-license, distribute, sell or otherwise make available the Licensed Data to third parties in any form. Third party rights to enforce the terms of this licence shall be reserved to OS.</i>
Attribution	Contains Environment Agency information © Environment Agency and/or database rights. Contains Ordnance Survey data © Crown copyright 2020 Ordnance Survey 100024198.

Data Available Online

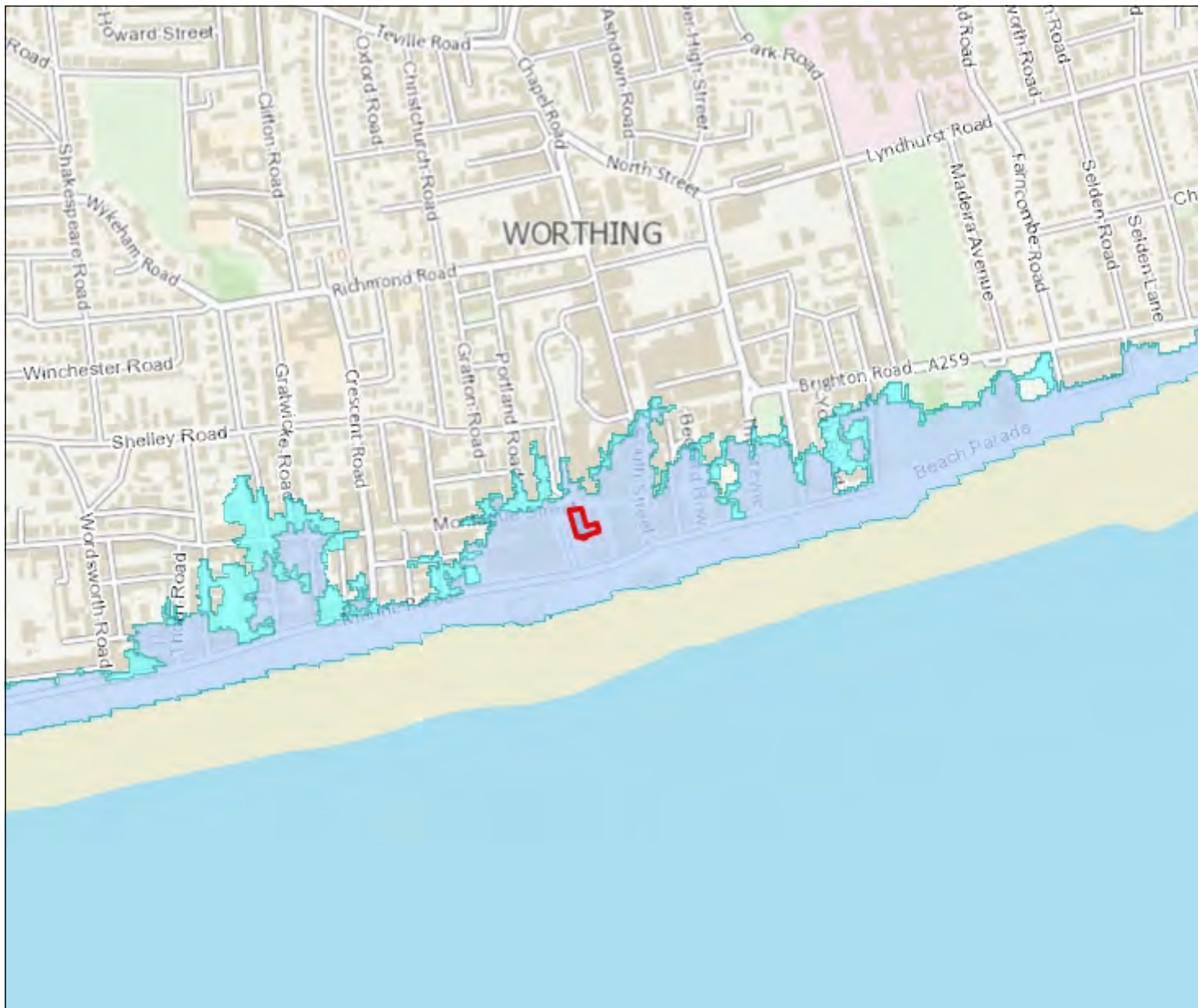
Many of our flood datasets are available online:

- Flood Map For Planning ([Flood Zone 2](#), [Flood Zone 3](#), [Flood Storage Areas](#), [Flood Defences](#), [Areas Benefiting from Defences](#))
- [Risk of Flooding from Rivers and Sea](#)
- [Historic Flood Map](#)
- [Current Flood Warnings](#)

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Yours sincerely,

Flood Map for Planning (Rivers and Sea). Centred on BN11 3BE. Created 17-03-2020.



1: 10,000

0 Metres 250



Flood Map for Planning (Rivers & Sea)

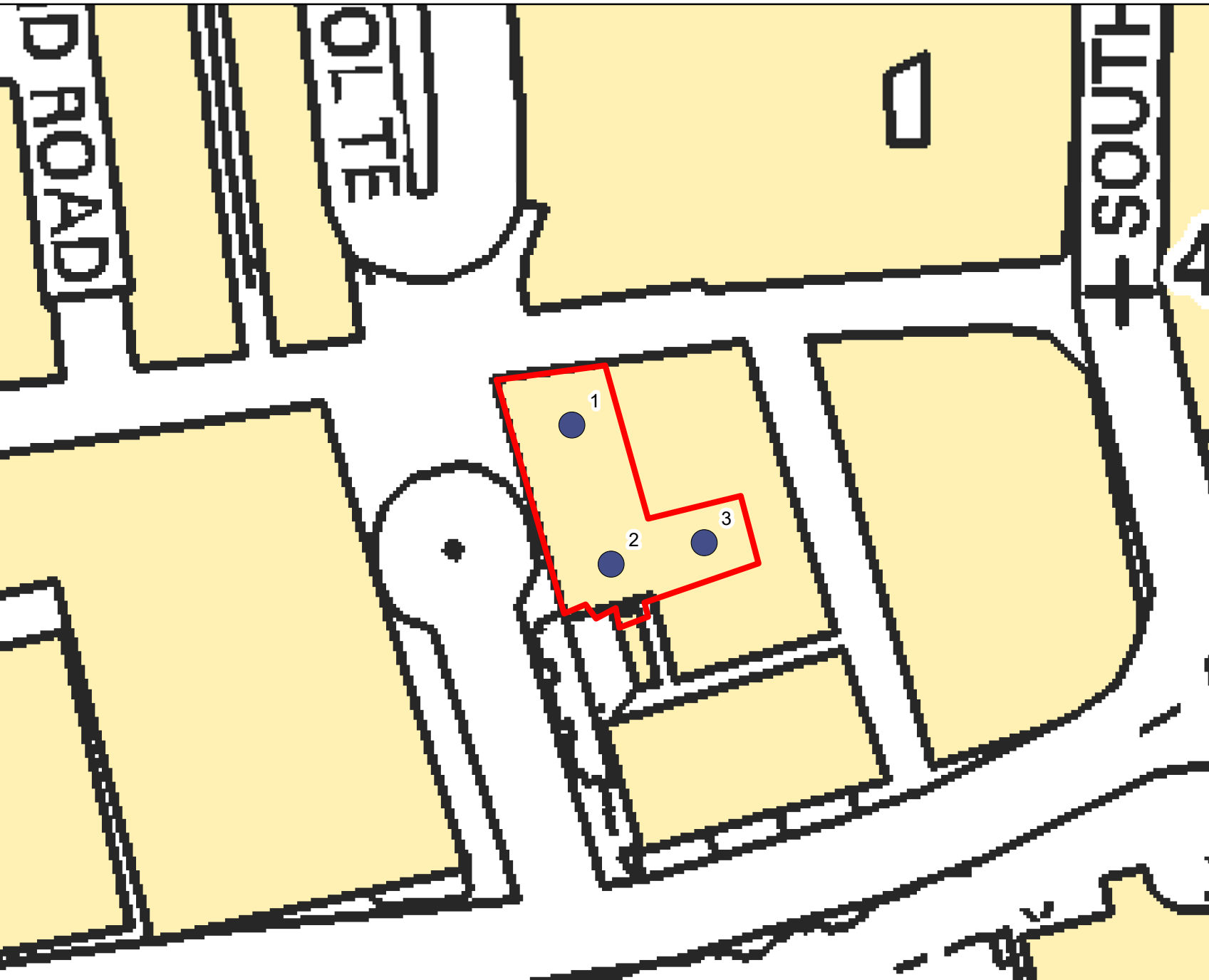
- Defences
- Flood Storage Areas
- Areas benefiting from flood defences
- Flood Zone 3
- Flood Zone 2

Flood Map Areas (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:

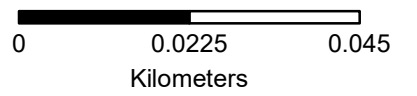
- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.



- Legend**
- Site Nodes
 - Site Boundary

Scale: 1:1,000



Product 4 Flood Risk Data Requested by: JM Enviro Limited

Site: 31-35 Montague Street, Worthing, West Sussex, BN11 3BE

Table 1: Water Levels: Tidal Undefended

Node Ref	NGR		Modelled Flood Levels in Metres AOD			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			0.5%	0.5% (2070)*	0.5% (2115)*	0.1%
1	514835	102442	-	-	5.26	-
2	514842	102416	-	-	5.25	-
3	514860	102420	-	-	5.25	-

Table 2: Water Levels: Tidal Defended

Node Ref	NGR		Modelled Flood Levels in Metres AOD			
	Eastings	Northings	Defended Annual Exceedance Probability			
			0.5%	0.5% (2070)*	0.5% (2115)*	0.1%
1	514835	102442	5.05	5.01	5.21	5.16
2	514842	102416	5.05	5.01	5.21	5.16
3	514860	102420	5.05	5.01	5.21	5.16

Table 3: Water Depths: Tidal Undefended

Node Ref	NGR		Modelled Flood Depths in Metres			
	Eastings	Northings	Undefended Annual Exceedance Probability			
			0.5%	0.5% (2070)*	0.5% (2115)*	0.1%
1	514835	102442	-	-	0.35	-
2	514842	102416	-	-	0.43	-
3	514860	102420	-	-	0.55	-

Table 4: Water Depths: Tidal Defended

Node Ref	NGR		Modelled Flood Depths in Metres			
	Eastings	Northings	Defended Annual Exceedance Probability			
			0.5%	0.5% (2070)*	0.5% (2115)*	0.1%
1	514835	102442	-	0.28	0.28	0.23
2	514842	102416	0.26	0.22	0.42	0.37
3	514860	102420	0.34	0.27	0.50	0.45

All levels taken from: Arun to Adur Coastal Modelling

Produced on: 16/04/2020






*** The flood risk data provided is based on existing EA hydraulic models for existing 0.5% annual probability events with an allowance for climate change. Please note the climate change allowances provided are not up to date. These were updated on 17 December 2019.**

You should refer to ['Flood risk assessments: climate change allowances'](#) for the most up to date allowances. You will need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence.

There is no additional information or health warnings for these levels/depths or the model from which they have been produced.

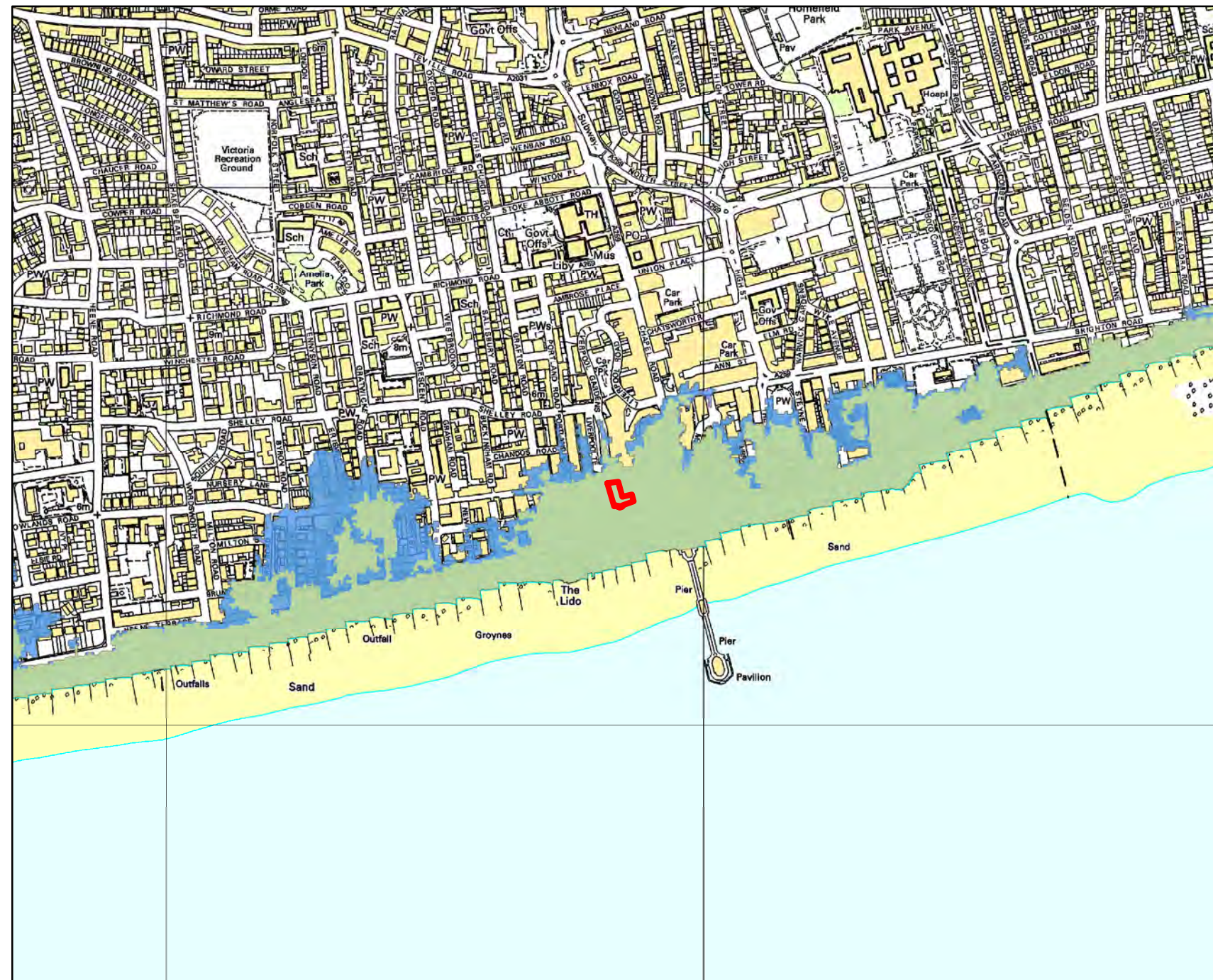
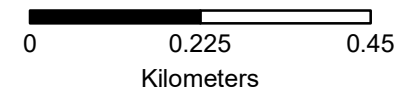


Legend

-  Site Boundary
-  0.5% AEP (2012) (Defended)
-  0.5% AEP (2070) (Defended)
-  0.5% AEP (2115) (Defended)
-  0.1% AEP (2012) (Defended)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:10,000



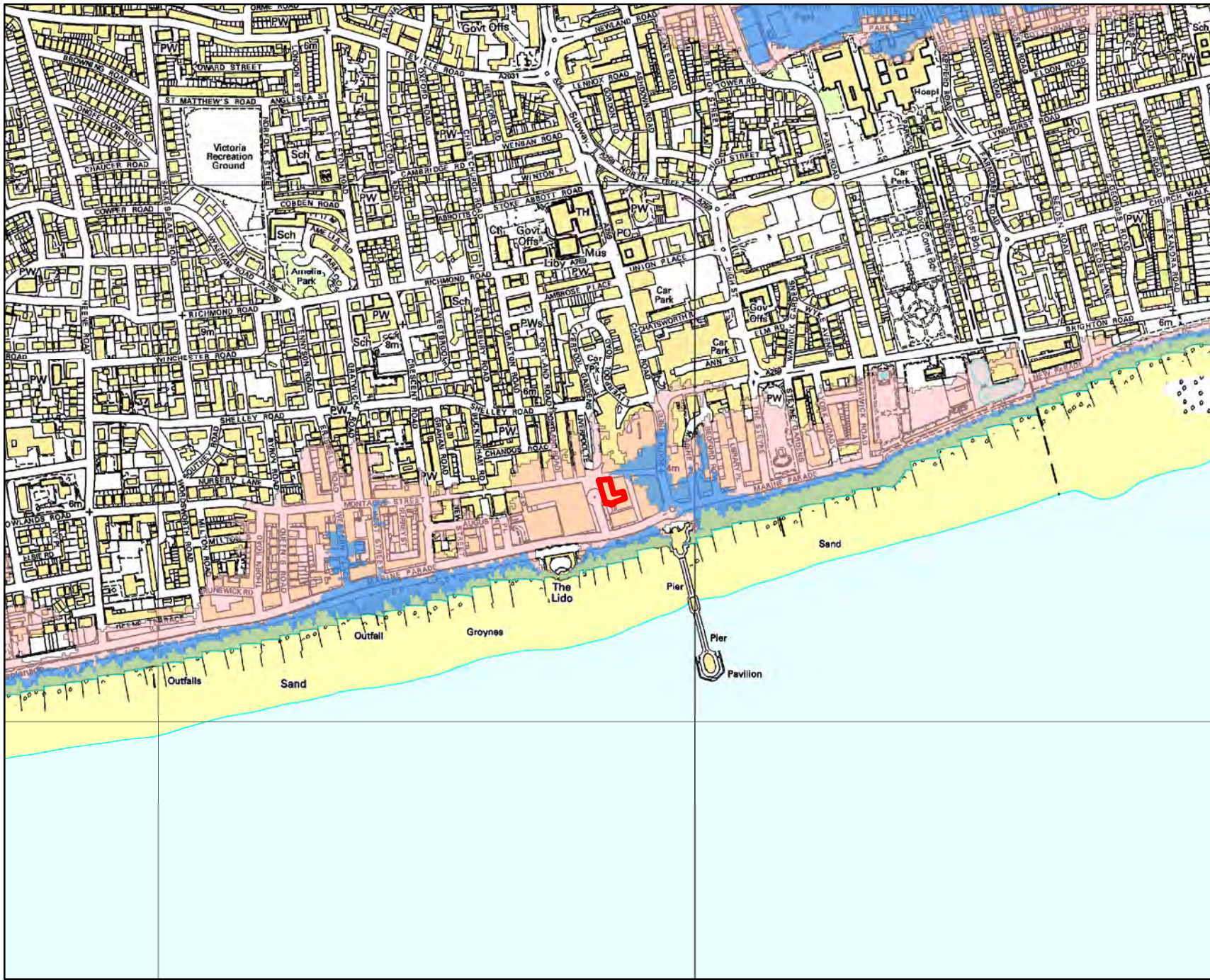
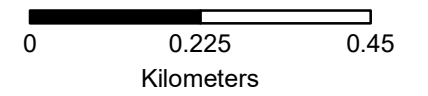


Legend

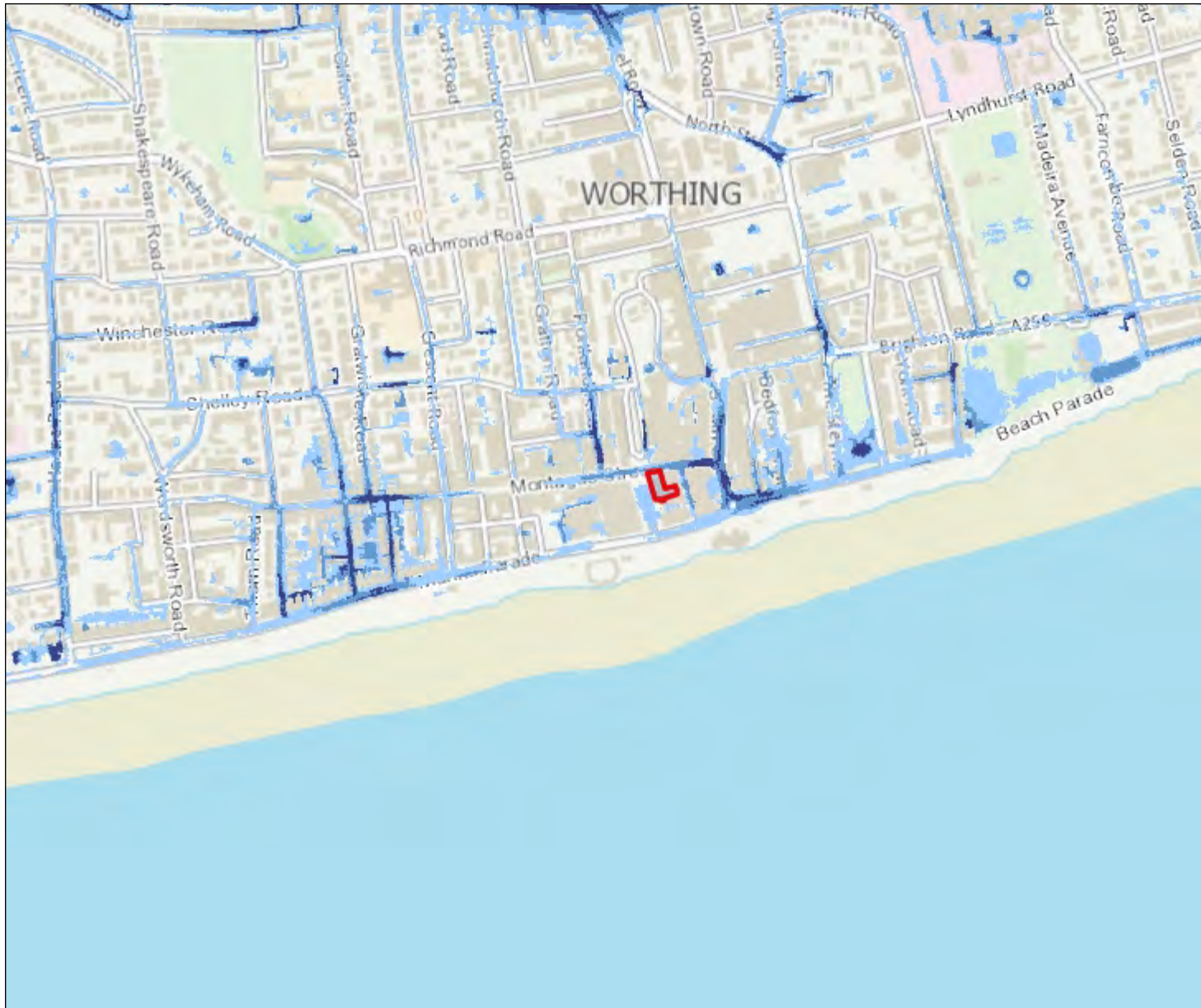
- Site Boundary
- 0.5% AEP (2012) (Undefended)
- 0.5% AEP (2070) (Undefended)
- 0.5% AEP (2115) (Undefended)
- 0.1% AEP (2012) (Undefended)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occurring in any given year.

Scale: 1:10,000



Risk of flooding from Surface Water. Centred on Bn11 3BE. Created 17-03-2020.



1: 10,000

0 Metres 250



Likelihood of flooding from Surface Water

- High ($\geq 3.3\%$)
- Medium (3.3% - 1%)
- Low (1% - 0.1%)
- Very Low

Likelihood of flooding from Surface Water

- High:** Greater than or equal to 3.3% (1 in 30) chance in any given year
- Medium:** Less than 3.3% (1 in 30) but greater than or equal to 1% (1 in 100) chance in any given year
- Low:** Less than 1% (1 in 100) but greater than or equal to 0.1% (1 in 1,000) chance in any given year
- Very Low:** Less than 0.1% (1 in 1,000) chance in any given year

This information is shown on the Risk of Flooding from Surface Water map on GOV.UK.

APPENDIX E
Correspondence with
Worthing and Adur Council

From: [Laura Gibbons](#)
To: [Julian Moore](#)
Date: 31 March 2020 09:59:16

Good Morning Julian,

I note that Glenn has provided you with details regarding the recent overtopping and crest height.

In addition to this, I can confirm that the site is within Flood Zone 3, this will mean that you will need to submit an FRA as part of your application. The FRA should include consideration of safe access and egress and whether this is possible.

I also note that areas adjacent to the site are shown to be at moderate risk of surface water flooding.

Should you have any further questions regarding flood risk or should you wish to discuss drainage proposals in detail please do not hesitate to contact me.

Kind regards,

Laura Gibbons

Engineer, Adur & Worthing Councils

Phone: 01903 221374

Email: laura.gibbons@adur-worthing.gov.uk

Website: www.adur-worthing.gov.uk

Address: Facilities & Technical Services, Worthing Town Hall, Chapel Road, Worthing, West Sussex, BN11 1HA



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From: [Glenn Longley](#)
To: [Julian Moore](#)
Cc: [Laura Gibbons](#); [Martyn Payne](#)
Date: 30 March 2020 15:18:35

Dear Julian,

I can confirm that the shingle beach situated between the Pier and the Lido has an approximate crest/berm height of 6.0 AOD, however during storms the shingle beach can be eroded resulting in the crest height being reduced.

I can confirm that on 10th February 2020 we did have localised overtopping of the sea defences within this area, which resulted in sea water washing across the promenade and down on to the southern section of footpath on Marine Parade.

The reason for the overtopping was due to the culmination of very strong winds, low pressure and spring high tides.

If you have any other queries please do not hesitate to contact me.

Regards
Glenn Longley

Glenn Longley

Engineer, Adur & Worthing Councils

Phone: 01903 221377

Email: glenn.longley@adur-worthing.gov.uk

Website: <http://www.adur-worthing.gov.uk/>

Address: Engineering Team, Town Hall, Chapel Road, Worthing, BN11 1HA



On Mon, 30 Mar 2020 at 08:53, Martyn Payne <martyn.payne@adur-worthing.gov.uk> wrote:

Hello Julian,

I've copied Laura Gibbons for assistance regarding flooding, in majority of land drainage/flooding issues Laura is the go to. Glenn can confirm sea defence level.

regards

Martyn Payne

Senior Engineer, Adur & Worthing Councils

Phone: 01903 221375

Email: martyn.payne@adur-worthing.gov.uk

Website: <http://www.adur-worthing.gov.uk/>

Address: Digital & Resources Department, Adur and Worthing Councils, Room 45, Town Hall, Chapel Road, Worthing, West Sussex BN11 1HA



On Fri, 27 Mar 2020 at 15:58, Julian Moore <julian@jmenviro.co.uk> wrote:

Dear Martyn,

Please see my email below – I assume that Bryan and Ken no longer work at the council.

Please can you or Glenn please steer my queries in the right direction if this is not either of you.

Kind regards,

Julian

From: Julian Moore

Sent: 27 March 2020 15:55

To: bryan.curtis@adur-worthing.gov.uk

Cc: glenn.longley@adur-worthing.gov.uk; ken.argent@adur-worthing.gov.uk

Subject: 31-35 Montague Place, Worthing

Dear Bryan/Glenn,

I am undertaking a flood risk assessment for a proposed development at 31-35 Montague Place, Worthing.

My client is preparing an application to convert the second floor and extend the third floor to provide 14 flats (currently in retail). A small extension of the ground floor (to the south, will be made to create an entrance lobby/stairwell.

Please can you provide confirmation of the height and level of the protection offered by the coastal defences protecting the site in the area west of the pier at the end of Bath Street and Montague Place.

Please can you provide any further information on any local flood risk issues/records of flooding. I understand anecdotally that some drainage improvement works were recently undertaken in the junction of Montague and Bath Street, and that earlier this year, the esplanade was locally overtopped

in this area, though I have no specific details.

Glenn – are you the person to discuss the drainage proposals with?

Kind regards,

Julian

Julian Moore

julian@jmenviro.co.uk

07944 999980

JM Enviro Limited

Environmental Consulting

Water, Air & Land

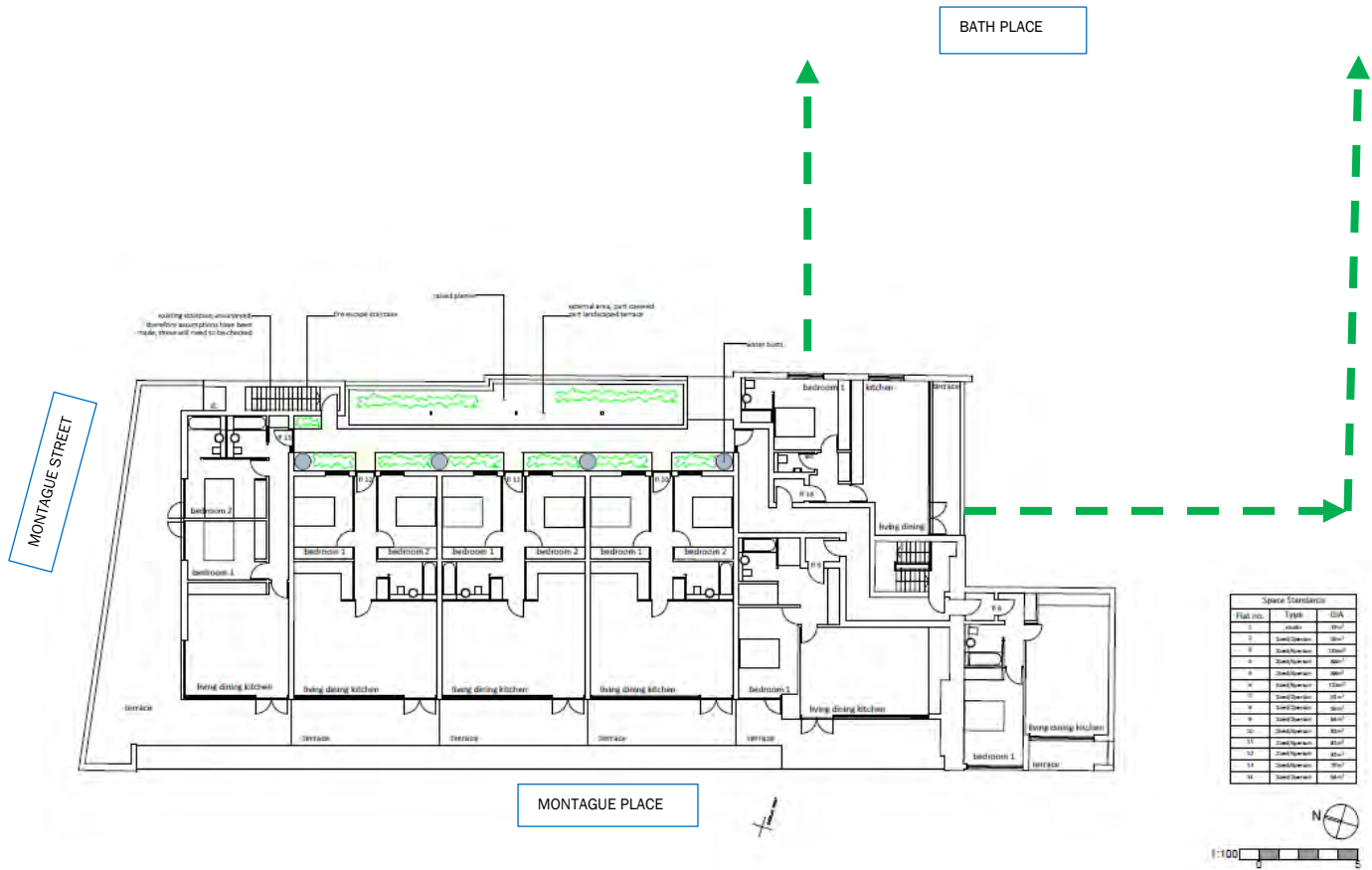
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APPENDIX F
Drainage Strategy
& Calculations

31-35 MONTAGUE STREET - DRAINAGE STRATEGY



KEY

-  Raised Planter (28m²)– Will act like an intensive green roof
-  Water butts for roof garden terrace (4no.)
-  Existing connections to the public sewer (via passageways to Bath Place (assumed route based on initial inspection).

Notes:

- Detailed drainage survey to be undertaken prior to detailed design of the building.
- Re-use existing connections subject to CCTV survey and agreement with Southern Water.
- Opportunities to increase the amount of raised planters will be sought at the next stage of design.
- Consider viability of green roof at the next stage of design.
- Opportunities to separate foul and surface water from existing connections will be sought at the next stage of design.
- All service chamber covers in pedestrian trafficked areas to be bolt down and watertight where possible.
- Detailed drainage design to be agreed with LLFA/LPA and Southern Water,

Space Standards		
Flat no.	Type	GIA
1	1bed	35m ²
2	2bed/2bath	50m ²
3	2bed/2bath	55m ²
4	2bed/2bath	50m ²
5	2bed/2bath	50m ²
6	2bed/2bath	55m ²
7	2bed/2bath	55m ²
8	2bed/2bath	55m ²
9	2bed/2bath	55m ²
10	2bed/2bath	55m ²
11	2bed/2bath	55m ²
12	2bed/2bath	55m ²
13	2bed/2bath	55m ²
14	2bed/2bath	55m ²
15	2bed/2bath	55m ²



Date 29/05/2020 21:07

Designed by

File EXISTING SW DRAINAGE.MDX

Checked by

XP Solutions

Network 2018.1.1

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	550	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.076	4-8	0.013

Total Area Contributing (ha) = 0.089

Total Pipe Volume (m³) = 0.972



Date 29/05/2020 21:07

Designed by

File EXISTING SW DRAINAGE.MDX

Checked by

XP Solutions

Network 2018.1.1

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.045	0.045	0.045
1.001	-	-	100	0.044	0.044	0.044
1.002	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.089	0.089	0.089

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.600	Storm Duration (mins)	30
Ratio R	0.438		



Date 29/05/2020 21:07
File EXISTING SW DRAINAGE.MDX

Designed by
Checked by

XP Solutions

Network 2018.1.1

1 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 Coefficient 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 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 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	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	1	+0%					8.548
S1.001	S2	15 Winter	1	+0%					8.234
S1.002	S3	15 Winter	1	+0%					7.983

PN	US/MH Name	Surcharged Flooded			Pipe		Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap. (l/s)	Flow (l/s)	Status	
S1.000	S1	-0.102	0.000	0.22	5.6	OK	
S1.001	S2	-0.166	0.000	0.15	10.3	OK	
S1.002	S3	-0.167	0.000	0.15	10.4	OK	



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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 Coefficient 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 0
 Number of Online Controls 0 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 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	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	30	+0%					8.580
S1.001	S2	15 Winter	30	+0%					8.276
S1.002	S3	15 Winter	30	+0%					8.026

PN	US/MH Name	Surcharged Flooded			Pipe		Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Flow / Overflow (l/s)	Flow (l/s) Status	
S1.000	S1	-0.070	0.000	0.55	13.8	OK	
S1.001	S2	-0.124	0.000	0.41	28.2	OK	
S1.002	S3	-0.124	0.000	0.41	28.0	OK	



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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 Coefficient 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 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	100	+40%					8.633
S1.001	S2	15 Winter	100	+40%					8.321
S1.002	S3	15 Winter	100	+40%					8.071

PN	US/MH Name	Surcharged Flooded			Pipe		Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap. (l/s)	Flow (l/s)	Status	
S1.000	S1	-0.017	0.000	0.99	24.8	OK	
S1.001	S2	-0.079	0.000	0.74	51.0	OK	
S1.002	S3	-0.079	0.000	0.74	50.8	OK	



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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	550	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.071	4-8	0.024

Total Area Contributing (ha) = 0.095

Total Pipe Volume (m³) = 1.193



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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.095	0.095	0.095
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.095	0.095	0.095

Time Area Diagram for Green Roof at Pipe Number S1.001 (Storm)

Area (m³) 38 Evaporation (mm/day) 1
Depression Storage (mm) 5 Decay Coefficient 0.050

Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)
0	4	0.000691	32	36	0.000139	64	68	0.000028	96	100	0.000006
4	8	0.000565	36	40	0.000114	68	72	0.000023	100	104	0.000005
8	12	0.000463	40	44	0.000093	72	76	0.000019	104	108	0.000004
12	16	0.000379	44	48	0.000077	76	80	0.000015	108	112	0.000003
16	20	0.000310	48	52	0.000063	80	84	0.000013	112	116	0.000003
20	24	0.000254	52	56	0.000051	84	88	0.000010	116	120	0.000002
24	28	0.000208	56	60	0.000042	88	92	0.000008			
28	32	0.000170	60	64	0.000034	92	96	0.000007			



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1 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 Coefficient 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 0
 Number of Online Controls 0 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 0.350
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 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	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	1	+0%					8.563
S1.001	S2	15 Winter	1	+0%					8.314
S1.002	S3	15 Winter	1	+0%					8.064

PN	US/MH Name	Surcharged Flooded			Pipe		Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Flow / Overflow (l/s)	Pipe Flow (l/s) Status	
S1.000	S1	-0.162	0.000	0.17	11.9	OK	
S1.001	S2	-0.161	0.000	0.17	11.9	OK	
S1.002	S3	-0.161	0.000	0.18	12.1	OK	



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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 Coefficient 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 0
 Number of Online Controls 0 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 0.350
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 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	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	30	+0%					8.603
S1.001	S2	15 Winter	30	+0%					8.353
S1.002	S3	15 Winter	30	+0%					8.104

PN	US/MH Name	Surcharged Flooded			Pipe		Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Flow (l/s)	Status	
S1.000	S1	-0.122	0.000	0.43	29.3	OK	
S1.001	S2	-0.122	0.000	0.42	29.0	OK	
S1.002	S3	-0.121	0.000	0.43	29.5	OK	



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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 Coefficient 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 0
 Number of Online Controls 0 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 0.350
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 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	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	100	+40%					8.651
S1.001	S2	15 Winter	100	+40%					8.401
S1.002	S3	15 Winter	100	+40%					8.152

PN	US/MH Name	Surcharged Flooded			Pipe		Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Flow / Overflow (l/s)	Pipe Flow (l/s) Status	
S1.000	S1	-0.074	0.000	0.77	53.1	OK	
S1.001	S2	-0.074	0.000	0.76	52.5	OK	
S1.002	S3	-0.073	0.000	0.77	53.2	OK	



Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:

Site name:

Site location:

Site Details

Latitude:

Longitude:

Reference:

Date:

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach

Site characteristics

Total site area (ha):

Methodology

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	697	697
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	0.18	0.18
1 in 1 year (l/s):	0.15	0.15
1 in 30 years (l/s):	0.41	0.41
1 in 100 year (l/s):	0.57	0.57
1 in 200 years (l/s):	0.66	0.66

APPENDIX G

Photographs

APPENDIX G – PHOTOGRAPHS



Photo 1. Location of proposed extension looking towards existing Sub-station.



Photo 2. Looking towards site from Montague Place.



Photo 3. Looking east down Watkin Road beyond the site.



Photo 4. Looking north from the esplanade towards the site

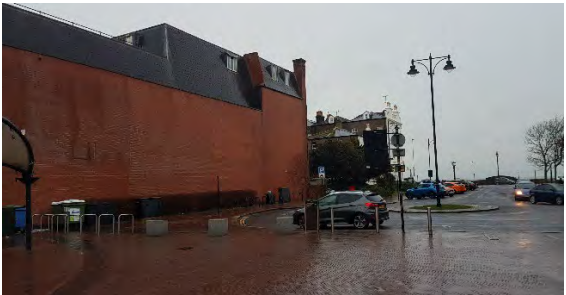


Photo 5. Looking south towards sea (site on left).



Photo 6. Looking east along esplanade towards the pier.

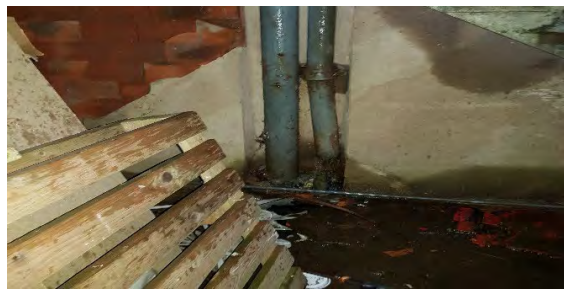


Photo 7. Aboveground drainage on southern face of building.



Photo 8. Looking east towards Bath Place – southern drainage route via passage to rear of Marine Parade.



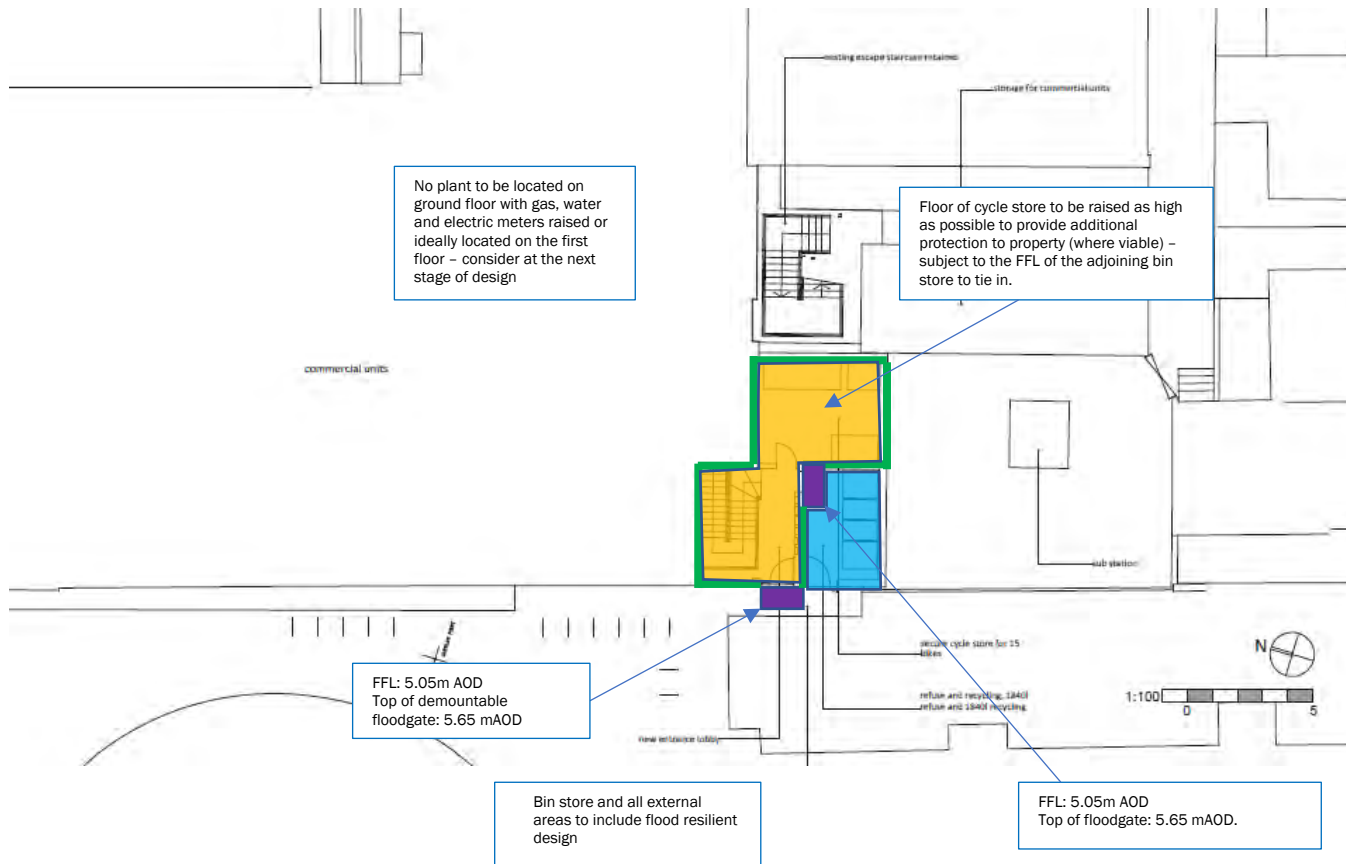
Photo 9. Flood defences - wall (left), EA slipway (centre) and







Photo 10. Looking east towards Bath Place – Northern drainage route via passage to rear of Marine Parade.

APPENDIX H
Flood Mitigation Strategy

31-35 MONTAGUE STREET - FLOOD MITIGATION STRATEGY



KEY

-  600mm Demountable Flood barrier
-  Designed to flood during design flood - flood resilient design
-  Prevent from flooding - barriers, flood resilient design and any necessary plant raised from ground (plinths/wall mounted) and Flood resilient design as high as practicable, to manage residual risk.
-  Structure should be designed to withstand flooding to at least 6.05mAOD to prevent vulnerable areas from flooding. Avoid where possible service penetrations of the structure below 6.05 mAOD, though where essential these should be fully sealed.

Notes:

- Where flood barriers are required, doors should generally be able to open inwards and flood barriers to be fitted on the outside of the openings. This is essential on the main entrance to ensure emergency access is available when the barrier is fitted.
- External areas to be designed with flood resilient design consideration
- All service chamber covers to be bolt down and watertight where possible.

APPENDIX I
Sustainability Appraisal

SA Objective	Indicator	Comment	Score
Environmental Quality	Worthing Air Quality Management Area	The site is not located in close proximity to the Worthing AQMA. The proposals are also for a 'car-free development	G
	Water Quality (WFD waterbodies and Groundwater Source Protection Zones)	Not located in a Source Protection Zone but is located within the Teville Stream catchment which is a WFD waterbody which has been heavily modified .	Y
	Noise	The site is not within an area identified as experiencing significant road or rail noise.	G
Biodiversity	Sites, Habitats and Species	Site does not meet the criteria.	G
Land and Soils	Potentially Contaminated Land	PCL	Y
	Agricultural Land	Previously developed urban land.	G
Water Management	Flooding from Rivers and Sea	A large portion of the site is located in Flood Zone 3 and at risk of tidal flooding in the event of overtopping/breach of the coastal defences. Sequential approach to be adopted with more vulnerable uses on upper floor. Mitigation required to manage safety of site users and protect ground floor.	R
	Surface Water	There is a low chance of flooding adjacent to the site in Montague Place, and a low-medium risk in Montague Street.	Y
	Groundwater	The site is in an area considered to be at a generally low risk of groundwater flooding.	G
Landscape and Character	Setting of South Downs National Park	Due to the distance from the National Park and urban setting the site is unlikely to impact on its setting.	G
	Coalescence	The site forms no visual or physical separation between settlements.	G

	Undeveloped coastline and countryside	Located within the Built-up Area Boundary.	G
Built Environment	Derelict sites	Brownfield site with long-term vacant floorspace	G
Historic Environment	Designated Heritage Assets	The site is not within a conservation area but development would have the potential to affect the setting of the Chapel Road Conservation Area and the South Street Conservation Area. There are a number of listed buildings in proximity to the site (Nos 10-14 Montague Place, all Grade II). Sensitive design will be required to ensure no significant harm is caused to heritage assets and their setting. However, it is also recognised that there may be opportunities to improve their setting and the appearance of Montague Place	Y
	Archaeology	No	G
Healthy Lifestyles	Accessible open space, sport and leisure	The site is located in close walking distance of Steyne Gardens and the Marine Parade promenade. The application site also adjoins a pedestrianised area of civ space. However, there are no allotments within the 10 minute walk standard.	Y
Crime and Public Safety	Indices of Multiple Deprivation	Ranked as the most deprived area in Worthing according to the IMD 2015.	G
Communities	Proximity to doctor's Surgeries	Is within 800m of 2 doctor surgeries: Health Central Surgery and Dr B. Allen – Worthing Medical Group	G
	Proximity to Libraries	The nearest library (Worthing Library) is approximately 600m away.	G
Education	Proximity to primary schools (infant, junior)	Approximately 700m from Our Lady of Sion Junior School and 1.2km from Heene Primary School.	G

	Proximity to secondary schools	Worthing High School, St Andrews Church of England High School for Boys, Bohunt and Davison Church of England Comprehensive School for Girls and Our Lady of Sion Senior Schol are all within 2km. Our Lady of Sion and Davison are the nearest school approximately 700 and 1.1km away respectively	G
Economy	Key office location or industrial estate	No	G
Town Centres	Within 800m of a town centre defined by the NPPF as including town centres, district centres and local centres	The site is within the Town Centre Boundary.	G
Travel and Access	Proximity to train station	The site is on the cusp of an acceptable walking distance of a train station. It is also connected by a short bus journey	Y
	Proximity to cycle routes	The South Coast Route runs along the seafront to the south of the site.	G
<p>Conclusions</p> <p>Opportunities:</p> <ul style="list-style-type: none"> It is a brownfield site providing an opportunity for regeneration. It is located in the Town Centre. Located within the Built Up Area Boundary. Visual enhancement of Montague Place <p>Constraints:</p> <ul style="list-style-type: none"> The site is located in Flood Zone 3. There are a number of other heritage assets surrounding the site 			

Policy Appraisal

	0
Environmental quality	The development is unlikely to significantly affect environmental quality or reduce pollution as long as SUDS are included and the drainage strategy is agreed with Southern Water and the LLFA.
Biodiversity	+

	Development of the site affords for the opportunity for the provision of a green roof
Land and Soils	++
	The development of this brownfield site will make efficient use of land and deliver new homes. This reduces the pressure to release greenfield land.
Energy	-
	Development is likely to cause increased emissions and waste, contributing to climate change unless fully mitigated. This will have a negative impact on this objective.
Water management	+
	The site lies in Flood Zone 3. Therefore development in this location would place additional people at risk of flooding. However managing flood risks so that development is safe across its lifetime will have a positive impact on this objective.
Landscape and Character	0
	The development would have no impact on landscape and character.
Built Environment	+
	A development that is sensitive to the surrounding Conservation Areas will help to integrate the site with the wider area. This will have a positive impact on this objective.
Historic Environment	0
	The development would have no direct impact on the historic environment.
Healthy Lifestyles	++
	The development by virtue of being 'car-free' with generous bicycle storage provision and access to pedestrian links helps promote a healthy lifestyle for future residents.
Crime and Public Safety	+
	The development will enhance the natural surveillance of Montague Place
Housing	+
	The development would contribute towards meeting housing needs through the delivery of 14 additional dwellings.
Communities	0
	The development would have no direct impact on communities.
Education	0
	The development would have no direct impact on education. The number of school-places likely to be required by the development is negligible.
Economy	+
	The development would have a marginal beneficial on the local economy by contributing to an increase population (and footfall) within the town centre.
Town and Local Centres	++
	The development would have a highly positive impact upon the attractiveness of the town centre including through the provision of public art and its contribution to vitality and viability.
Travel and Access	+
	The development through the provision of cycle storage would assist in promoting a shift to more sustainable modes
Mitigation	None identified

Conclusions	The residential-led development on previous developed land provides new dwellings in a highly accessible location and offers the opportunity for significant aesthetic improvement to the building