CRAIG CONSTRUCTION SERVICES



10-20 MARINE PLACE, WORTHING, WEST SUSSEX, BN11 3DN

Flood Risk and Drainage Assessment

March 2026
(Revised September 2026)

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REPORT DATA SHEET

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CONTENTS

1. BACKGROUND, EXISTING SITE & PROPOSED DEVELOPMENT
2. GEOLOGY & HYDROGEOLOGICAL CONSIDERATIONS
3. FLOOD RISK ASSESSMENT
4. ALTERNATIVE SOURCES OF FLOODING
5. HISTORY OF FLOODING
6. PLANNING WITH RESPECT TO FLOODING
7. RISK TO PROPERTY
8. RISK TO USERS OF THE PROPOSED DEVELOPMENT
9. LIKELY IMPACT ON FLOOD RISK ELSEWHERE
10. EXISTING SITE DRAINAGE
11. SURFACE WATER DRAINAGE OPTIONS
12. PROPOSED FOUL DRAINAGE
13. DRAINAGE DESIGN SUMMARY
14. OPERATION AND MAINTENANCE OF THE SYSTEM
15. SUMMARY OF CONCULSIONS

APPENDIX A: FIGURES AND DRAWINGS

Figure 1: Site Location
Figure 2: Site as Existing
Figure 3: Proposed Development
Figure 4: Suggested Drainage Arrangement

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APPENDIX B: ENVIRONMENT AGENCY FLOOD MAPS FOR PLANNING

APPENDIX C: H R WALLINGFORD GREENFIELD FLOW RATES

APPENDIX D: OUTPUT FROM DRAINAGE DESIGN SOFTWARE

APPENDIX E: PHOTOGRAPHS

APPENDIX F: SOUTHERN WATER SEWER PLAN

APPENDIX G: ENVIRONMENT AGENCY PRODUCT 4 INFORMATION

APPENDIX H: FLOOD WARNING AND EVACUATION PLAN TEMPLATE

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1. BACKGROUND, EXISTING SITE & PROPOSED DEVELOPMENT

1.1 The site comprises a disused warehouse building to the north and a yard/parking area to the south. It is located in an urban location to the north of Worthing seafront, West Sussex. The site is bordered to the north by a commercial building – No. 22 Marine Place (Just Yoga), to the east by an alleyway with residential properties (Bedford Row) on the far side, to the south by a commercial property – No. 10 Marine Place (Turning Tides Community Centre) and to the west by Marine Place public high with residential properties on the far side (currently under construction). The site is accessed from Marine Place to the west. The site area (redline boundary) is approximately 0.08 ha. The Ordnance Survey map reference for the centre of the site is TQ 15000 02495. The site elevation for the centre of the site is approximately +5 m OD. See Appendix A Figure 1 for the site location plan and Figure 2 for the existing site layout.

1.2 It is proposed to redevelop the site after the demolition of the existing building, into a three-storey residential building comprising 27 one-bedroom apartments with associated outdoor communal area to the east. Access to the site is via an existing entrance from Marine Place to the west. See Figure 3 in Appendix A for the proposed site layout.

2. GEOLOGY & HYDROGEOLOGICAL CONSIDERATIONS

2.1 According to the British Geological Survey website the site lies on Lewes Nodular Chalk Formation - Chalk bedrock with superficial River Terrace Deposits (Undifferentiated) - Sand, silt and clay.

2.2 The Department for Environment, Food and Rural Affaires (Defra) online mapping (MAGIC) shows the site to be lying on a principal bedrock aquifer and Secondary B superficial drift. DEFRA classify the soil type as *" Freely draining slightly acid loamy soils"*. The site lies on an area of 'medium-high' groundwater vulnerability but does not lie in a groundwater source protection zone (SPZ).

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3. FLOOD RISK ASSESSMENT

3.1 Outline Flood Risk

3.2 According to the Environment Agency's Flood Maps for Planning, the site lies in Flood Zone 3 (High risk of flooding from tidal sources where defences are not considered / >3.3% AEP of flooding in any given year). The site is not shown to be at risk of surface water flooding in the 1 in 30-year scenario but has a section of surface water flood risk in the southwestern corner of the site in the 1 in 100-year scenario which increases in the 1- in 1000-year to encompass the whole site. Groundwater and reservoir flooding is considered unlikely at this location. See Appendix B for the flood maps for the site.

3.3 Defences

3.3.1 Flood defences can help reduce the chance of flooding but cannot completely prevent it. They can fail, or water could spill over the top if it is deep enough. The main defences from tidal flooding in Worthing that will have a protective impact on the site is the shingle beach, which acts as a barrier against storm event; as well as 144 timber and 11 rock groynes that trap sediment and prevent erosion of the beach. There is also a Splash Wall and wide beach zone further west of the site which adds a secondary layer of flood protection to the town. There is ongoing maintenance of the existing flood defences in the form of the a multi-year Coastal Defence Project led by Worthing Borough Council and the Environment Agency to protect the coastline between Seaview Road and Brooklands Park from erosion and flooding: The Timber Groyne Repair Works (2025-2026) and the Shingle Management Scheme (Autumn 2026-2027) aim to give the existing groynes and beach an additional 10 years of lifespan.

4 ALTERNATIVE SOURCES OF FLOODING

An assessment of alternative sources of flooding potentially affecting the site has been made from a review of the EA online flood mapping, the EA's Product 4 information and from Adur and Worthing Level 1 Strategic Flood Risk Assessment (SFRA 2024). The SFRA addresses alternative sources of flooding including fluvial flooding, surface water flooding, groundwater flooding and flooding from sewers and reservoirs.

4.1 Surface Water Flooding

4.1.1 Surface water runoff (or 'pluvial' flooding) is most likely to be caused by intense downpours e.g. thunderstorms and is exacerbated by blocked culverts and areas of nonpermeable surfacing.

4.1.2 The EA flood maps for planning show that the site is not at risk of surface water flooding in the 1 in 30-year scenario, but to be at risk of surface water flooding in the southwestern corner in the 1 in 100-year scenario. This area of risk increases in size to encompass the entirety of the site in the 1 in 1000-year scenario. The EA's long-term flood prediction indicates that the risk of surface water flooding at the site is low risk (0.1 % - 1% risk per year) rising to medium

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risk (1 % - 3.3 % risk per year) in the 2040-2060 prediction. See Appendix B for the long-term surface water flood risk map for the site.

4.1.3 In coastal areas, surface water flood risk is also related to the tidal outfalls where tide-locking can restrict the discharge from gravity sewers and culverted watercourses.

The SFRA (2024) states:

"There have been several recorded flood incidents across the study area, with surface water the most frequent cause of flooding."

"The most notable flooding incidents in the Local Plan areas occurred in 1980, 2000, 2007, 2012 and the winter of 2013/14. These incidents were largely caused by surface water flooding following heavy or prolonged rainfall."

The last major flood event in Worthing occurred in 2012, with widespread property flooding reported. There are no records of the site itself being affected by flooding.

4.2 Sewer Flooding

4.2.1 There is a foul sewer at the site served by Southern Water. Although there have been records of sewer flooding within the Worthing and Lancing localities there are no records of sewer flooding at the site itself. See Appendix F for the Southern Water Sewer maps for the area.

4.3 Groundwater Flooding

4.3.1 Groundwater flooding occurs when the water table rises above the surface of the ground, normally as a result of persistent rainfall over a prolonged period. Increased levels of development in an area can increase the risk of groundwater flooding. The flood maps for planning classifies the site as unlikely to be at risk from groundwater flooding.

The SFRA (2024) states:

"A large proportion of Worthing Borough is predicted to be at risk of groundwater flooding emergence, with some of the highest risk areas around Durrington, Goring and East Worthing."

There are no records of the site being impacted by groundwater flooding.

5 HISTORY OF FLOODING

5.1 According to the SFRA (2024), there are several recorded incidents of flooding within the Worthing area. Most notably in 1980, 2000, 2007, 2012 and the winter of 2013/14. No records of historic flood events directly affecting the site, or its immediate surroundings, have been found.

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5.2 The design flood level is usually derived from the Environment Agency Product 4 for the site. The Environment Agency's flood risk data (Product 4) was ordered from the EA on 24 March 2026. See Appendix G for the EA's Product 4 data. The EA provided modelled data for the site, including heights and depths from six nodes situated across the site, with nodes 2, 4 and 8 running from north to south along the eastern boundary with Bedford Row and 1, 3 and 5 running from north to south along the western boundary with Marine Place. See Appendix B for a map showing the fluvial node locations. The modelled flood levels in metres AOD (Above Ordnance Datum) for tidal undefended (AEP) 0.5% (2115) is 5.26 m AOD across all nodes. The tidal undefended depths range between 0.37 m at node 1 (in the northwest corner of the site) and 0.96 m at node 2 (in the northeast corner of the site). No level or depth data is shown for the 0.5 %, 0.5 % (2070) and 0.1 % AEP.

5.3 For defended levels the 0.5 % (2115) level reduces to 5.01 m AOD. The Product 4 also shows a level of 5.05 m AOD in the 0.5 % AEP, 5.21 m AOD in the 0.5 % (2070) prediction and 5.15 m AOD in the 0.1 % AEP across all nodes. The depths for the defended 0.5 % (2115) range from 0.12 m at node 1 to 0.71 m at node 2. In the 0.5 % AEP the range is from 0.15 m at node 1 to 0.75 m at node 2, and in the 0.5 % (2070) AEP prediction the depth ranges between 0.32 m at node 1 to 0.91 m at node 2. The 0.1 % EAP depth ranges between 0.26 m at node 1 and 0.84 m at node 2.

6 PLANNING STATUS WITH RESPECT TO FLOODING

6.1 The site is shown on the current Environment Agency (EA) flood risk mapping as being within Flood Zone 3 (>3.3 % probability of flooding in any year). The site is not at risk of flooding from surface water in the 1 in 30-year scenario (present day) but shows an area of risk of flooding from surface water in the southwest corner in the 1 in 100-year scenario and the whole site is shown to be at risk of surface water flooding in the 1 in 1000-year scenario. See Appendix B for the Environment Agency Flood maps for planning.

6.2 The Sequential Test is intended to steer more vulnerable development to land in a lower Flood Zone, in this case Flood Zone 2 or lower. The fact that the site lies in flood Zone 3, coupled with the change of use of the site from commercial to residential representing an increase in the vulnerability category of the users will consequently trigger the requirement of a Sequential Test.

6.3 The applicant must demonstrate that there are no reasonably available alternative sites within the local area of lower flood risk and that are suitable for the proposed development size and scale; in this case residential development sites, suitable for 27 one-bedroom flats within the area local to the site and in Flood Zone 1 or 2 and at low risk of flooding from surface water.

6.4 Government guidance set out in the National Planning Policy Framework (NPPF) requires all Councils to assess the amount of land available for housing development and publish the results in the form of a Strategic Housing Land Availability Assessment (SHLAA). A review of the Adur and Worthing

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Strategic Land Availability Assessment Update and the Adur and Worthing Brownfield site register has shown that there are not any other suitable sites available within the local area that are in Flood Zone 1 or 2 and at low risk of surface water flooding for a development of this size and nature:

6.6 The high-risk flood zone comprises much of the southern part of the town centre, between Splashpoint and West Buildings. Within this area, major mixed use land allocations, including offices and new dwellings have been made in the Submission Draft Worthing Local Plan **(**SDWLP) for available redevelopment sites at Grafton Road Car Park and the Stagecoach Bus Depot in nearby Marine Parade. Other mixed-use allocations in the central or edge-of-centre sites are on sites outside the risk zone at the former gas work at Lyndhurst Road, Union Place and Teville Gate. These contribute to the total of new homes required during the period up to 2036. However, these sites, together with the total suburban and other allocations in the Local Plan, can only deliver less than 30 percent of the total requirement.

6.7 On this basis it can be considered that the Sequential Test is satisfied as the development is the construction of a building on the footprint of an existing commercial building and yard into residential, and there is an unfulfilled need for accommodation of this type within the area and no alternative sites of a suitable size and scale.

6.8 The Exception Test is designed to assess whether development should be allowed in areas at higher risk of flooding, specifically when suitable land at lower risk is unavailable for the specific land use type. To pass the Exception Test the development must provide benefits to the community (such as economic growth, job creation, or meeting a critical housing need) that outweigh the flood risk and must prove that the development will be safe for its entire lifetime (considering climate change), won't increase flood risk elsewhere, and where possible, reduces flood risk overall. The exception Test can be considered to be met if the following have been met:

i. Delivery of regeneration and redevelopment of brownfield land.
ii. Reduction of flood risk.
iii. Inclusion of multi-functional sustainable drainage.
iv. Safe access and egress, with flood warning & escape plan.
v. Flood resilient design.

6.9 Worthing Borough Council is actively pledging to build more homes, focusing on brownfield regeneration, affordable housing, and sustainable development to address local housing needs. The Worthing Local Plan 2020-2036 Flood Risk Sequential & Exceptions Test Submission Draft (January 2021) states:

"Given the limited land availability in Worthing the Local Plan is unable to meet the local housing need. It is therefore considered that all potential windfall sites will need to be developed (where acceptable in terms of planning policy) to further contribute to meeting this need as far as possible. Individual sites not allocated through the Local Plan will be required to undertake the Sequential Test, and where necessary the Exception Test at the planning application stage. This should consider the Flood Zones and other sources of flooding. However,

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given the scale of unmet need it is unlikely to be possible for development to be directed to areas of lower flood risk."

6.10 The site is proposed to have permeable surfacing in the communal area to the east and planted borders along the eastern and southeastern boundaries (SuDS measures). This will decrease the non-permeable area of the site (the site is currently entirely non-permeable), reducing the runoff form the site by infiltrating and attenuating the surface water. These sustainable drainage measures will reduce the flood risk from surface water elsewhere.

6.11 Should the sits experience an extreme storm event (i.e. tidal breach) the ground floor residents would be able to escape to the first floor or above via the internal invacuation route as detailed in section 8 below. If sufficient flood warning is given via the EA's flood warning system external evacuation will be possible via the route detailed in section 8 below. Encompassing: exiting the building via the usual exit and heading north along Marine Parade for approximately 30 m to reach dry land (estimated flood depth 230 m).

6.12 The proposed development is to include flood resilient measures in the construction: Floor levels are to be raised to 600 mm above the design flood level (which is 5.21 m AOD in the EA's Product 4 defended 0.5% scenario (2070)), or 300 mm above the ground level, whichever is greater; making the finished floor level (FFL) for the development 5.81 m AOD. Flood resistant materials should be used in the construction of the ground floor, such as flood resistant paint, raised socket levels and installing non-return valves to prevent sewer backflow.

6.13 It can be considered that the Exception test is satisfied for the proposed development.

7 RISK TO PROPERTY

7.1 The NPPF section F7 states:

"1. Development proposals should not present a risk from flooding to potential occupiers, users, or visitors, and should not increase flood risk elsewhere.
2. Where development is proposed in a location known to be at risk from any form of flooding, now or in the future, it should be refused unless:
a. Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons which justify a different arrangement;
b. The development will be safe throughout its lifetime taking account of the vulnerability of its users;
c. Any residual risk can be safely managed, and safe access and escape routes are included where appropriate, as part of an agreed emergency plan;
d. The development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment; and
e. It can be demonstrated that flood risk will not be increased elsewhere."

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The area of the site to be developed lies in Flood Zone 3 (high risk of flooding form tidal waters where defences are not considered) and is at low risk of flooding from surface water flooding in the present-day scenario, but with risk in the 1 in 100-year scenario and above. The buildings on the site are considered to be at risk from flooding: the EA's Product 4 data suggests a maximum flood depth in the 2115 predicted 0.5 % AEP of 0.71 m. In order to safeguard the property for its lifetime inline with NPPF section F7 2 b and d, the finished floor level should be 0.6 m above the estimated flood level or 0.3 m above the average ground level of the site or adjacent road level, whichever is greater, making the FFL 5.81 m AOD. Flood resistant materials should be used in the construction of the ground floor, such as flood resistant paint, raised socket levels and installing non-return valves to prevent sewer backflow.

7.2 The site at present is entirely under hardstanding and the proposed development is to include some areas of soft landscaping to the east. The communal areas of hardstanding, including the bike store and yard area to the east of the development, is to be of a permeable design. This will help to reduce the runoff from the site when compared to the existing scenario. These SuDS measures will decrease the overall impermeable surface area of the site, reduce surface water runoff and make the site more sustainable.

8 RISK TO USERS OF THE PROPOSED DEVELOPMENT

8.1 The developed area of the site lies in Flood Zone 3 (high risk of tidal flooding where defences are not considered) and is at low risk of surface water flooding (present day scenario). The site is defended by the Adur and Worthing flood defence scheme, comprising the shingle beach and groynes to the south of the site. The proposed development will reduce the amount of hardstanding at the site by the use of soft landscaped borders in the communal area and private terraces and permeable surfacing in the communal yard area to the east. The site lies in an area with a long history of residential development and is bordered to the east and west by residential dwellings. It can be considered that the future users of the site will be protected from flood risk by the sea defences as with the existing scenario for the site and the neighbouring dwellings.

8.2 The NPPF section F7 2c requires that safe access and escape routes for emergency services to and from the development during a flood event should be identified, where required. Worthing has a flood warning system in place for coastal areas including. The site lies within this area. See Appendix B for a map of the areas covered by the Adur and Worthing Flood Warning scheme. The future residents should be encouraged to sign up to this service which can deliver warnings by phone or text and encouraged to have a flood warning and evacuation plan See Appendix H for a template for a flood warning and evacuation template.

8.3 Should an extreme storm event occur where tidal defences fail the site may experience flooding up to a depth of 230 mm. Safe, direct access onto Marine Parade would be needed, and a pre-arranged route safely out of the flood zone would need to be followed. A suitable evacuation route is detailed below:

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- Leave the site via Marine Parade heading north.
- Turn east onto Bedford Row, continuing north to reach Warwick Street.
- Head east along Warwick Street to the High Street (A259) to exit the flood zone.

8.4 In the unlikely event of catastrophic failure of the coastal flood defences and insufficient time being available to evacuate the premises (coordinated by emergency services, along dry egress routes to areas above the floodplain), then internal "invacuation" routes have also been provided for users/occupants of the lower ground and ground floor areas via the internal stairs.

8.5 Residents should contact the local authority to check if it is safe to return to their property. It may be several months before the property is habitable and fully dried out following a flood. Residents should regularly update their evacuation plan and check with the EA that the flood risk for the property has not changed. They should be aware of how to turn off the gas, electricity, and water mains supply.

9 LIKELY IMPACT ON FLOOD RISK ELSEWHERE

9.1 The site, as existing, is entirely impermeable surfacing (warehouse and tarmac yard). As such, the proposed development will decrease the impermeable surface area and therefore reduce the surface water runoff leaving the site by the area of the permeable paved outdoor communal areas and soft landscaped borders. This will slow, infiltrate and attenuate the runoff from the wider site and make it more sustainable, and decrease flood risk elsewhere inline with the SuDS hierarchy and NPPF section F7 1 and 2e. The use of the planted borders will filter the runoff, improving the quality of the water leaving the site, creating a betterment of the effluent leaving the sit compared with the existing scenario. Additionally, the topography of the existing site shows no areas that would be at risk of floods pooling at the site at present.

9.2 In terms of coastal flooding (Flood Zones) the loss of flood plain volume is not of significance as the sea is considered to an infinite volume, hence unaffected by flood plain loss; in terms of surface water (an issue for the site partly in the 1 in 100-year scenario and in the 1 in 1000-year scenario) there will be a loss of functional flood plain volume as a result of the preposed development. The loss has been calculated as 72.34 m^2. To mitigate this loss the area between the ground level and the finished floor level can be a hollow void with air bricks in the walls (to allow flood water flow) and supporting pillars up to the height of the FFL. The flood water would recede via the air bricks at the time of the flood's cessation.

10 EXISTING SITE DRAINAGE

10.1 The site was visited on Tuesday 10 and Tuesday 24 March 2026.

10.2 The site currently drains its surface water to the public surface water sewer, located in Marine Parade to the south of the site, via chamber 0453 and drains

its foul water to the public foul sewer located in the alleyway to the east of the site, adjacent to Bedford Row, via chamber number 0404. The mains public sewage system at the site is managed by Southern Water. See Appendix E for photographs of the manholes onsite and the surface water drainpipes form the existing building and Appendix F for the Southern Water sewer maps for the site.

11 SURFACE WATER DRAINAGE OPTIONS

11.1 There is a general requirement that new drainage systems should be sustainable (SuDS) and that flow leaving the site should not exceed the Greenfield flow rate, including both surface water and sewage effluent.

11.2 The area of impermeable surface will be decreased by the proposed redevelopment as the site is currently entirely impermeable, consisting of a warehouse and impermeable surfaced yard/parking area.

11.3 The proposed development will have an impermeable surface area of approximately 543 m^2 comprising the roof of the proposed building. The use of permeable paving in the communal area to the east and south, and the inclusion of soft landscaped borders in the communal area and ground floor private terraces, will reduce the surface water runoff and make the development more sustainable.

11.4 The Greenfield runoff rate for the site has been calculated using the UK SuDS tools. The results are shown in See Appendix C and summarised in Table 11.1 below:

TABLE 11.1
GREENFIELD RUNOFF RATES

Return period	**Flow rates (l/s)**
Qbar	0.1
1 in 1 year	0.1
1 in 2 year	0.1
1 in 10 year	0.1
1 in 30 year	0.2
1 in 100 year	0.3
1 in 200 year	0.3

11.5 The Supplementary Requirements for Surface Water Drainage Proposals (May 2022) provided by Adur and Worthing Councils states:

"Discharge to a watercourse or surface water sewer must be restricted to the estimated mean greenfield runoff rate (Qbar) for all design storm events. The calculations must be based on the positively drained area, rather than the entire greenfield site area. Runoff rates can be derived from IH124 or a similar approved method.

For brownfield sites, the same criteria applies. If it is deemed that this is not achievable, evidence must be provided and flow should be restricted to as close to Qbar as possible, with a minimum requirement of 50% betterment.

Flow restriction is to be achieved using a suitable controlled outflow with a minimum outflow of 2 l/s, unless otherwise agreed, with satisfactory blockage mitigation measures specified."

11.6 The site as existing has no permeable area and would be categorised as a brownfield site. Peak flow rates for the site as existing have been calculated in accordance with The SuDS Manual C753-8 and are summarised in Table 11.2 below:

TABLE 11.2
BROWNFIELD RUNOFF RATES

Return period	Flow rates (l/s)
1 in 10 year	4.91
1 in 20 year	5.91
1 in 30 year	6.49
1 in 50 year	7.23
1 in 100 year	8.28

11.7 It would not be practicable to reduce the maximum discharge rate to the Qbar Greenfield flow rate. However, discharged surface water via a flow-controlled vortex valve could be restricted to the lowest currently practicable outflow of 2 l/s which would result in a betterment of the existing rate of over the minimum requirement of 50%.

11.8 According to the SuDS manual, UK runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:

- *priority 1: collected for non-potable use*
- *priority 2: infiltrated to ground*
- *priority 3: discharged to an above ground surface water body*
- *priority 4: discharged to a surface water sewer, or another piped surface water drainage system*
- *priority 5: discharged to a combined sewer*

(priority 1 is the highest priority and priority 5 is the lowest.)

11.9 In this instance rainwater harvesting is impracticable due to the size of the site and the proposed building (*discounting collection for the non-potable use*). The inclusion of permeable paving in the communal area will allow some of the surface water to *infiltrate to the ground*, making the development more sustainable, and the use of planted borders along the eastern and southeastern

boundaries will help to reduce the runoff from the site and improve the quality of the water leaving the site.

11.10 Discharge to soakaway requires suitably permeable ground. The soil at the site is Lewes Nodular Chalk Formation - Chalk bedrock with superficial River Terrace Deposits (variable-good permeability), and suitable for soakaway drainage. However, standard building regulations and best practice guidelines, such as BS 8301, require soakaways to be located at least 5 metres away from any building or road, and at least 2.5 metres from a property boundary. As the distance from the boundary to the east is less than 5 m is not practicable to drain the surface water from the site to soakaway/infiltration drainage.

11.11 The alternative to drainage to soakaway is drainage to attenuation storage where excess surface water is stored on site, either in a pond, gully, swale or underground attenuation storage unit. The surface water is allowed to discharge at a maximum of the Greenfield 1 in 1-year flow rate (or as near as practicable) via a flow-control vortex valve or orifice plate into a nearby watercourse. In this case, as there is no suitable *above ground surface water body* in the vicinity of the site, it is proposed to drain to the surface water sewer that lies at the entrance to Marine Place from Marine Parade via chamber 0453, as with the existing scenario. The above-mentioned '2.5 m from a building and 5 m from a boundary rule' also relates to attenuation storage but, does not apply if the attenuation unit is sealed: i.e. a sealed crate or attenuation pipe. This is the preferred method of disposal of surface water from the developed site inline with the SuDS hierarchy. The use of water butts on the drainpipe down pipes for use in watering the landscaped areas would further reduce the runoff from the site.

11.12 A suitable area to locate a sealed, underground attenuation crate would be the communal area to the east of the proposed building. The attenuation crate would need to accept any surface water runoff from the roof of the proposed building.

11.13 Section 18, Policy F8 the NPPF August 2026 states:

"Development proposals which could affect drainage on or around the development site should incorporate sustainable drainage systems to control flow rates and reduce volumes of runoff in ways which are proportionate to the nature and scale of the proposal. The systems employed should provide multifunctional benefits where possible, facilitating improvements in water quality, biodiversity and amenity."

11.14 The use of permeable paving in the communal area and ground floor terraces will infiltrate and slow the runoff from the site. Included in the design are two proposed planted borders along the eastern and southeastern boundaries of the site as well as in the private ground floor terraces. These are sustainable landscaping features that combine functional benefits with the structural and aesthetic advantages to the development. The borders will intercept, slow, and filter stormwater runoff and increase the biodiversity by improving the quality of the surface water exiting the site, this is inline with the NPPF section N2 1e (*"Use green infrastructure provided as part of the scheme and nature-based solutions to secure multiple benefits").* Additional SuDS measures to mitigate

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the impact of the development by decreasing the runoff flow rates and increasing sustainability could include water butts off the drainpipe downpipes.

11.15 A suitable sized sealed underground attenuation crate would be 2 m x 26 m x 0.8 m deep as calculated by the MasterDrain drainage network model. The attenuation storage unit will be located in the communal area to the east of the proposed building, running parallel to Bedford Row. The surface water runoff from the roof of the building will be drained into this before discharging via a flow-controlled device, limiting the flow to 2 l/s, (the small size of the communal area limits the use of a lower output device due to the resulting increase in crate size) into the surface water chamber 0453, managed by Southern Water. Detailed plans of the proposed drainage strategy are shown in Figure 4 and output from the drainage design model can be seen in Appendix D.

11.16 **Design Storm**

The surface water drainage system has been designed for the 3.33% Annual Exceedance Probability, 1 in 30-year return period event plus a 40% allowance for climate change and 10% urban creep. The surface water drainage system has been tested for surcharge for 100% AEP (1 in 1 year), 3.33% AEP (1 in 30 year), 3.33% AEP (1 in 30 year) plus 45% allowance for climate change, the 1% AEP (1 in 100 year) and the 1% AEP (1 in 100) plus 45% allowance for climate change. See Appendix A, Figure 4 for the detailed plans of the proposed drainage strategy and Appendix D for pipe and chamber layout and sizing of the drainage field from the MasterDrain model.

11.17 **Drainage Design Model**

The attenuation crate is to be a sealed unit (wrapped in non-permeable membrane) and as such will not need to adhere to the ‘not less than 5 m from the edge of the nearest building and 2.5 m from the nearest boundary’ rule. The chosen location is in the communal area to the east of the proposed building running parallel with the boundary with Bedford Row. See Figure 4 in Appendix A for detailed plans of the drainage arrangement.

The attenuation crate consists of modular, high-strength plastic structures designed for underground stormwater management. They form a robust, lightweight, interlocking grid that creates a large, high-void ratio (over 95%) underground reservoir. These crates temporarily store rainwater, releasing it slowly into a watercourse (in this case the Southern Water surface water sewer). The crates are wrapped in a non-permeable membrane to create a sealed unit. The attenuation crate has been sized at 2 m x 26 m x 0.8 m deep.

The drainage arrangement has been designed using the MasterDrain network drainage model.

11.16 **Hydrological Data**

Hydrological data for the site as used in the MasterDrain model is given in Appendix D.

11.17 **Extreme Event**

An extreme event, which overwhelmed the drainage system, would likely result in water flowing south across the surface of the ground with the topography of the land towards Marine Parade and the sea, utilising the surface water drains in the Marine Place and Marine Parade to drain into the Southern Water mains public sewer system.

12 PROPOSED FOUL DRAINAGE

12.1 The site as existing drains its foul water to the mains public foul sewer managed by Southern Water via chamber 0404 located in the alleyway to the east of the site running parallel with Bedford Row. It is proposed to drain the foul water from the developed site via the same route. This will need a capacity check from Southern Water. The developer should apply for a capacity check prior to commencing development. See Appendix F for the Thames Water Sewer Plans for the site and Figure 4 in Appendix A for the plans of the drainage strategy.

13. DRAINAGE DESIGN SUMMARY

13.1 The surface water chamber sizes, invert levels and pipe sizes from the MasterDrain model are summarised in Table 13.1 below:

TABLE 13.1
SURFACE WATER CHAMBERS

No.	Dia (mm)	Cover level (mAOD)	Invert level (mAOD)	Pipe dia in (mm)	Pipe dia out (mm)
SW1	900	4.71	4.21	100	100
SW2	900	4.64	3.71	100	100
SW3	900	4.65	3.21		
Attenuation Crate	N/A	4.65	2.71	100	-
SW4 (2 l/s Flow Control)	900	4.65	2.40	100	100
SW5	900	4.53	2.05	100	100
0453	1200	4.43	1.59	-	-

13.2 The foul sewage chamber sizes, invert levels and pipe sizes are given in Table 13.2 below:

TABLE 13.2
FOUL SEWAGE CHAMBERS

No.	Dia (mm)	Cover level (mAOD)	Invert level (mAOD)	Pipe dia in (mm)	Pipe dia out (mm)
FW1	900	4.71	4.21	100	100
FW2	1200	4.64	3.67	100	100
FW3	1200	4.65	3.88	100	100
FW4	1200	4.65	4.03	100	100
0404	N/A	4.53	2.00	100	-

14 OPERATION AND MAINTENANCE OF THE SYSTEM

14.1 The drainage system will generally require minimal operational input once construction has been completed. However, it will require some regular maintenance.

14.2 Items requiring maintenance will include:

- Chambers (including any flow control devices) will require regular removal of any debris likely to obstruct and checking for any structural damage to the chamber or cover. Cleaning requires removing sediment, silt, and obstructions, using high-pressure water jets or manual clearing. Ensure covers are secure and airtight to prevent odour, rodent, or water ingress. Maintenance should be carried out annually at the time of year after most leaf fall has occurred.

- Any gullies, pipes and channels will need regular removal of accumulated debris and silt. Annual cleaning (or 3-6 months for high-debris areas) to remove leaves, sediment, and litter, to prevent blockages, odours, and flooding. Preventative measures like silt traps or drain guards will aid maintenance.

- The permeable surfacing will require regular cleaning to prevent clogging and ensure drainage, typically involving annual inspections, brushing to remove debris, and vacuuming or pressure washing to clear joints of moss and debris and ensure the permeability is maintained.

- The attenuation crate will need annual, inspections and cleaning of inlet and outlet pipes to remove accumulated silt, debris and pollutants, prevent clogging and to check for and repair any structural issues.

15. SUMMARY OF CONCLUSIONS

15.1 The site comprises a disused warehouse building to the north and a yard/parking area to the south. It is located in an urban location to the north of Worthing seafront, West Sussex.

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15.2 It is proposed to redevelop the site after the demolition of the existing building, into a three-storey residential building comprising 27 one-bedroom apartments with communal areas. Access to the site is via an existing entrance from Marine Place to the west. See Figure 3 in Appendix A for the proposed site layout.

15.3 According to the British Geological Survey website the site lies on Lewes Nodular Chalk Formation - Chalk bedrock with superficial River Terrace Deposits (Undifferentiated) - Sand, silt and clay.

15.4 According to the Environment Agency's Flood Maps for Planning, the site lies in Flood Zone 3 (High risk of flooding from tidal sources where defences are not considered / >3.3% AEP of flooding in any given year). The site is not shown to be at risk of surface water flooding in the 1 in 30-year scenario but has a section of surface water flood risk in the southwestern corner of the site in the 1 in 100-year scenario which increases in the 1- in 1000-year to encompass the whole site. Groundwater and reservoir flooding at the site is considered unlikely at this location. There does not appear to be any history of sewer flooding at the site. See Appendix B for the flood maps for the site.

15.5 The site is protected from tidal flooding by the Worthing Tidal Defences in the form of the shingle beach, which acts as a barrier against storm events, 144 timber and 11 rock groynes that trap sediment and prevent erosion of the beach. There is also a Splash Wall and wide beach zone further southwest of the site. The site lies in a long-established residential area and is a redevelopment of an existing building. As such it can be considered that the future users of the site will be protected from flood risk by the sea defences as with the existing scenario and that of the neighbouring residential dwellings. Should an extreme flood event occur in which tidal defences were breached the future resident would be able to follow the evacuation route detailed in section 8 of this report to escape onto dry land or use the internal invacuation route to the first floor via the internal staircases. In order to safeguard the property for its lifetime the finished floor level should be 0.6 m above the estimated flood level, which in the defended scenario 0.5% (2070) from the EA's product 4 is 5.21 m AOD or 0.3 m above the average ground level of the site or adjacent road level, whichever is greater. Which means that the site should have a finished floor level (FFL) of 5.81 m AOD. Flood resistant materials should be used in the construction of the ground floor, such as floor resistant paint, raised socket levels and installing non-return valves to prevent sewer backflow.

15.6 The proposed development includes permeable paving in the communal area to the east and south of the building and planted borders along the eastern and southeastern boundaries and in the ground floor private terraces. These measures help keep the impact of the development on flood risk elsewhere to a minimum, making the development more sustainable inline with the SuDS hierarchy.

15.7 The preferred method for the disposal of surface water is drainage to a sealed underground attenuation storage crate, draining via a flow-controlled device limiting the flow to 2 l/s and draining into the public surface water chamber number 0453 located in the entrance to Marine Place from Marine Parade and managed by southern Water. The attenuation crate is to be located in the

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communal area to the east of the proposed building. A suitable sized attenuation crate would be 2 m x 26 m x 0.8 m deep. This is the preferred method for the disposal of surface water inline with the SuDS hierarchy when taking into consideration the limitations of the size and location of the site and building.

15.8 The use of permeable paving for the areas of hardstanding in the communal area, and the inclusion of planted borders along the boundaries to the east and southeast and in the private ground floor terraces, will reduce the non-permeable area in the development, slowing the runoff from the site and increasing the sustainability as well as improving the quality of the water leaving the site inline with the current NPPF guidelines.

15.9 An extreme event overtopping the system would likely follow the topography of the land and flow south towards Marine Parade and the sea utilising the surface water drains in the Marine Place and Marine Parade to drain into the Southern Water mains public sewer system.

15.10 The foul water at site is currently drained into the Southern Water mains sewage system via chamber 0404 located in the alleyway to the east of the site and adjacent to Bedford Row. It is proposed to drain the foul water from the developed site into this chamber. This will require a capacity check from Southern Water.

☆ ☆ ☆ ☆ ☆ ☆ ☆

APPENDIX A:

Figure 1: Site Location
Figure 2: Site as Existing
Figure 3: Proposed Development
Figure 4: Suggested Drainage Arrangement

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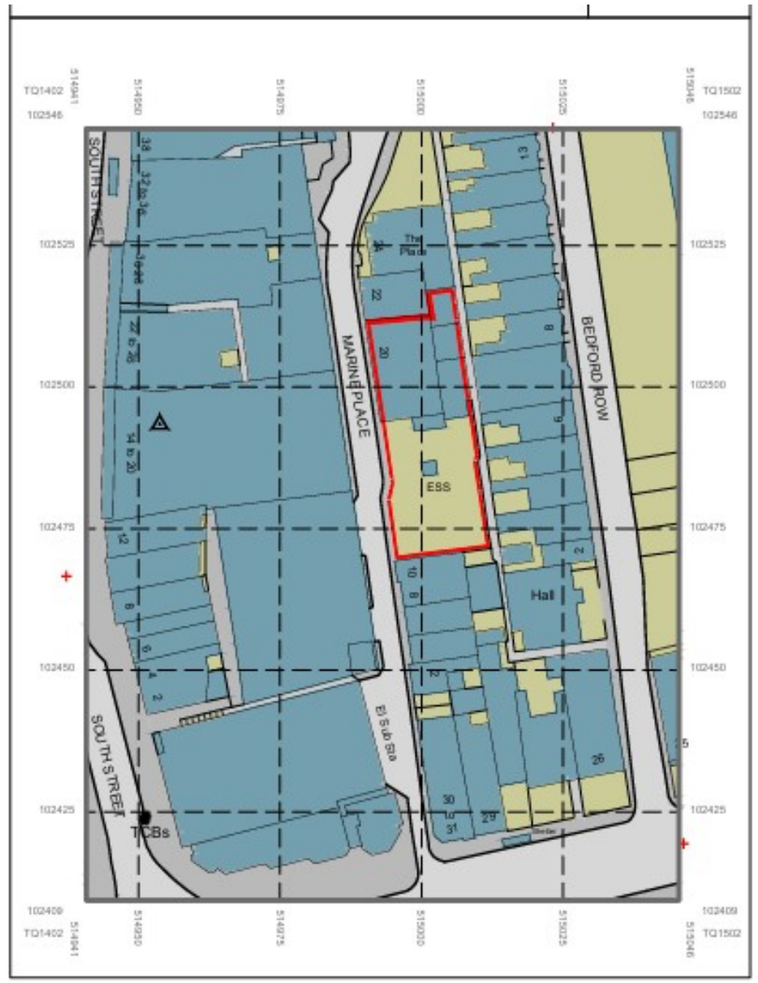


+LP Location Map 1:1250

Scale in Metres 1:1250

0 10 20 30 40 50

Craig Construction Services

10-20 Marine Place, Worthing, West Sussex, BN11 3DN

Figure 1: Location

Scale as shown

March 2026



Scale as shown

Craig Construction Services

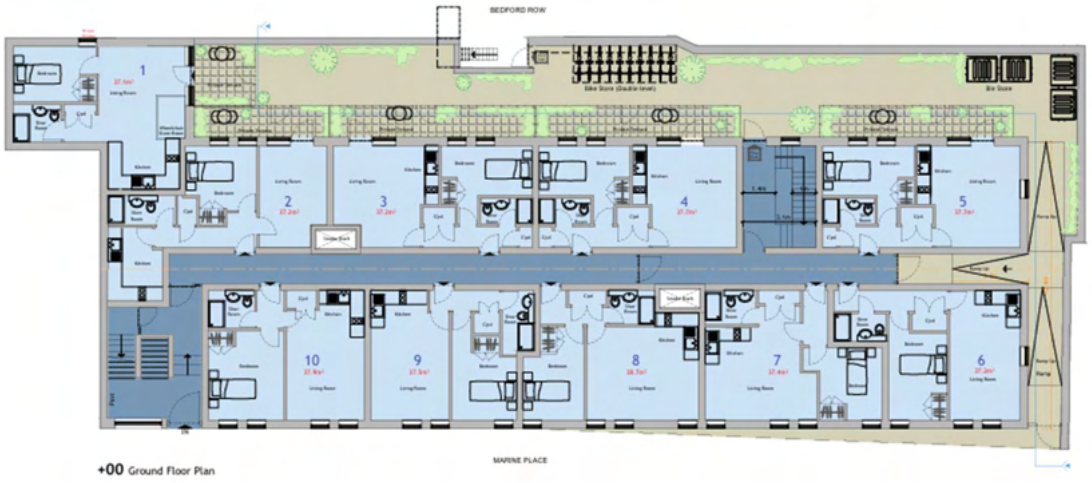
10-20 Marine Place, Worthing, West Sussex, BN11 3DN

Figure 2: Site As Existing

March 2026

Figure 3: Proposed Development

Ground Floor



First Floor



Second Floor



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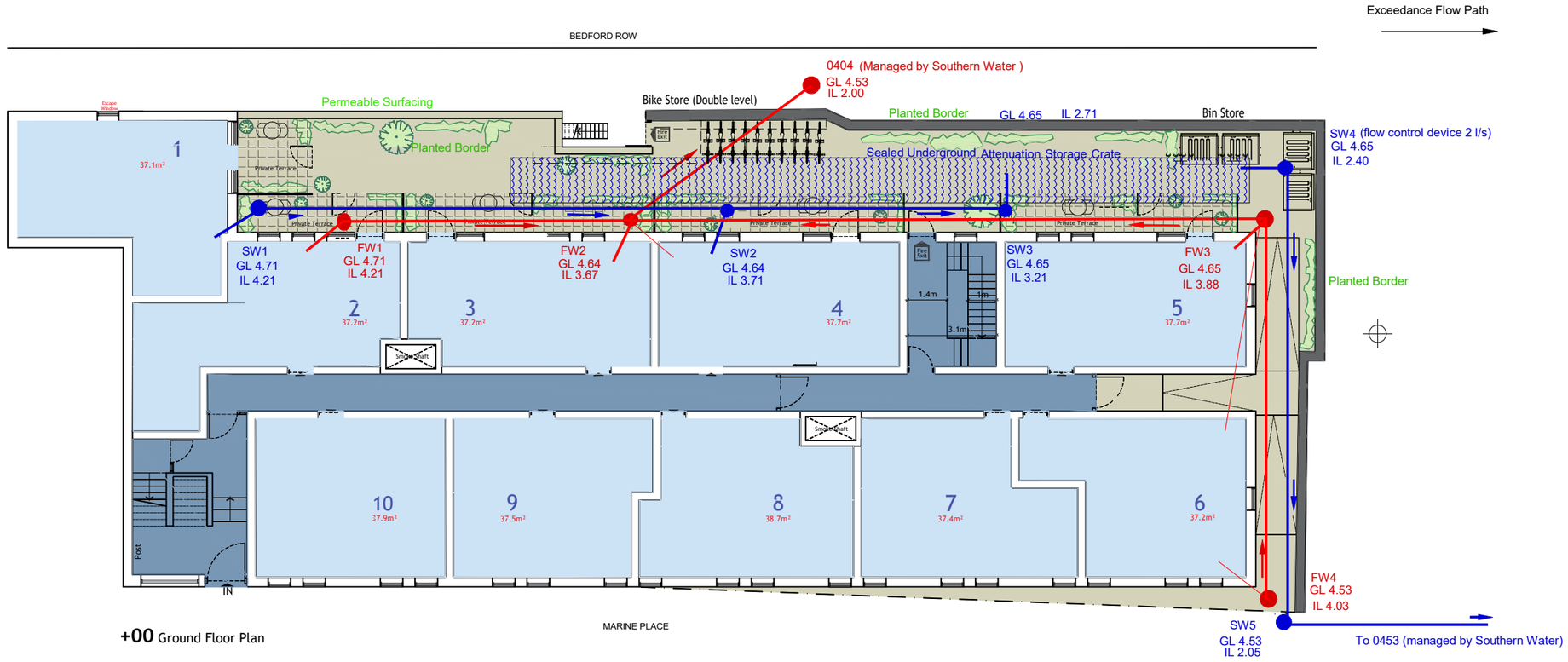

Craig Construction

Scale as Shown

10-20 Marine Place, Worthing, BN11 3DN

Figure 4: Drainage Design

September 2026

APPENDIX B:

ENVIRONMENT AGENCY FLOOD MAPS FOR PLANNING

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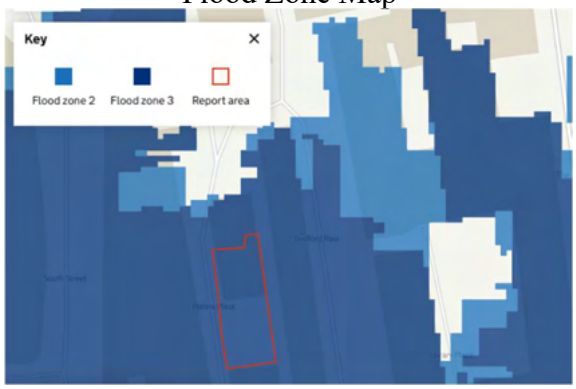
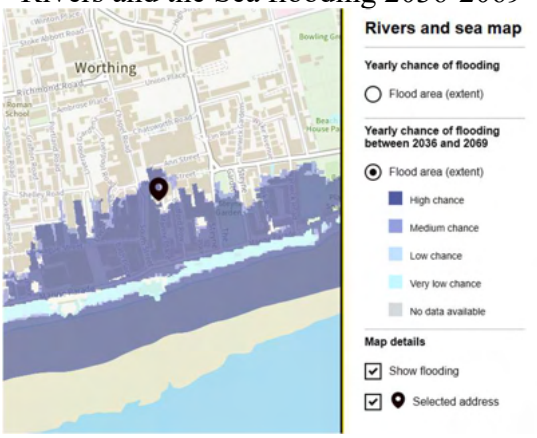
Flood Zone Map



Long-term Flood Zone Map (2070-2125)



Rivers and the Sea flooding 2036-2069



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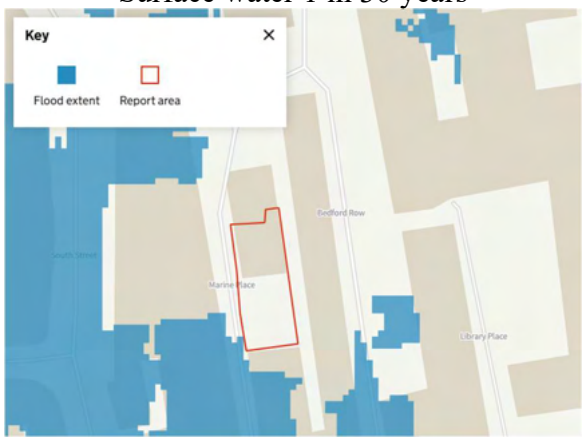
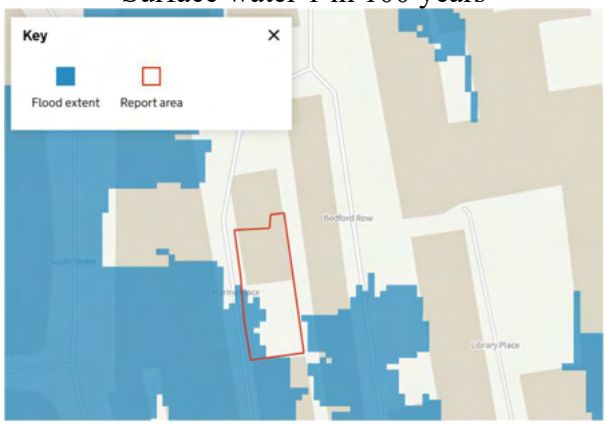
Surface water 1 in 30 years



Surface water 1 in 100 years



Surface water 1 in 1000 years



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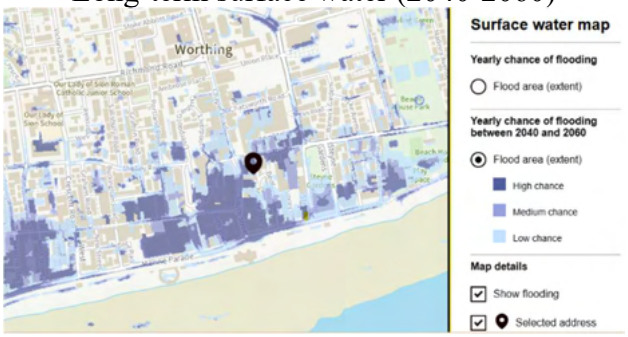
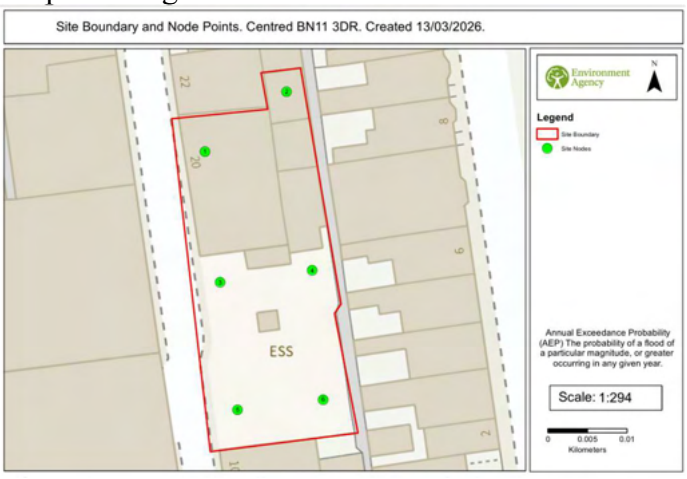
Long-term surface water (2040-2060)



Map of the beech groynes to the south of the site



Map showing EA modelled node locations at the site



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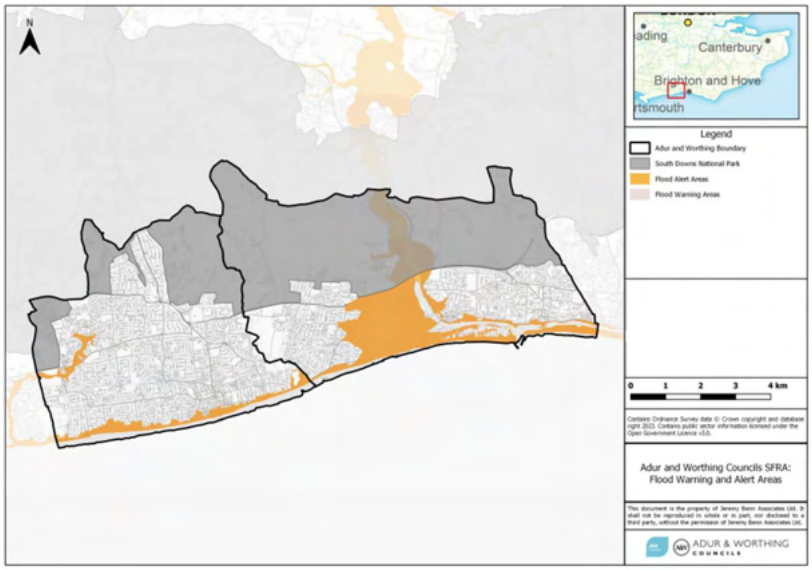
Worthing and Adur Flood Alert map



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APPENDIX C:

HR WALLINGFORD GREENFIELD FLOW RATES

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Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

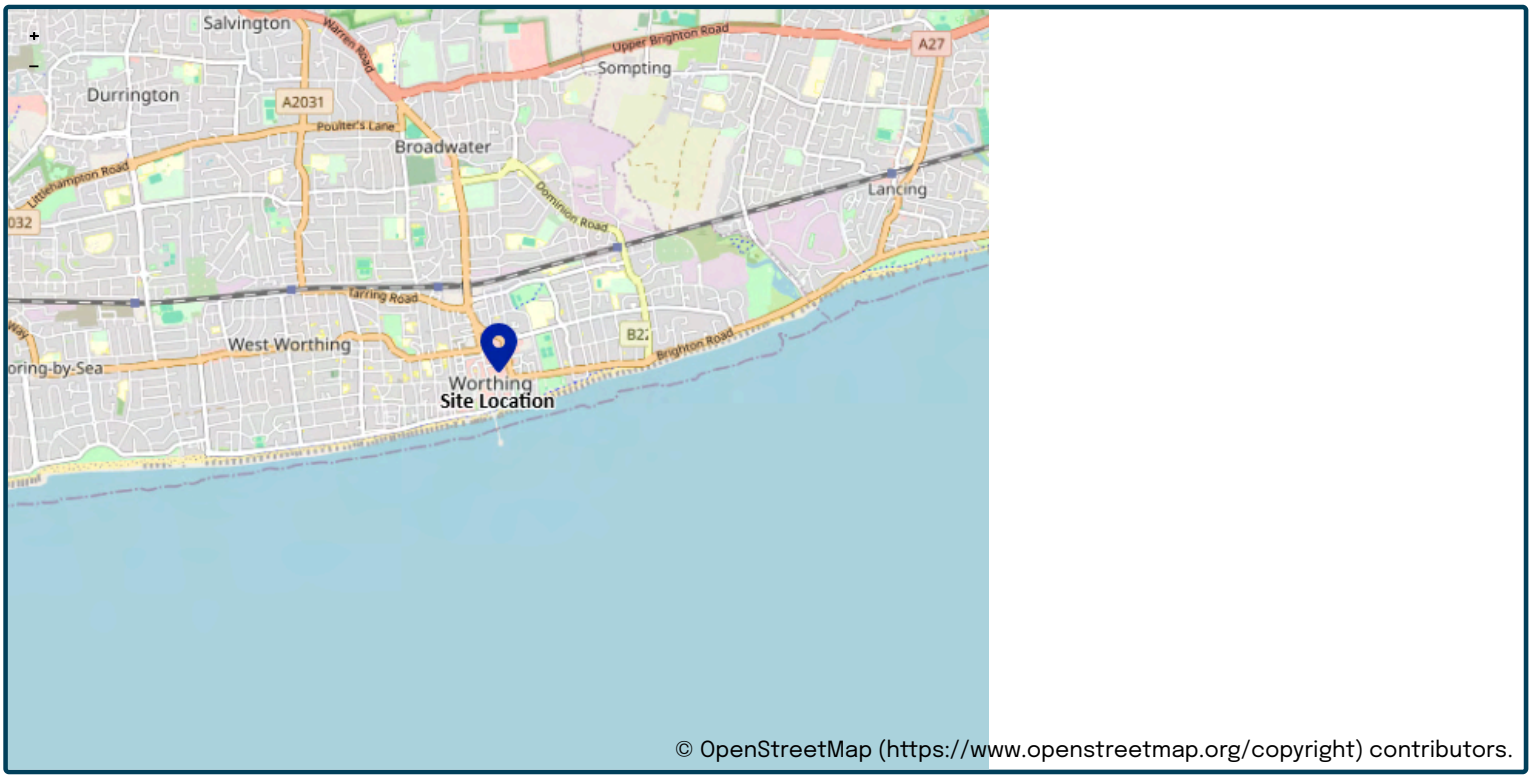
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015).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

Project details

Date	16/09/2026
Calculated by	EAS Ltd
Reference	883
Model version	2.2.3

Location

Site name	Marine Place
Site location	Worthing



Site easting (British National Grid)	514999
Site northing (British National Grid)	102507

Site details

Total site area (ha)	0.08 ha

Greenfield runoff

Method

Method	FEH statistical (2025)

FEH statistical (2025)

	My value		Map value
SAAR9120 (mm)	949 mm		
BFIHOST19scaled	0.873		
QMed-QBar conversion	1.136		1.136
QMed (l/s)	0.1 l/s		
QBar (FEH statistical 2025) (l/s)	0.1 l/s		

Growth curve factors

	My value		Map value
Hydrological region	7		7
1 year growth factor	0.85		
2 year growth factor	0.88		
10 year growth factor	1.62		
30 year growth factor	2.3		
100 year growth factor	3.19		
200 year growth factor	3.74		

Results

Method	FEH statistical (2025)
Flow rate 1 year (l/s)	0.1 l/s
Flow rate 2 year (l/s)	0.1 l/s
Flow rate 10 years (l/s)	0.1 l/s
Flow rate 30 years (l/s)	0.2 l/s
Flow rate 100 years (l/s)	0.3 l/s
Flow rate 200 years (l/s)	0.3 l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at uksuds.com (https://www.uksuds.com/). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (https://www.uksuds.com/terms-conditions). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

APPENDIX D:

OUTPUT FROM DRAINAGE DESIGN SOFTWARE AND DRAINAGE FIELD INFILTRATION CALCULATIONS

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MasterDrain SW

Job No.	833
Sheet no.	1
Date	16/09/26
Project	Marine Place
Title	Surcharge calcs for MARINE PLACE.SW CCF = 45%

By	Checked	Reviewed

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 45

PEAK hydrograph values printed
Storm duration = 15 mins
No offline storage

Mean rain intens. 272.00 mm/hr
Storm profile = Summer
Using FEH data

Peak rain intens. 1066.24 mm/hr
Sample period = 7.5 secs.

Entry No.		SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	SURCHARGE Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) x FACTOR	STATUS
1	I	1.01	SW1	31.0	20.7	150	900	4.21	4.31	4.71	0.67	0.10	0.00	0.000	170	OK
2	I	1.02	SW2	39.9	41.5	150	900	3.71	3.88	4.64	1.04	0.17	1.53	0.000	340	Surch.
3	I	1.03	SW3	103.6	62.2	150	900	3.21	3.30	4.65	0.60	0.09	0.00	0.000	510	OK
4	I	1.04N	STORAGE	56.6	62.2	150	1200	2.71	2.90	4.65	1.10	0.19	5.61	0.000	510	Surch.
5	I	1.05	SW4‡	17.6	2.0	100	900	2.40	2.42	4.65	0.11	0.02	0.00	0.000	510	OK
6	I	1.06	SW5	6.8	0.0	100	900	2.05	2.05	4.53	0.00	0.00	0.00	0.000	0	OK

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MasterDrain SW

Job No. 833			
Sheet no. 2			
Date 16/09/26			
Project Marine Place	By	Checked	Reviewed
Title Surcharge calcs for MARINE PLACE.SW CCF = 45%			

Notes

Printout headings

1) Entry no - position in file
2) Section no - pipe identifier
3) Manhole ref - Manhole identifier
4) Pipe cap - full bore capacity of that pipe
5) Rate of flow - calculated flow rate (l/s) ‡ = flow restrictor.
6) Pipe diam - outlet pipe diameter (mm)
7) Chamber diam - chamber diam. at base of MH
8) Invert level - invert level of manhole
9) Water level - calculated peak water level.
10) Grnd level - ground / cover level
11) Surch. fract - calc.flow/pipe capacity
12) Surch. depth - surcharge level above soffit
13) Overflow - surcharged flow rate (l/s)
14) Flooded vol - volume of water above cover
15) Upstrm Vol - upstream pipe vol to previous manhole(s)
16) Status - OK - outlet not surcharged
17) Status - Surcharged - outlet surcharged
18) Status - Warning - water level within 299mm of cover level
19) Status - Flooded - cover over-topped
20) § against diameter indicates throttle pipe used.

Title box

Hydrograph data

1) Ret. period - that used to calculate profile
2) Duration - length of storm (mins)
3) Profile - either Winter (75%) or Summer (50%)

Flow restrictors

Manhole reference - SW4

Restrictor flowrate - 2 l/s

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Job No.	Sheet no.	Date	By	Checked	Reviewed
833	3	16/09/26			

MasterDrain SW

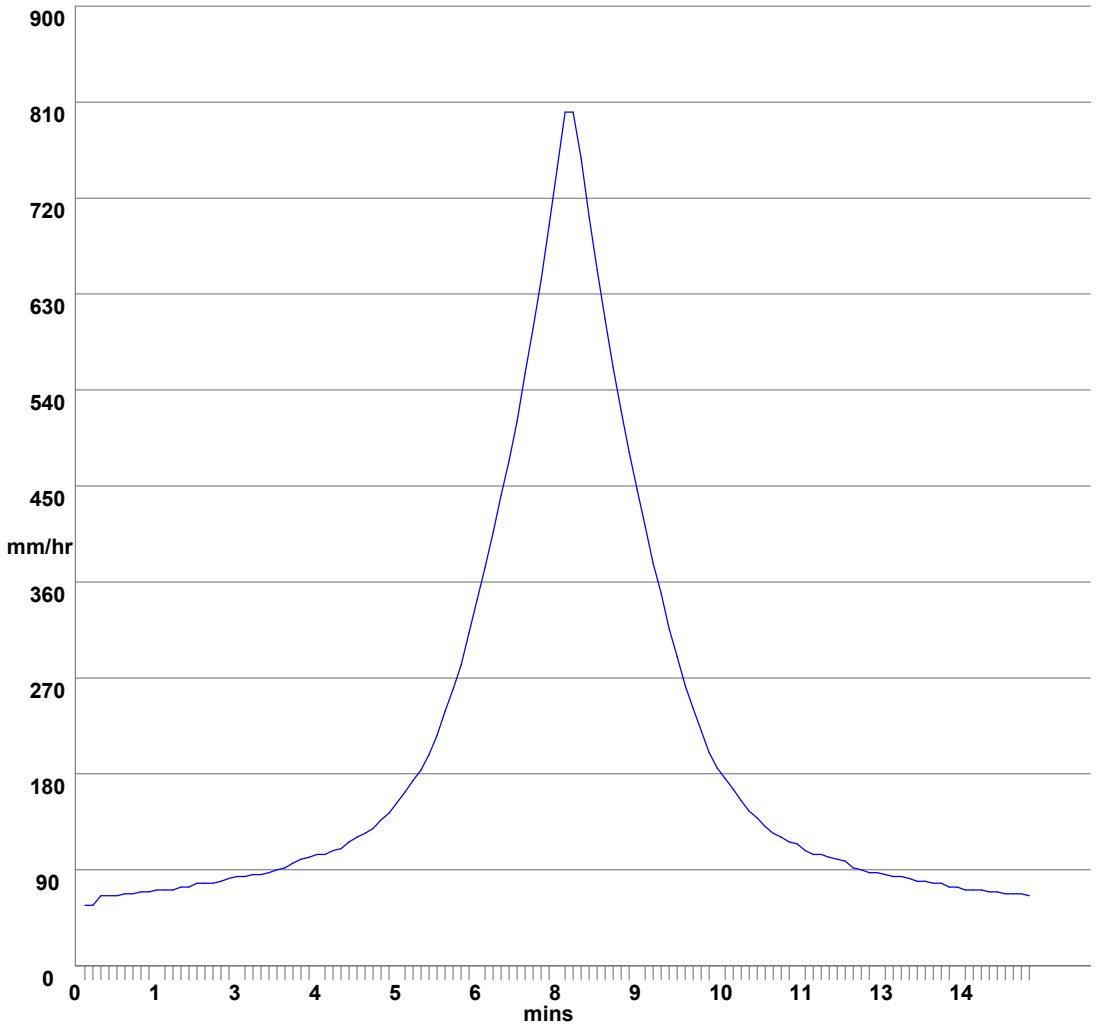
Project: Marine Place

Title: Surcharge calcs for MARINE PLACE.SW CCF = 45%

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:08	63.48	5:08	181.37	10:08	194.97
0:15	63.48	5:15	192.70	10:15	183.63
0:22	72.55	5:22	204.04	10:22	172.30
0:30	72.55	5:30	219.91	10:30	160.96
0:38	72.55	5:38	240.31	10:38	154.16
0:45	74.81	5:45	265.25	10:45	145.09
0:52	74.81	5:52	287.92	10:52	138.29
1:00	77.08	6:00	312.86	11:00	133.76
1:08	77.08	6:08	346.86	11:08	129.22
1:15	79.35	6:15	380.87	11:15	126.96
1:22	79.35	6:22	414.87	11:22	120.15
1:30	79.35	6:30	451.15	11:30	115.62
1:38	81.61	6:38	489.69	11:38	115.62
1:45	81.61	6:45	525.96	11:45	113.35
1:52	86.15	6:52	566.77	11:52	111.09
2:00	86.15	7:00	616.64	12:00	108.82
2:08	86.15	7:08	664.25	12:08	102.02
2:15	88.42	7:15	714.13	12:15	99.75
2:22	90.68	7:22	770.80	12:22	97.48
2:30	92.95	7:30	829.75	12:30	97.48
2:38	92.95	7:38	888.69	12:38	95.22
2:45	95.22	7:45	888.69	12:45	92.95
2:52	95.22	7:52	841.08	12:52	92.95
3:00	97.48	8:00	779.87	13:00	90.68
3:08	99.75	8:08	725.46	13:08	88.42
3:15	102.02	8:15	673.32	13:15	88.42
3:22	106.55	8:22	623.44	13:22	86.15
3:30	111.09	8:30	578.10	13:30	86.15
3:38	113.35	8:38	535.03	13:38	81.61
3:45	115.62	8:45	496.49	13:45	81.61
3:52	115.62	8:52	457.95	13:52	79.35
4:00	120.15	9:00	419.41	14:00	79.35
4:08	122.42	9:08	387.67	14:08	79.35
4:15	129.22	9:15	351.40	14:15	77.08
4:22	133.76	9:22	321.92	14:22	77.08
4:30	138.29	9:30	292.45	14:30	74.81
4:38	142.83	9:38	267.51	14:38	74.81
4:45	151.89	9:45	244.84	14:45	74.81
4:52	158.69	9:52	222.17	14:52	72.55
5:00	170.03	10:00	206.30	15:00	72.55

Hydrograph profile derived from data in the Flood Studies Report

Return period= 100 yrs Duration= 15 mins Profile - summer



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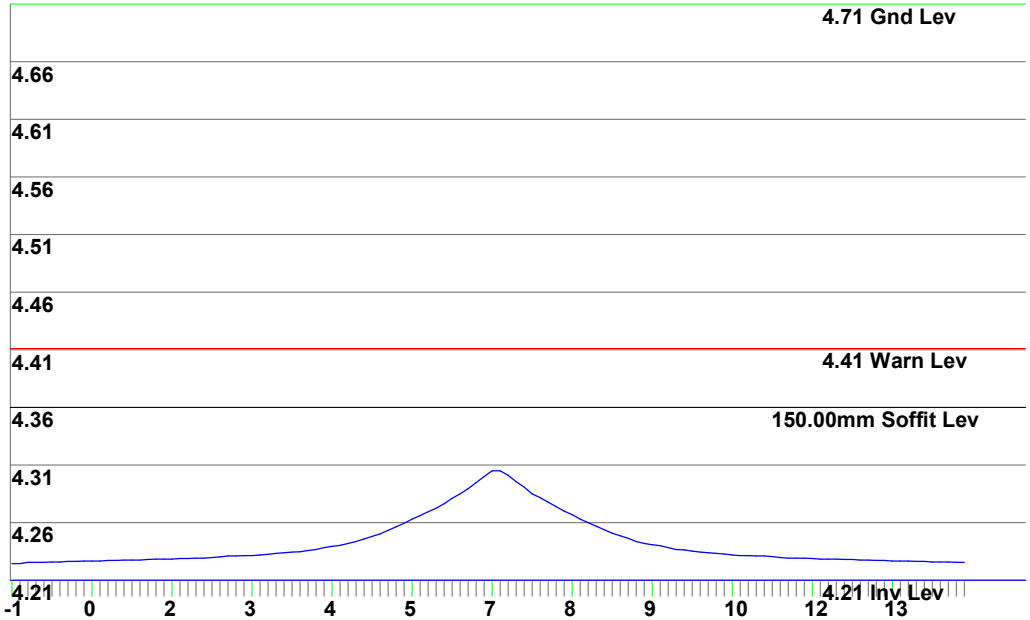
Job No.	833
Sheet no.	4
Date	16/09/26

MasterDrain SW

Project: Marine Place

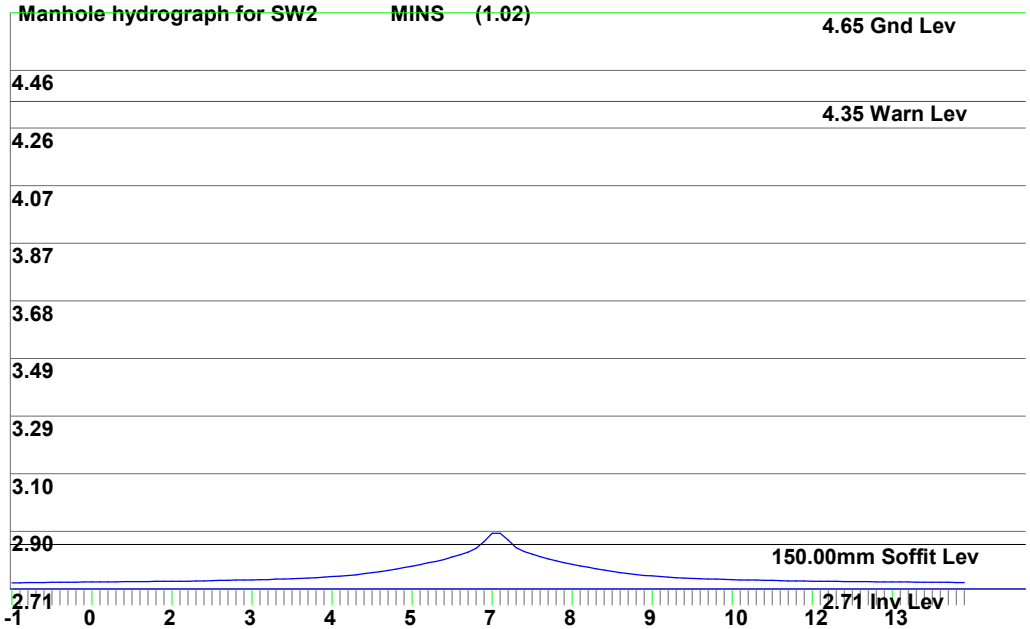
Title: Surcharge calcs for MARINE PLACE.SW CCF = 45%

By	Checked	Reviewed









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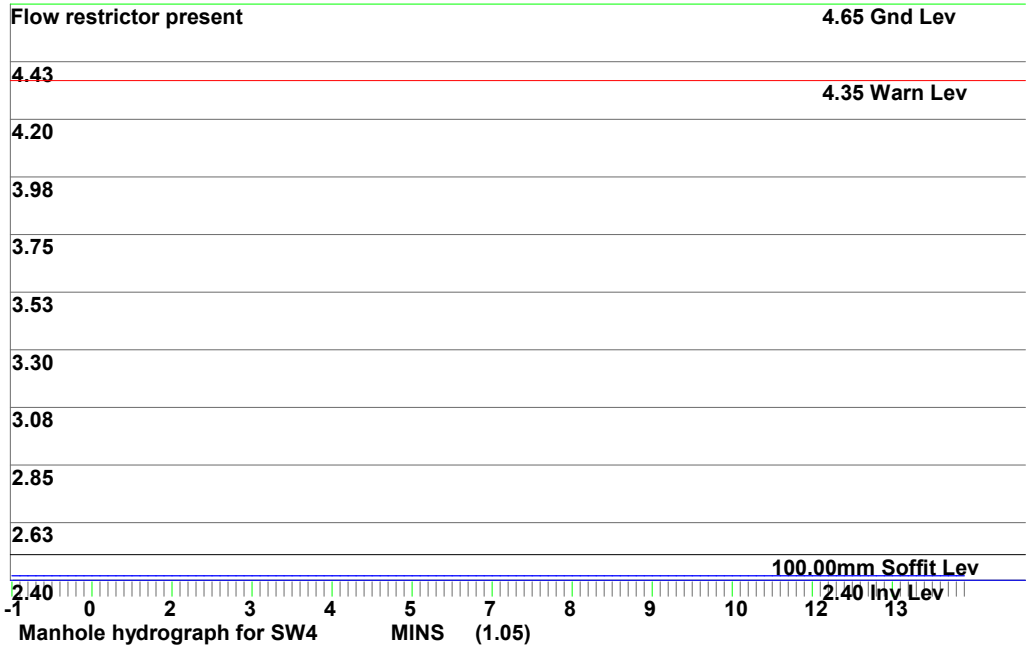
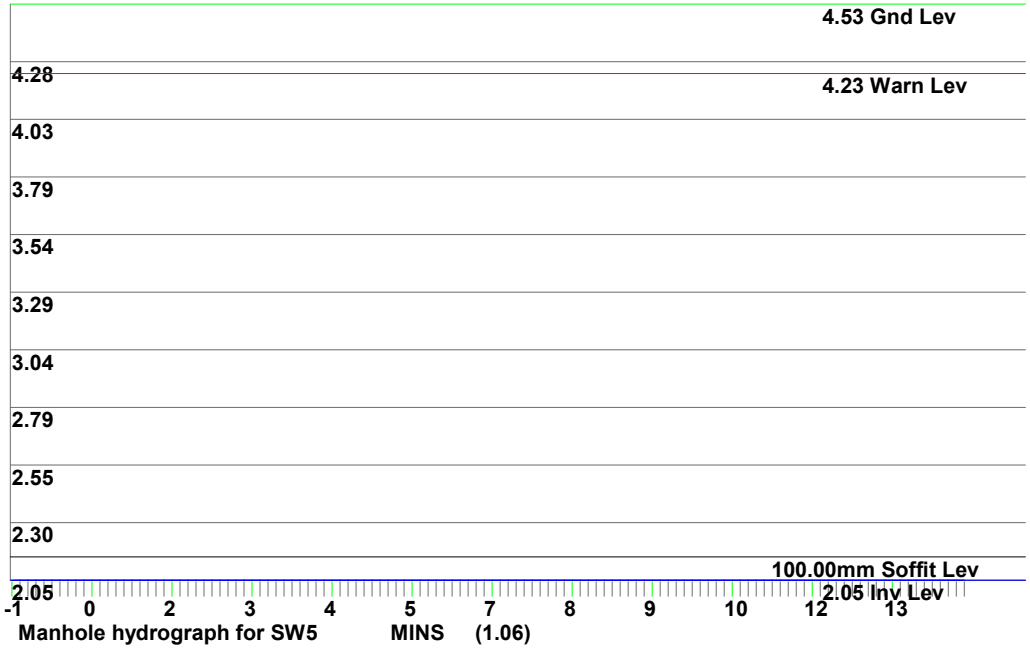
Job No.	833
Sheet no.	5
Date	16/09/26

MasterDrain SW

Project	Marine Place	By	Checked / Reviewed
Title	Surcharge calcs for MARINE PLACE.SW CCF = 45%		





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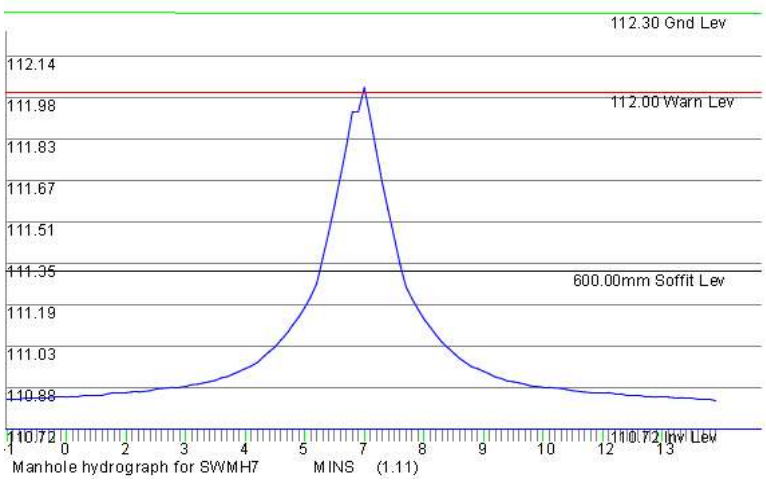
Job No. 833			
Sheet no. 6			
Date 16/09/26			
Project Marine Place	By	Checked	Reviewed
Title Surcharge calcs for MARINE PLACE.SW CCF = 45%			

MasterDrain SW



1) Ground / cover level

2) Warning level - in this case, set at 300mm below cover level.

3) Soffit level of outflow pipe.

4) Invert level of chamber.

Notes

a) Lower section of the graph shows the water depth filling the channel. Channel is assumed to be a full pipe diameter in depth.

b) Upper section of the graph shows the water depth filling the chamber. Chamber has a greater width/diameter than the channel, so increases in depth are proportionally less.

c) The top of the graph clips the warning level and would be marked thus on the printout.

d) In many cases the invert of the offline storage is required to enter at the channel soffit level, meaning that the pipe will still surcharge but flooding risk reduced.

e) The diagram above is a general one and is not part of the current calculation.

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MasterDrain SW

Job No.	833
Sheet no.	1
Date	16/09/26
Project	Marine Place
Title	Surcharge calcs for MARINE PLACE.SW

By	Checked	Reviewed

Using in-line restrictors PEAK hydrograph values printed Mean rain intens. 129.00 mm/hr Peak rain intens. 505.68 mm/hr
Return period = 100 yrs Storm duration = 15 mins Storm profile = Summer Sample period = 7.5 secs.
Climate change factor = 0 No offline storage Using FEH data

Entry No.		SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	SURCHARGE Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) x FACTOR	STATUS
1	I	1.01	SW1	31.0	9.9	150	900	4.21	4.26	4.71	0.32	0.05	0.00	0.000	170	OK
2	I	1.02	SW2	39.9	19.7	150	900	3.71	3.79	4.64	0.49	0.08	0.00	0.000	340	OK
3	I	1.03	SW3	103.6	29.6	150	900	3.21	3.26	4.65	0.29	0.05	0.00	0.000	510	OK
4	I	1.04N	STORAGE	56.6	29.6	150	1200	2.71	2.79	4.65	0.52	0.08	0.00	0.000	510	OK
5	I	1.05	SW4‡	17.6	2.0	100	900	2.40	2.42	4.65	0.11	0.02	0.00	0.000	510	OK
6	I	1.06	SW5	6.8	0.0	100	900	2.05	2.05	4.53	0.00	0.00	0.00	0.000	0	OK

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Job No.	833
Sheet no.	2
Date	16/09/26

MasterDrain SW

Project	Marine Place	By	Checked / Reviewed
Title	Surcharge calcs for MARINE PLACE.SW		

Notes

Printout headings

1) Entry no - position in file
2) Section no - pipe identifier
3) Manhole ref - Manhole identifier
4) Pipe cap - full bore capacity of that pipe
5) Rate of flow - calculated flow rate (l/s) ‡ = flow restrictor.
6) Pipe diam - outlet pipe diameter (mm)
7) Chamber diam - chamber diam. at base of MH
8) Invert level - invert level of manhole
9) Water level - calculated peak water level.
10) Grnd level - ground / cover level
11) Surch. fract - calc.flow/pipe capacity
12) Surch. depth - surcharge level above soffit
13) Overflow - surcharged flow rate (l/s)
14) Flooded vol - volume of water above cover
15) Upstrm Vol - upstream pipe vol to previous manhole(s)
16) Status - OK - outlet not surcharged
17) Status - Surcharged - outlet surcharged
18) Status - Warning - water level within 299mm of cover level
19) Status - Flooded - cover over-topped
20) § against diameter indicates throttle pipe used.

Title box

Hydrograph data

1) Ret. period - that used to calculate profile
2) Duration - length of storm (mins)
3) Profile - either Winter (75%) or Summer (50%)

Flow restrictors

Manhole reference - SW4

Restrictor flowrate - 2 l/s

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Job No.	833
Sheet no.	3
Date	16/09/26

MasterDrain SW

Project: Marine Place

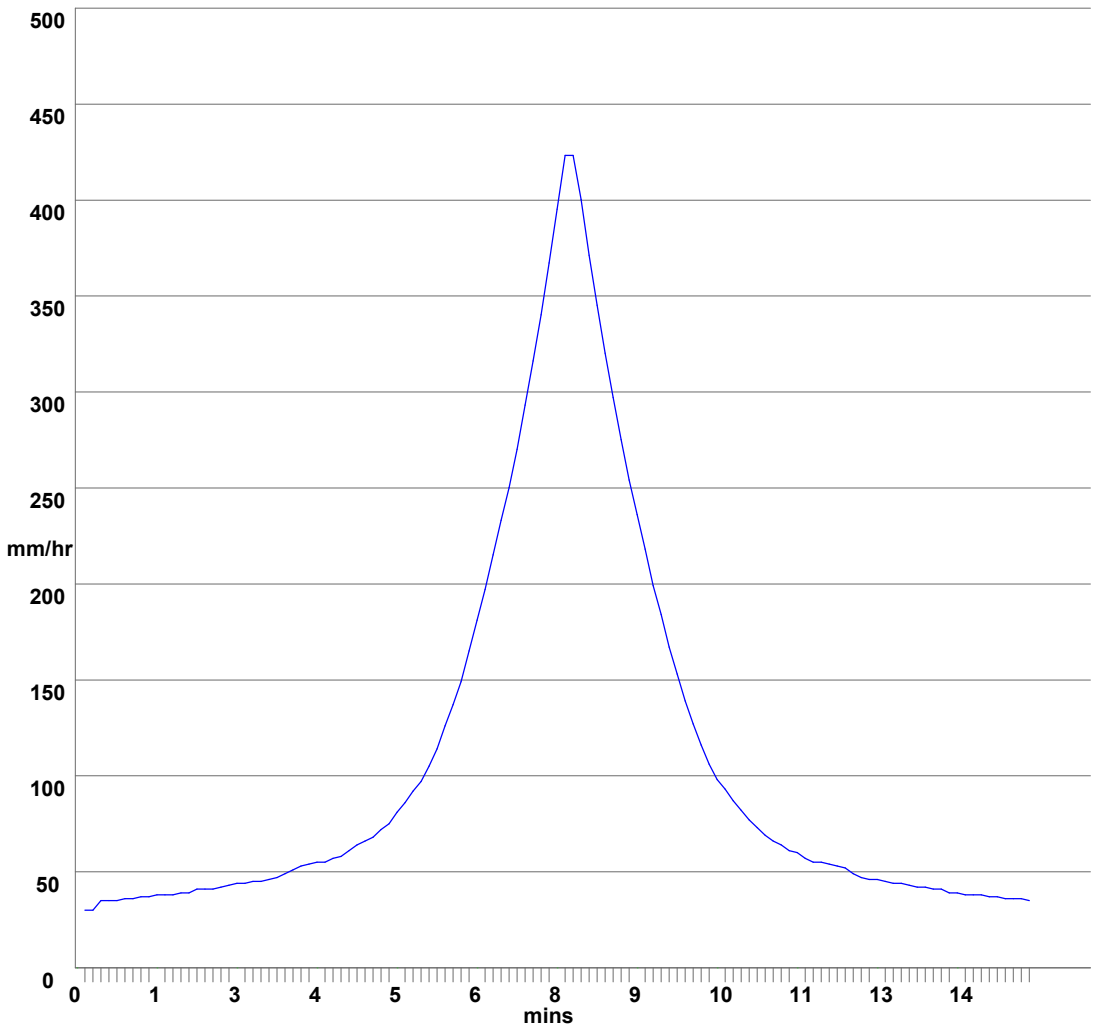
Title: Surcharge calcs for MARINE PLACE.SW

By	Checked	Reviewed

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:08	30.19	5:08	86.26	10:08	92.73
0:15	30.19	5:15	91.65	10:15	87.34
0:22	34.50	5:22	97.04	10:22	81.95
0:30	34.50	5:30	104.59	10:30	76.56
0:38	34.50	5:38	114.30	10:38	73.32
0:45	35.58	5:45	126.16	10:45	69.01
0:52	35.58	5:52	136.94	10:52	65.77
1:00	36.66	6:00	148.80	11:00	63.62
1:08	36.66	6:08	164.98	11:08	61.46
1:15	37.74	6:15	181.15	11:15	60.38
1:22	37.74	6:22	197.32	11:22	57.15
1:30	37.74	6:30	214.58	11:30	54.99
1:38	38.82	6:38	232.91	11:38	54.99
1:45	38.82	6:45	250.16	11:45	53.91
1:52	40.97	6:52	269.57	11:52	52.84
2:00	40.97	7:00	293.29	12:00	51.76
2:08	40.97	7:08	315.93	12:08	48.52
2:15	42.05	7:15	339.66	12:15	47.44
2:22	43.13	7:22	366.61	12:22	46.37
2:30	44.21	7:30	394.65	12:30	46.37
2:38	44.21	7:38	422.68	12:38	45.29
2:45	45.29	7:45	422.68	12:45	44.21
2:52	45.29	7:52	400.04	12:52	44.21
3:00	46.37	8:00	370.93	13:00	43.13
3:08	47.44	8:08	345.05	13:08	42.05
3:15	48.52	8:15	320.25	13:15	42.05
3:22	50.68	8:22	296.53	13:22	40.97
3:30	52.84	8:30	274.96	13:30	40.97
3:38	53.91	8:38	254.47	13:38	38.82
3:45	54.99	8:45	236.14	13:45	38.82
3:52	54.99	8:52	217.81	13:52	37.74
4:00	57.15	9:00	199.48	14:00	37.74
4:08	58.23	9:08	184.38	14:08	37.74
4:15	61.46	9:15	167.13	14:15	36.66
4:22	63.62	9:22	153.11	14:22	36.66
4:30	65.77	9:30	139.10	14:30	35.58
4:38	67.93	9:38	127.24	14:38	35.58
4:45	72.24	9:45	116.45	14:45	35.58
4:52	75.48	9:52	105.67	14:52	34.50
5:00	80.87	10:00	98.12	15:00	34.50

Hydrograph profile derived from data in the Flood Studies Report

Return period= 100 yrs Duration= 15 mins Profile - summer



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Job No.	833
Sheet no.	4
Date	16/09/26
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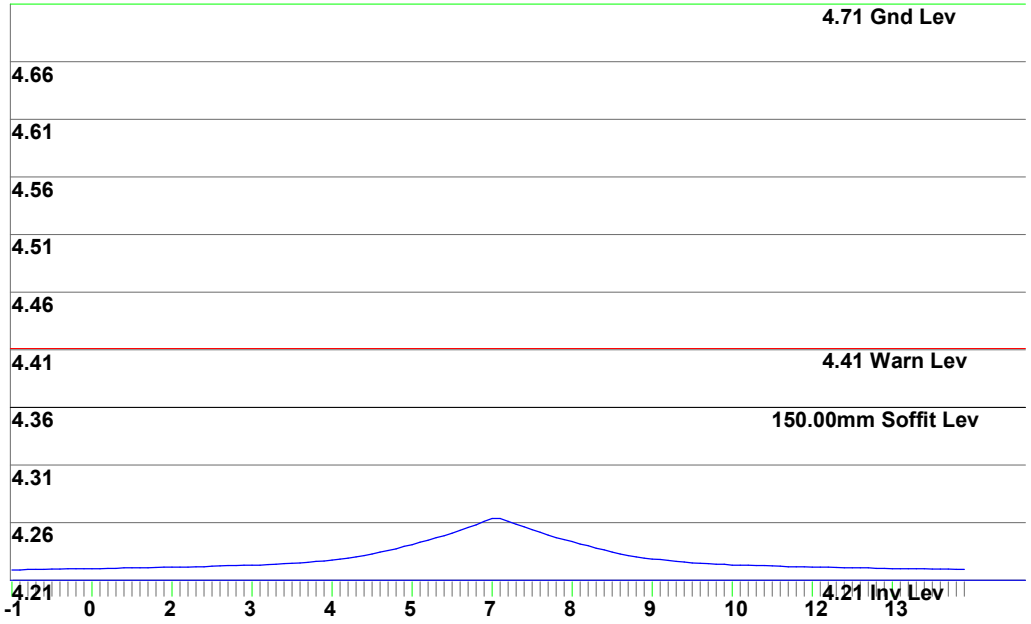
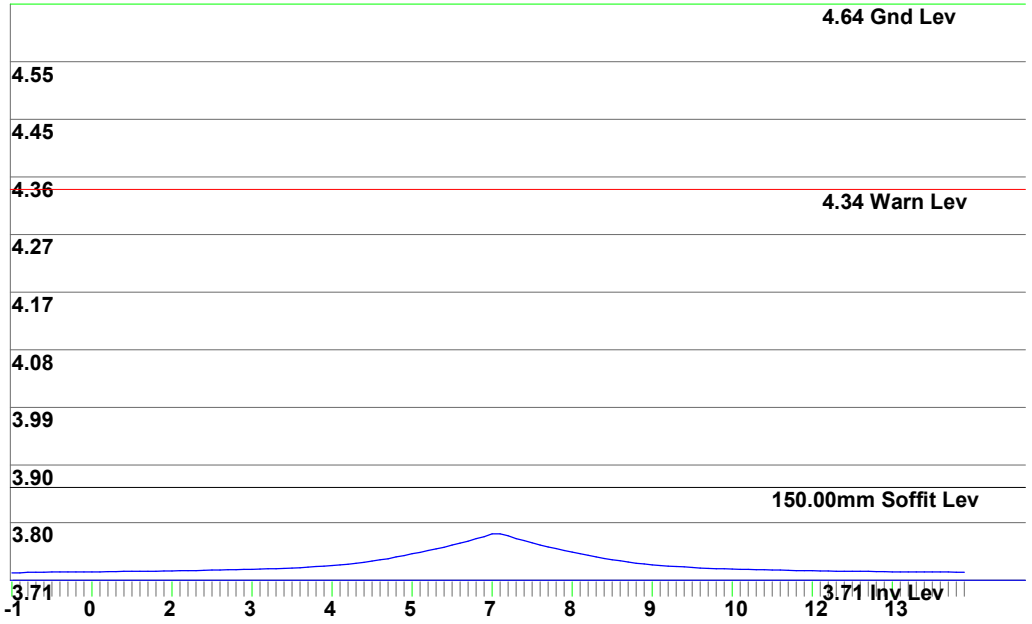
Checked	
Reviewed	

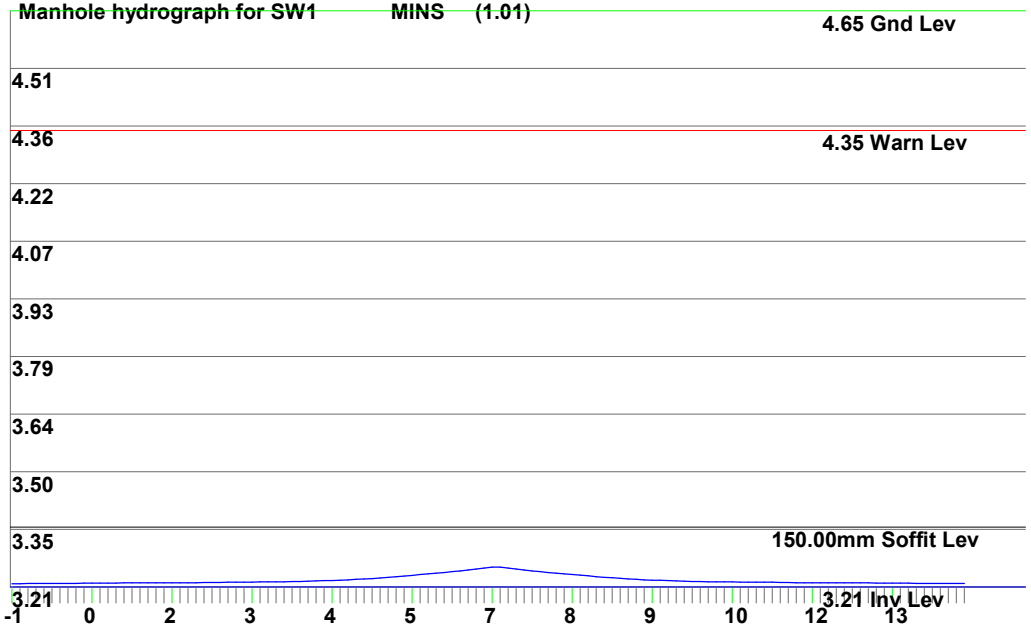
MasterDrain SW

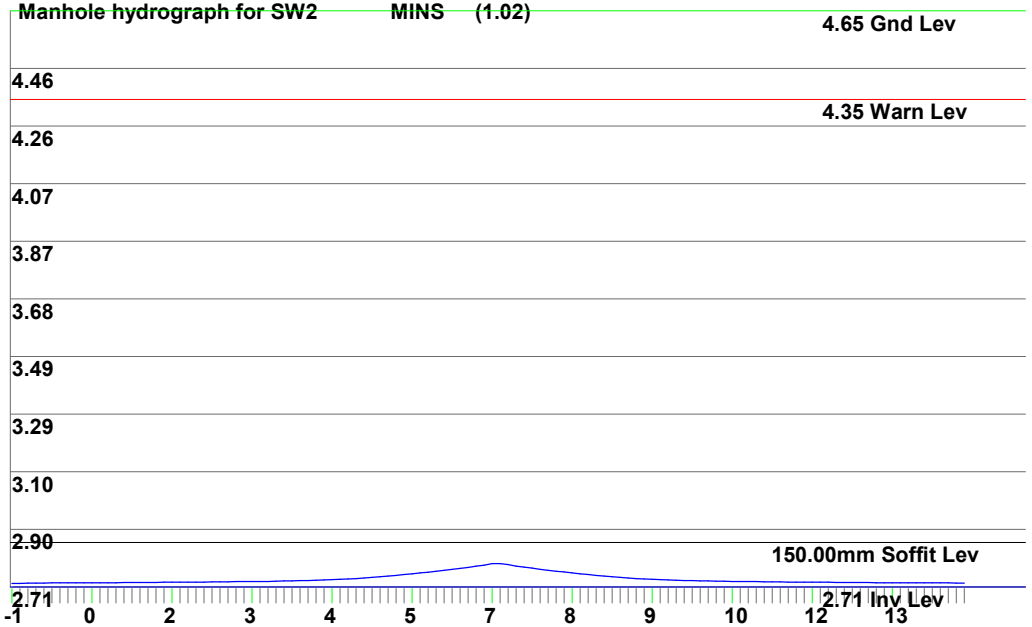
Project Marine Place

Title Surcharge calcs for MARINE PLACE.SW









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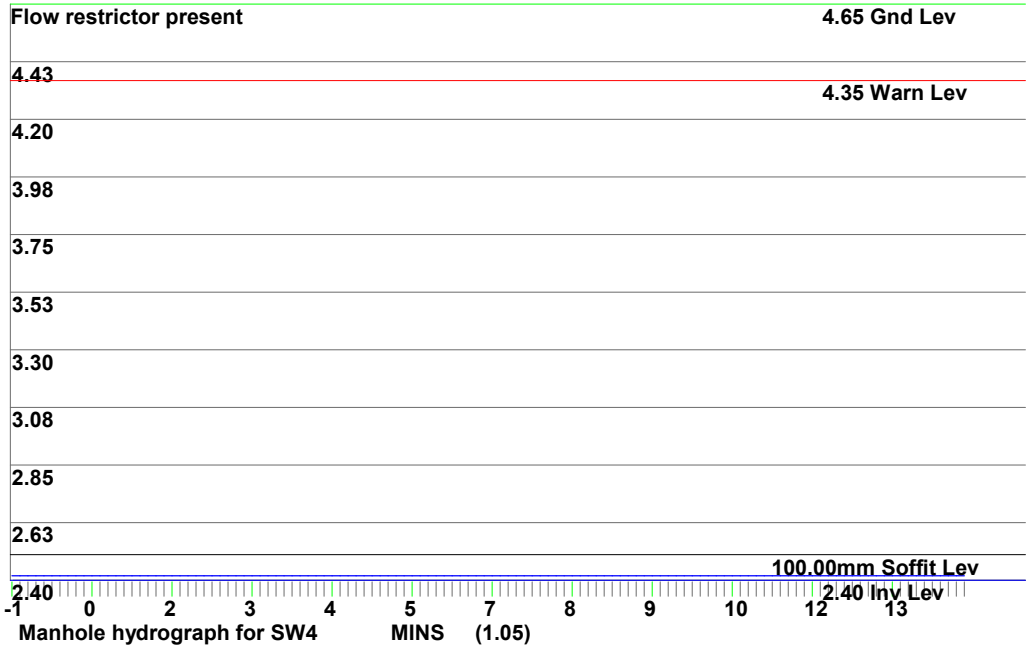
Job No.	833
Sheet no.	5
Date	16/09/26

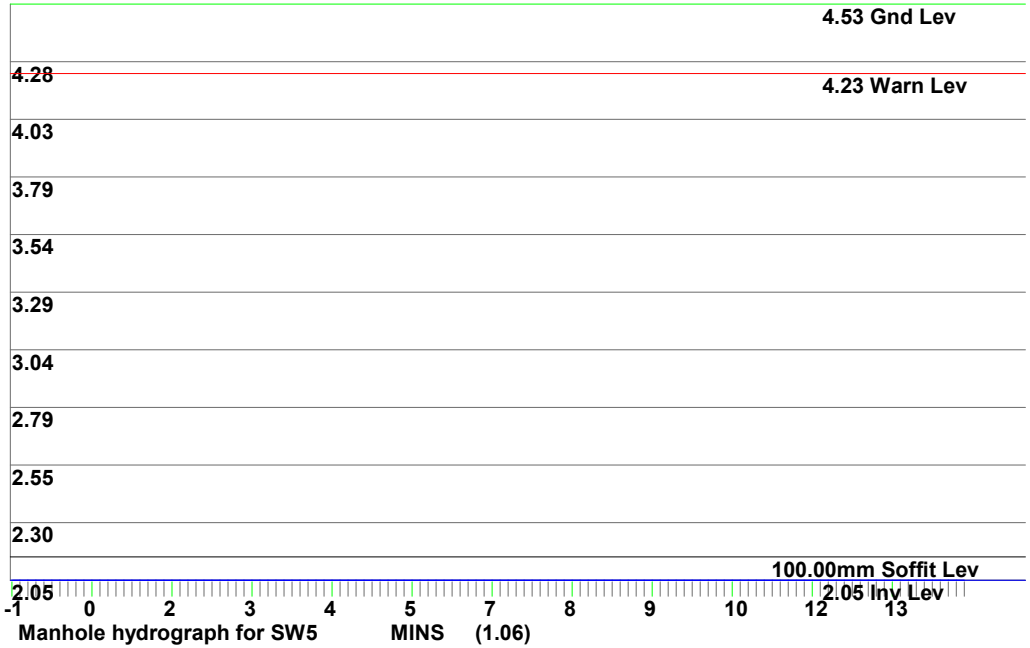
MasterDrain SW

Project: Marine Place

Title: Surcharge calcs for MARINE PLACE.SW

By	Checked	Reviewed





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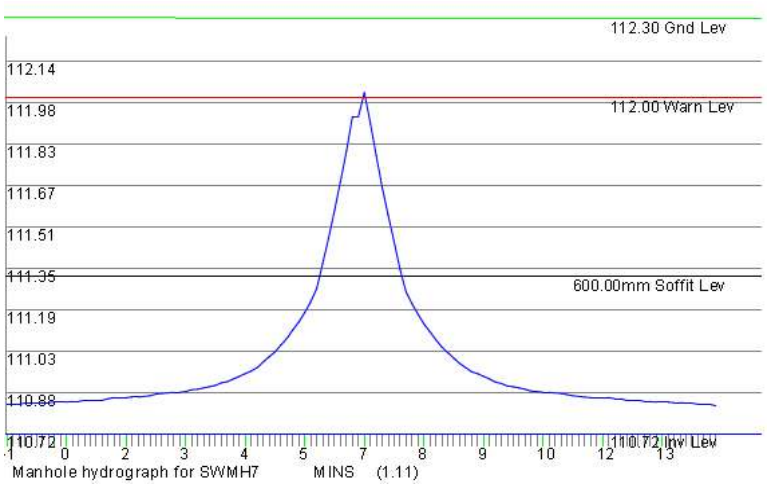
Job No. 833			
Sheet no. 6			
Date 16/09/26			
Project Marine Place	By	Checked	Reviewed
Title Surcharge calcs for MARINE PLACE.SW			



1) Ground / cover level

2) Warning level - in this case, set at 300mm below cover level.

3) Soffit level of outflow pipe.

4) Invert level of chamber.

Notes

a) Lower section of the graph shows the water depth filling the channel. Channel is assumed to be a full pipe diameter in depth.

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d) In many cases the invert of the offline storage is required to enter at the channel soffit level, meaning that the pipe will still surcharge but flooding risk reduced.

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Job No.	833
Sheet no.	1
Date	16/09/26
Project	Marine Place
Title	Surcharge calcs for MARINE PLACE.SW CCF = 45%

By	Checked	Reviewed

Using in-line restrictors PEAK hydrograph values printed Mean rain intens. 177.00 mm/hr Peak rain intens. 693.84 mm/hr
Return period = 30 yrs Storm duration = 15 mins Storm profile = Summer Sample period = 7.5 secs.
Climate change factor = 45 No offline storage Using FEH data

Entry No.		SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	SURCHARGE Depth	EXCESS FLOW l/s	FLOODED VOL m^3	DRAINED AREA (m^2) x FACTOR	STATUS
1	I	1.01	SW1	31.0	13.5	150	900	4.21	4.28	4.71	0.43	0.07	0.00	0.000	170	OK
2	I	1.02	SW2	39.9	27.0	150	900	3.71	3.81	4.64	0.68	0.10	0.00	0.000	340	OK
3	I	1.03	SW3	103.6	40.5	150	900	3.21	3.27	4.65	0.39	0.06	0.00	0.000	510	OK
4	I	1.04N	STORAGE	56.6	40.5	150	1200	2.71	2.81	4.65	0.72	0.10	0.00	0.000	510	OK
5	I	1.05	SW4‡	17.6	2.0	100	900	2.40	2.42	4.65	0.11	0.02	0.00	0.000	510	OK
6	I	1.06	SW5	6.8	0.0	100	900	2.05	2.05	4.53	0.00	0.00	0.00	0.000	0	OK

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MasterDrain SW

Job No. 833			
Sheet no. 2			
Date 16/09/26			
Project Marine Place	By	Checked	Reviewed
Title Surcharge calcs for MARINE PLACE.SW CCF = 45%			

Notes

Printout headings

1) Entry no - position in file
2) Section no - pipe identifier
3) Manhole ref - Manhole identifier
4) Pipe cap - full bore capacity of that pipe
5) Rate of flow - calculated flow rate (l/s) ‡ = flow restrictor.
6) Pipe diam - outlet pipe diameter (mm)
7) Chamber diam - chamber diam. at base of MH
8) Invert level - invert level of manhole
9) Water level - calculated peak water level.
10) Grnd level - ground / cover level
11) Surch. fract - calc.flow/pipe capacity
12) Surch. depth - surcharge level above soffit
13) Overflow - surcharged flow rate (l/s)
14) Flooded vol - volume of water above cover
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16) Status - OK - outlet not surcharged
17) Status - Surcharged - outlet surcharged
18) Status - Warning - water level within 299mm of cover level
19) Status - Flooded - cover over-topped
20) § against diameter indicates throttle pipe used.

Title box

Hydrograph data

1) Ret. period - that used to calculate profile
2) Duration - length of storm (mins)
3) Profile - either Winter (75%) or Summer (50%)

Flow restrictors

Manhole reference - SW4

Restrictor flowrate - 2 l/s

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Job No.	833
Sheet no.	3
Date	16/09/26
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MasterDrain SW

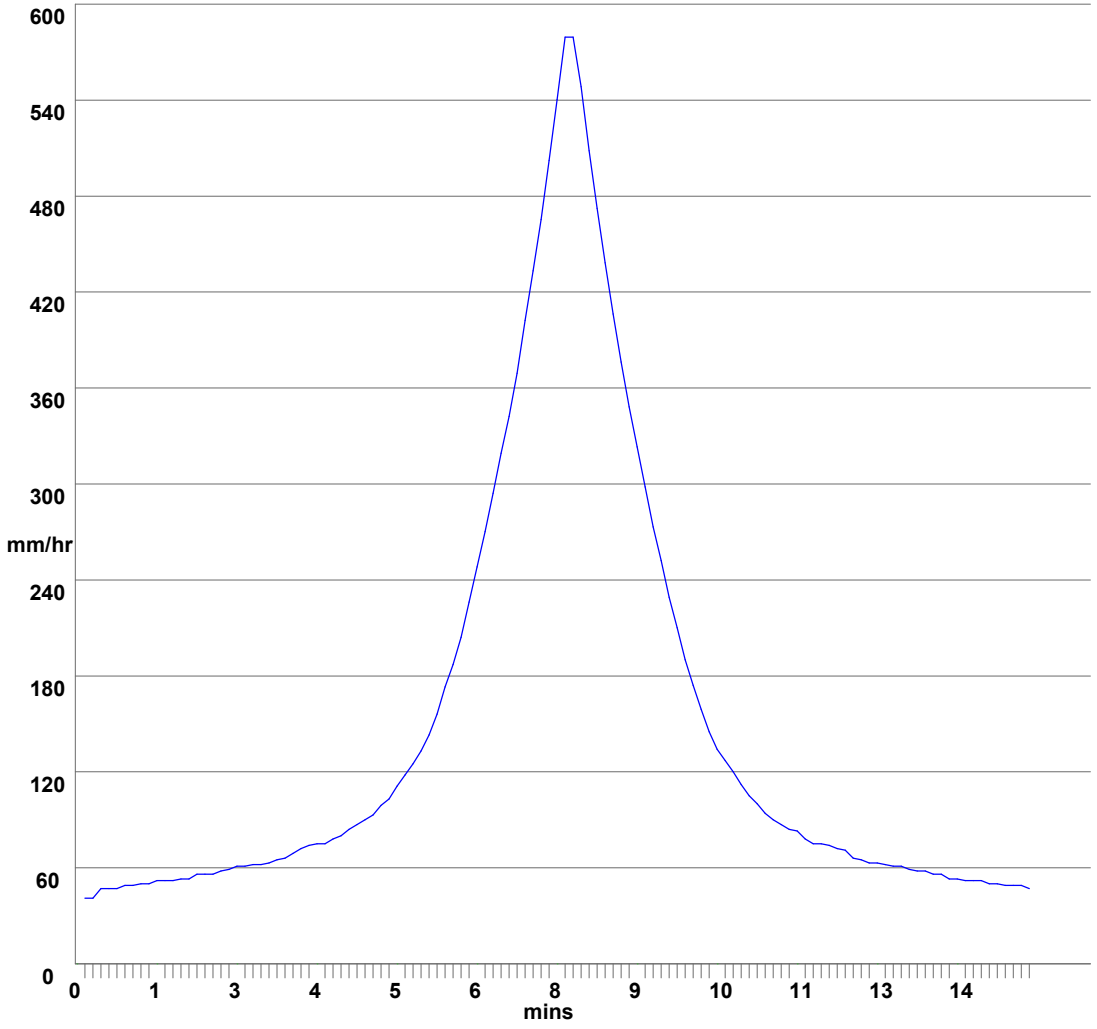
Project: Marine Place

Title: Surcharge calcs for MARINE PLACE.SW CCF = 45%

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:08	41.34	5:08	118.10	10:08	126.96
0:15	41.34	5:15	125.48	10:15	119.58
0:22	47.24	5:22	132.86	10:22	112.20
0:30	47.24	5:30	143.20	10:30	104.81
0:38	47.24	5:38	156.48	10:38	100.39
0:45	48.72	5:45	172.72	10:45	94.48
0:52	48.72	5:52	187.49	10:52	90.05
1:00	50.19	6:00	203.72	11:00	87.10
1:08	50.19	6:08	225.87	11:08	84.15
1:15	51.67	6:15	248.01	11:15	82.67
1:22	51.67	6:22	270.16	11:22	78.24
1:30	51.67	6:30	293.78	11:30	75.29
1:38	53.15	6:38	318.87	11:38	75.29
1:45	53.15	6:45	342.49	11:45	73.81
1:52	56.10	6:52	369.07	11:52	72.34
2:00	56.10	7:00	401.54	12:00	70.86
2:08	56.10	7:08	432.55	12:08	66.43
2:15	57.57	7:15	465.02	12:15	64.96
2:22	59.05	7:22	501.93	12:22	63.48
2:30	60.53	7:30	540.31	12:30	63.48
2:38	60.53	7:38	578.70	12:38	62.00
2:45	62.00	7:45	578.70	12:45	60.53
2:52	62.00	7:52	547.69	12:52	60.53
3:00	63.48	8:00	507.83	13:00	59.05
3:08	64.96	8:08	472.40	13:08	57.57
3:15	66.43	8:15	438.45	13:15	57.57
3:22	69.38	8:22	405.97	13:22	56.10
3:30	72.34	8:30	376.45	13:30	56.10
3:38	73.81	8:38	348.40	13:38	53.15
3:45	75.29	8:45	323.30	13:45	53.15
3:52	75.29	8:52	298.21	13:52	51.67
4:00	78.24	9:00	273.11	14:00	51.67
4:08	79.72	9:08	252.44	14:08	51.67
4:15	84.15	9:15	228.82	14:15	50.19
4:22	87.10	9:22	209.63	14:22	50.19
4:30	90.05	9:30	190.44	14:30	48.72
4:38	93.00	9:38	174.20	14:38	48.72
4:45	98.91	9:45	159.44	14:45	48.72
4:52	103.34	9:52	144.67	14:52	47.24
5:00	110.72	10:00	134.34	15:00	47.24

Hydrograph profile derived from data in the Flood Studies Report

Return period= 30 yrs Duration= 15 mins Profile - summer



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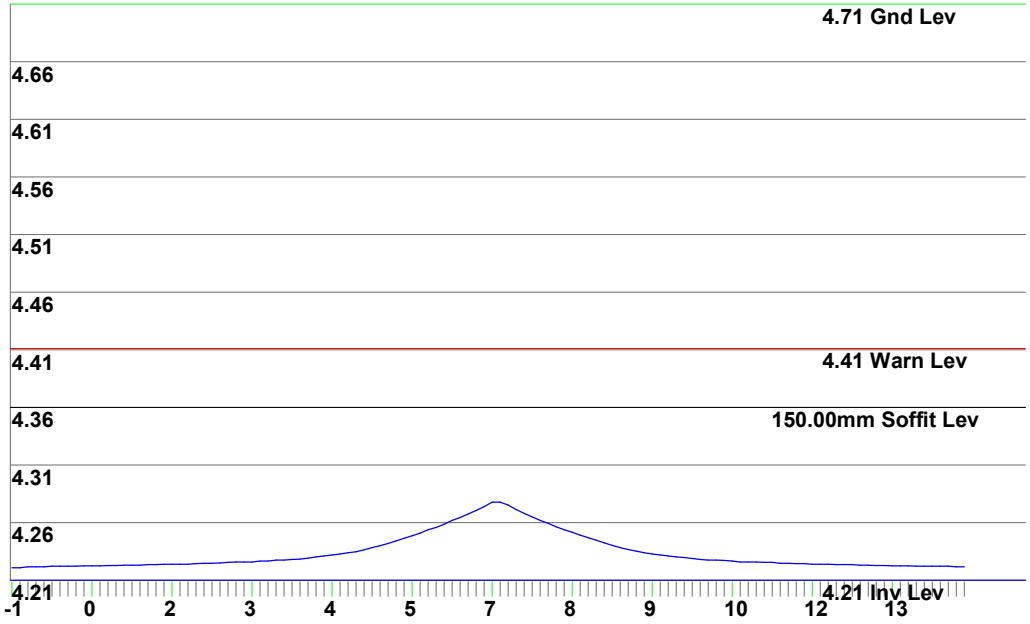
Date	16/09/26

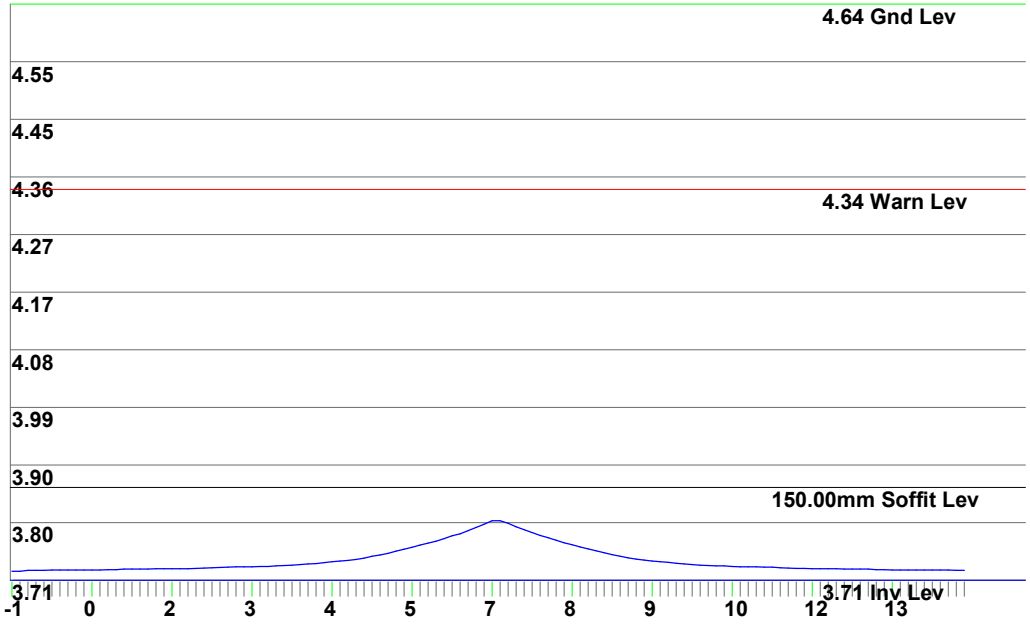
MasterDrain SW

Project: Marine Place

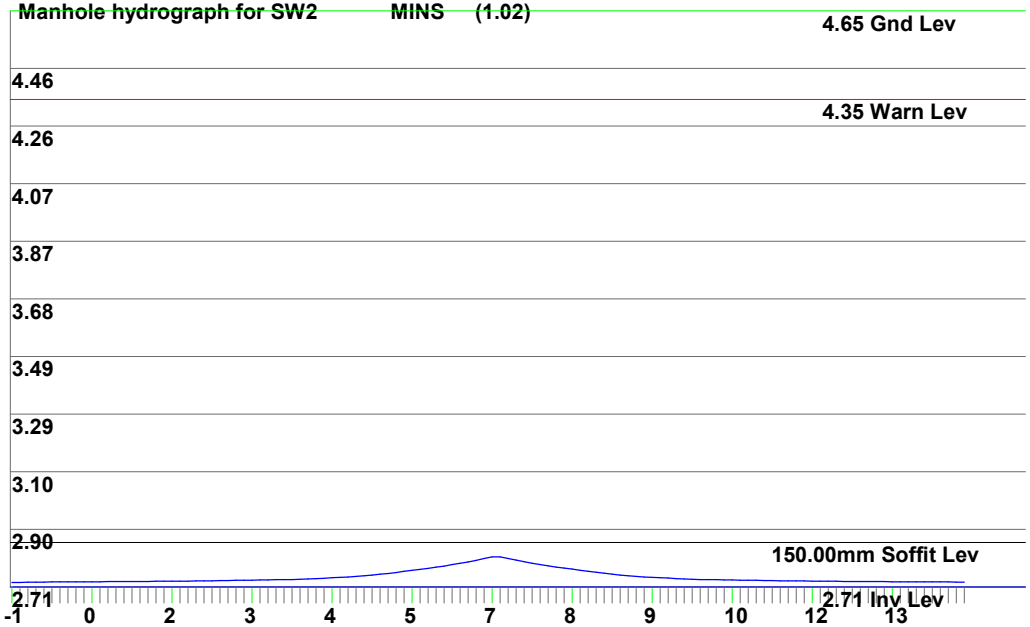
Title: Surcharge calcs for MARINE PLACE.SW CCF = 45%

By	Checked	Reviewed









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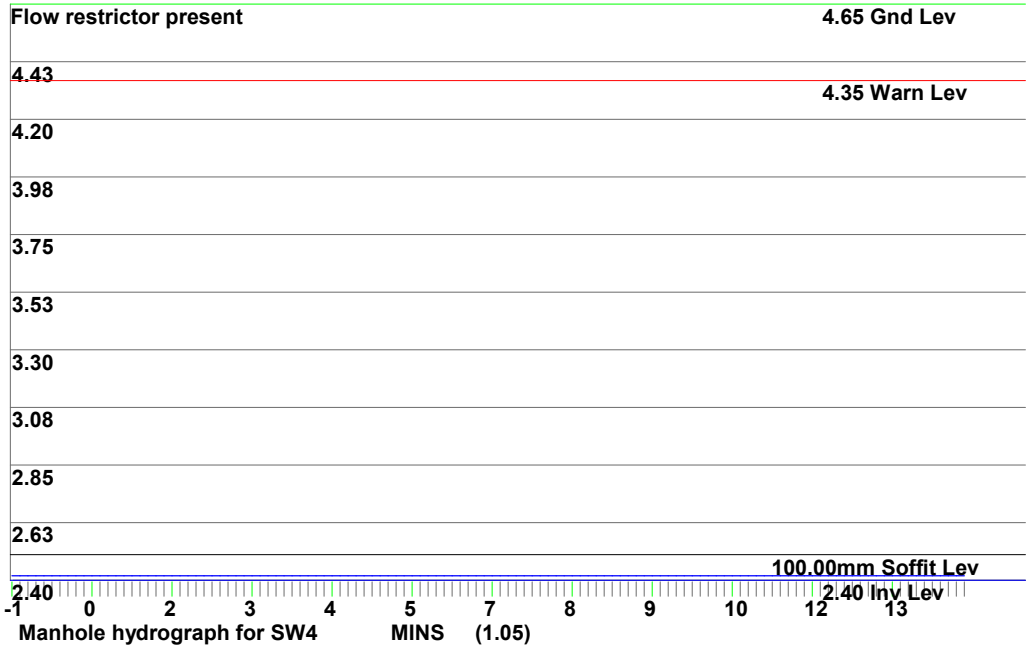
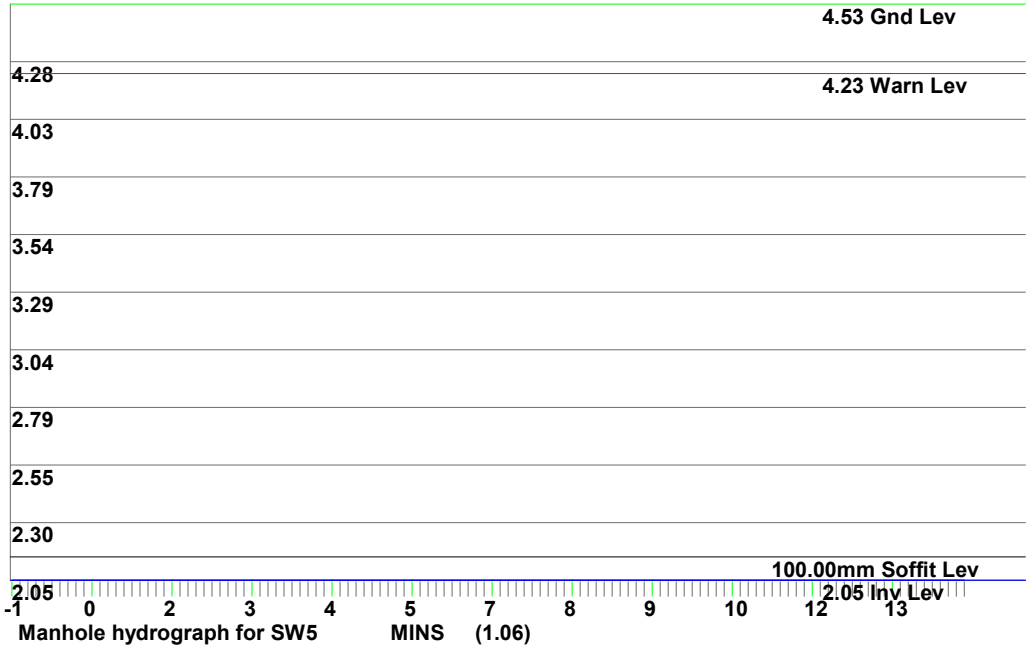
Job No.	833
Sheet no.	5
Date	16/09/26

MasterDrain SW

Project	Marine Place	By	Checked / Reviewed
Title	Surcharge calcs for MARINE PLACE.SW CCF = 45%		





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Job No. 833			
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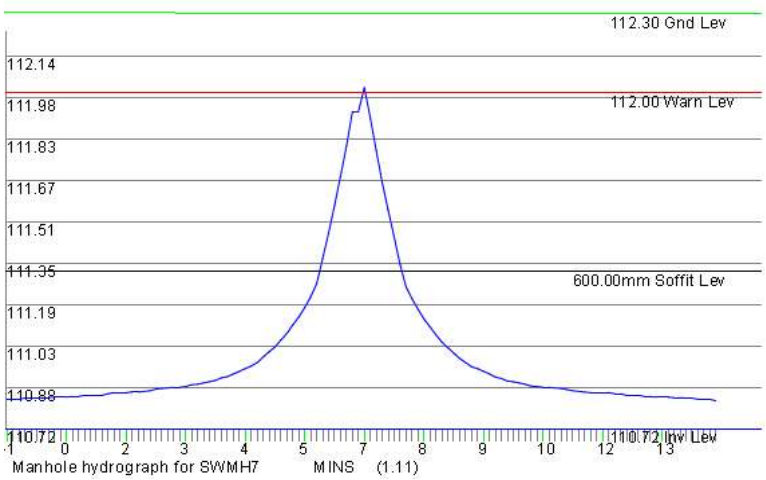
Project Marine Place	By	Checked	Reviewed
Title Surcharge calcs for MARINE PLACE.SW CCF = 45%			

MasterDrain SW



1) Ground / cover level

2) Warning level - in this case, set at 300mm below cover level.

3) Soffit level of outflow pipe.

4) Invert level of chamber.

Notes

a) Lower section of the graph shows the water depth filling the channel. Channel is assumed to be a full pipe diameter in depth.

b) Upper section of the graph shows the water depth filling the chamber. Chamber has a greater width/diameter than the channel, so increases in depth are proportionally less.

c) The top of the graph clips the warning level and would be marked thus on the printout.

d) In many cases the invert of the offline storage is required to enter at the channel soffit level, meaning that the pipe will still surcharge but flooding risk reduced.

e) The diagram above is a general one and is not part of the current calculation.

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MasterDrain SW

Job No.	833
Sheet no.	1
Date	16/09/26
Project	Marine Place
Title	Surcharge calcs for MARINE PLACE.SW

By	Checked	Reviewed

Using in-line restrictors PEAK hydrograph values printed Mean rain intens. 84.00 mm/hr Peak rain intens. 329.28 mm/hr
Return period = 30 yrs Storm duration = 15 mins Storm profile = Summer Sample period = 7.5 secs.
Climate change factor = 0 No offline storage Using FEH data

Entry No.		SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	SURCHARGE Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) x FACTOR	STATUS
1	I	1.01	SW1	31.0	6.4	150	900	4.21	4.25	4.71	0.21	0.04	0.00	0.000	170	OK
2	I	1.02	SW2	39.9	12.8	150	900	3.71	3.76	4.64	0.32	0.05	0.00	0.000	340	OK
3	I	1.03	SW3	103.6	19.3	150	900	3.21	3.25	4.65	0.19	0.04	0.00	0.000	510	OK
4	I	1.04N	STORAGE	56.6	19.3	150	1200	2.71	2.77	4.65	0.34	0.06	0.00	0.000	510	OK
5	I	1.05	SW4‡	17.6	2.0	100	900	2.40	2.42	4.65	0.11	0.02	0.00	0.000	510	OK
6	I	1.06	SW5	6.8	2.0	100	900	2.05	2.08	4.53	0.29	0.03	0.00	0.000	510	OK

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Job No.	833
Sheet no.	2
Date	16/09/26

MasterDrain SW

Project	Marine Place	By	Checked / Reviewed
Title	Surcharge calcs for MARINE PLACE.SW		

Notes

Printout headings

1) Entry no - position in file
2) Section no - pipe identifier
3) Manhole ref - Manhole identifier
4) Pipe cap - full bore capacity of that pipe
5) Rate of flow - calculated flow rate (l/s) ‡ = flow restrictor.
6) Pipe diam - outlet pipe diameter (mm)
7) Chamber diam - chamber diam. at base of MH
8) Invert level - invert level of manhole
9) Water level - calculated peak water level.
10) Grnd level - ground / cover level
11) Surch. fract - calc.flow/pipe capacity
12) Surch. depth - surcharge level above soffit
13) Overflow - surcharged flow rate (l/s)
14) Flooded vol - volume of water above cover
15) Upstrm Vol - upstream pipe vol to previous manhole(s)
16) Status - OK - outlet not surcharged
17) Status - Surcharged - outlet surcharged
18) Status - Warning - water level within 299mm of cover level
19) Status - Flooded - cover over-topped
20) § against diameter indicates throttle pipe used.

Title box

Hydrograph data

1) Ret. period - that used to calculate profile
2) Duration - length of storm (mins)
3) Profile - either Winter (75%) or Summer (50%)

Flow restrictors

Manhole reference - SW4

Restrictor flowrate - 2 l/s

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Job No.	833
Sheet no.	3
Date	16/09/26

MasterDrain SW

Project: Marine Place

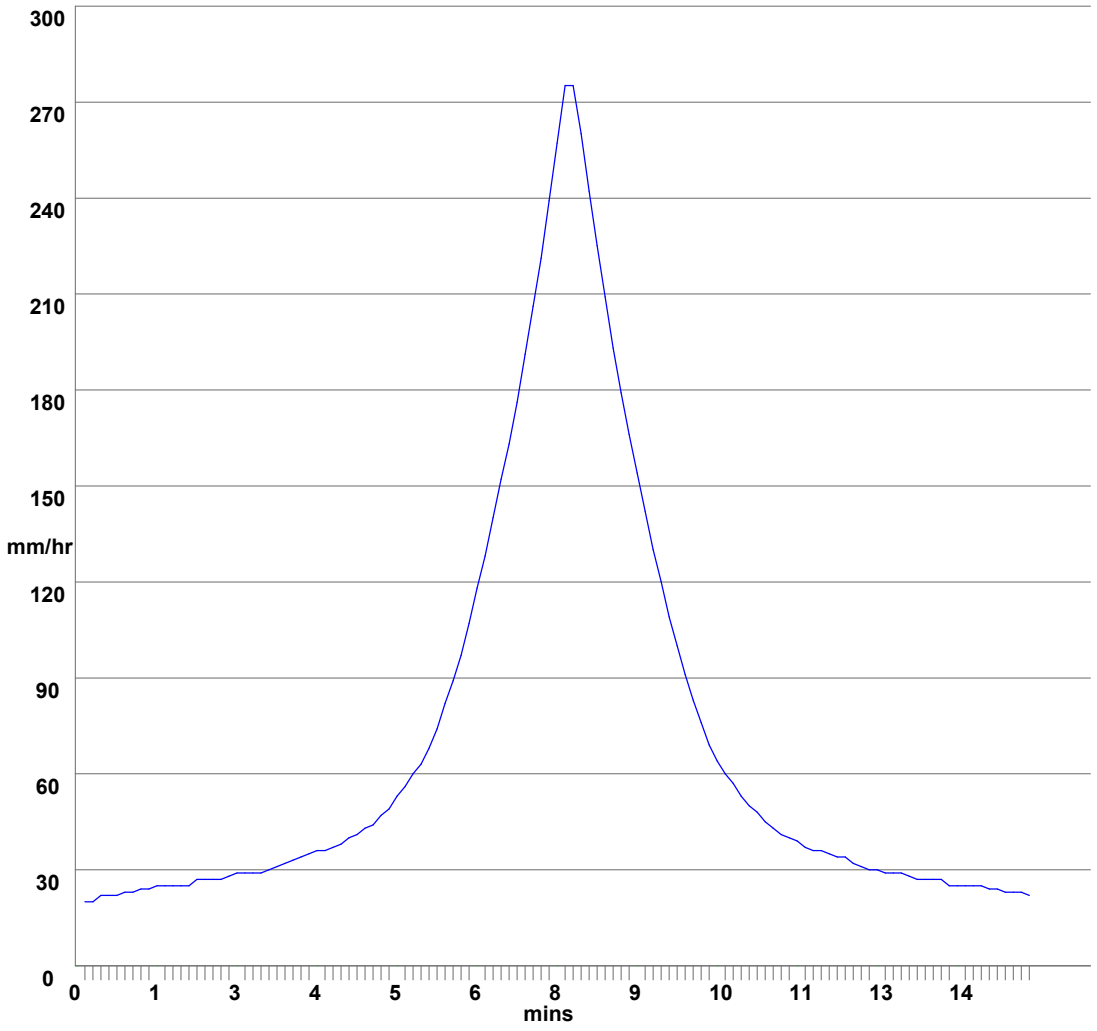
Title: Surcharge calcs for MARINE PLACE.SW

By	Checked	Reviewed

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:08	19.66	5:08	56.17	10:08	60.38
0:15	19.66	5:15	59.68	10:15	56.87
0:22	22.47	5:22	63.19	10:22	53.36
0:30	22.47	5:30	68.11	10:30	49.85
0:38	22.47	5:38	74.43	10:38	47.75
0:45	23.17	5:45	82.15	10:45	44.94
0:52	23.17	5:52	89.17	10:52	42.83
1:00	23.87	6:00	96.90	11:00	41.43
1:08	23.87	6:08	107.43	11:08	40.02
1:15	24.58	6:15	117.96	11:15	39.32
1:22	24.58	6:22	128.49	11:22	37.21
1:30	24.58	6:30	139.73	11:30	35.81
1:38	25.28	6:38	151.66	11:38	35.81
1:45	25.28	6:45	162.90	11:45	35.11
1:52	26.68	6:52	175.54	11:52	34.41
2:00	26.68	7:00	190.98	12:00	33.70
2:08	26.68	7:08	205.73	12:08	31.60
2:15	27.38	7:15	221.18	12:15	30.89
2:22	28.09	7:22	238.73	12:22	30.19
2:30	28.79	7:30	256.99	12:30	30.19
2:38	28.79	7:38	275.24	12:38	29.49
2:45	29.49	7:45	275.24	12:45	28.79
2:52	29.49	7:52	260.50	12:52	28.79
3:00	30.19	8:00	241.54	13:00	28.09
3:08	30.89	8:08	224.69	13:08	27.38
3:15	31.60	8:15	208.54	13:15	27.38
3:22	33.00	8:22	193.09	13:22	26.68
3:30	34.41	8:30	179.05	13:30	26.68
3:38	35.11	8:38	165.71	13:38	25.28
3:45	35.81	8:45	153.77	13:45	25.28
3:52	35.81	8:52	141.83	13:52	24.58
4:00	37.21	9:00	129.90	14:00	24.58
4:08	37.92	9:08	120.07	14:08	24.58
4:15	40.02	9:15	108.83	14:15	23.87
4:22	41.43	9:22	99.70	14:22	23.87
4:30	42.83	9:30	90.58	14:30	23.17
4:38	44.24	9:38	82.85	14:38	23.17
4:45	47.04	9:45	75.83	14:45	23.17
4:52	49.15	9:52	68.81	14:52	22.47
5:00	52.66	10:00	63.90	15:00	22.47

Hydrograph profile derived from data in the Flood Studies Report

Return period= 30 yrs Duration= 15 mins Profile - summer



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Job No.	833
Sheet no.	4
Date	16/09/26
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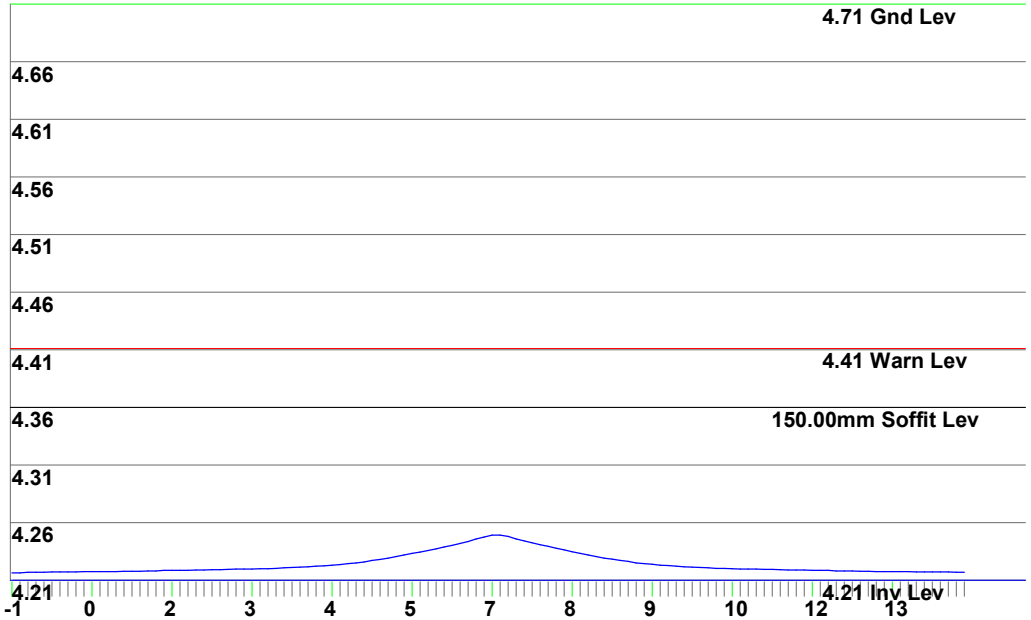
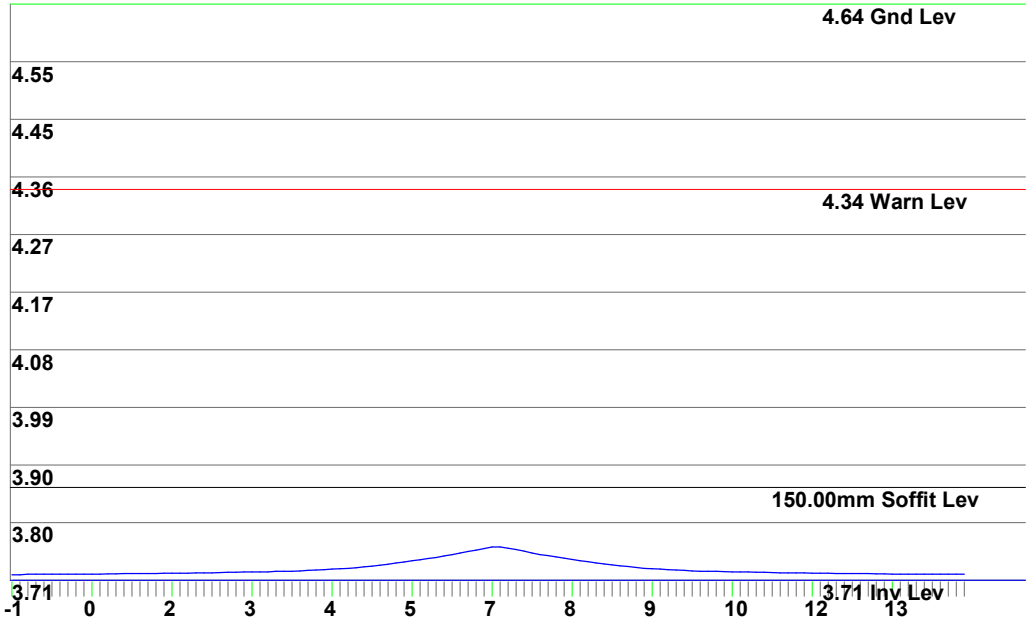
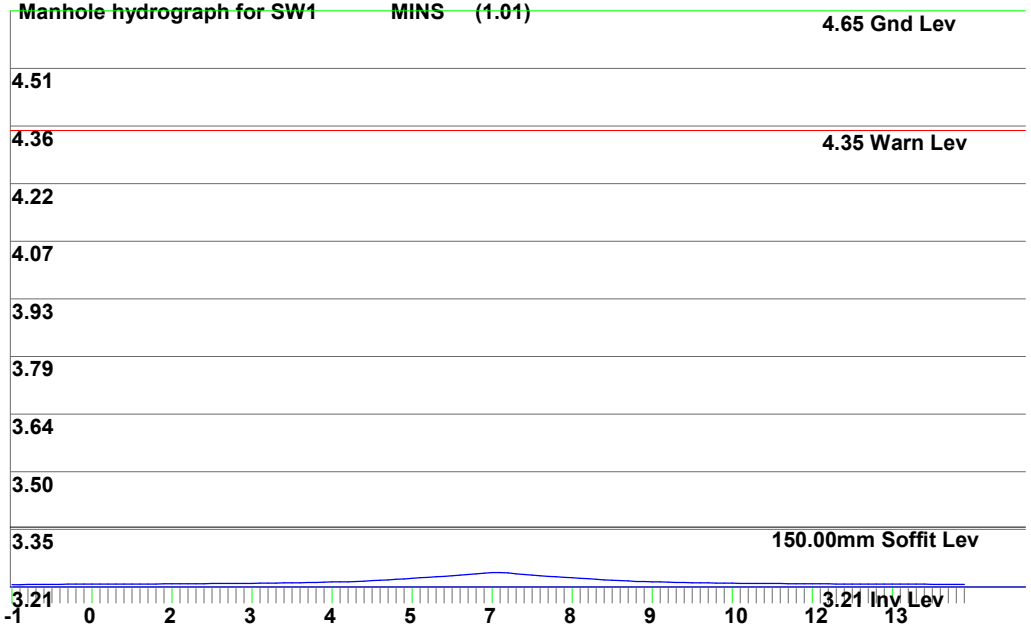
MasterDrain SW

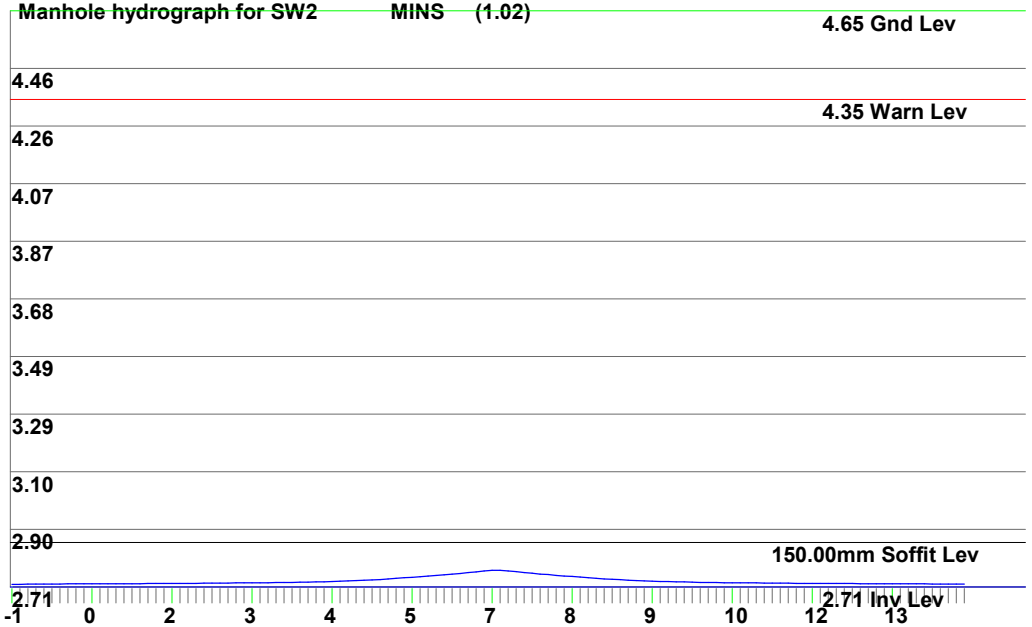
Project Marine Place

Title Surcharge calcs for MARINE PLACE.SW









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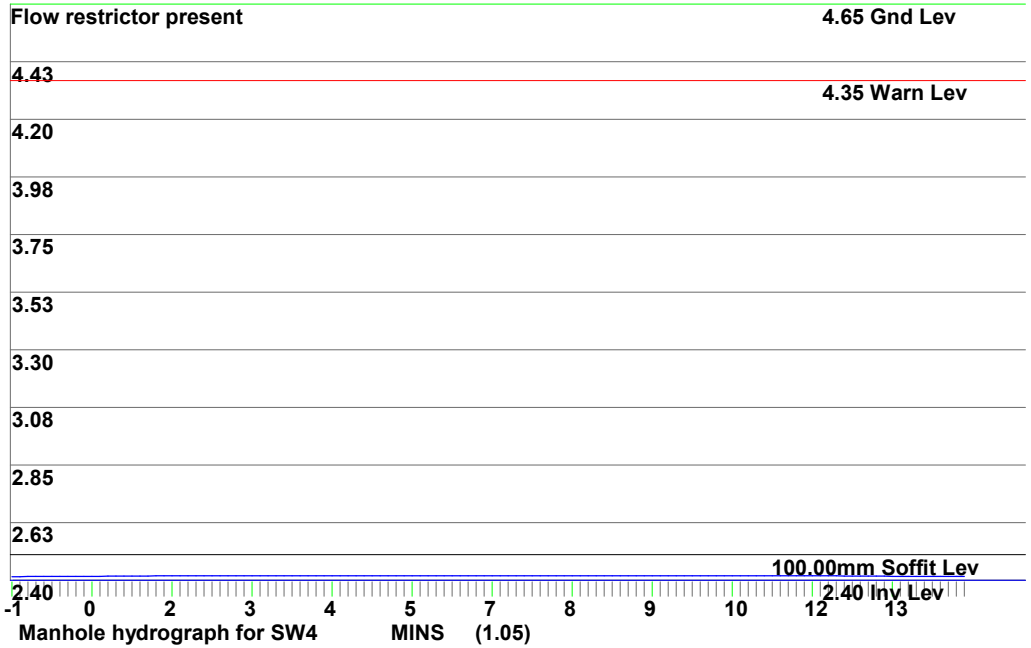
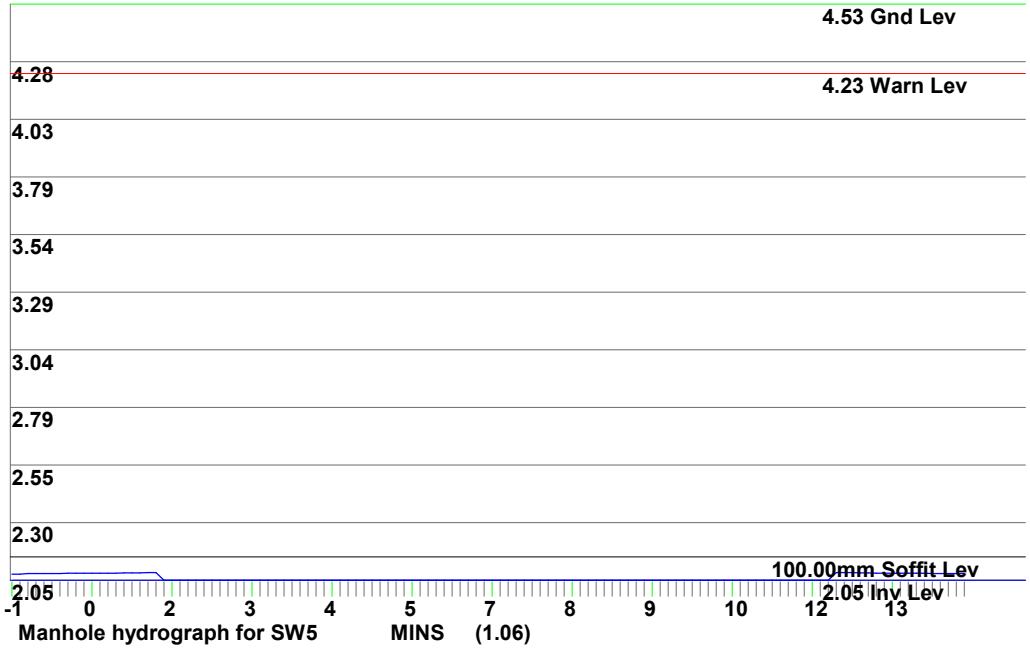
Job No.	833
Sheet no.	5
Date	16/09/26
Project	Marine Place
Title	Surcharge calcs for MARINE PLACE.SW

By	Checked	Reviewed





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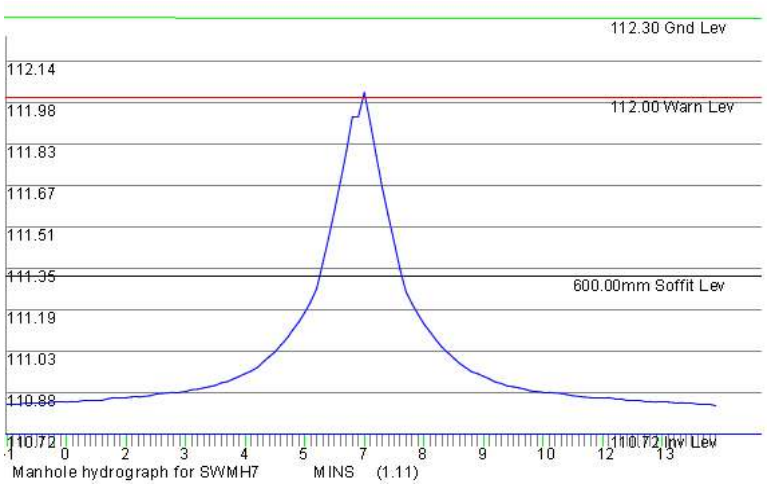
Job No. 833			
Sheet no. 6			
Date 16/09/26			
Project Marine Place	By	Checked	Reviewed
Title Surcharge calcs for MARINE PLACE.SW			



1) Ground / cover level

2) Warning level - in this case, set at 300mm below cover level.

3) Soffit level of outflow pipe.

4) Invert level of chamber.

Notes

a) Lower section of the graph shows the water depth filling the channel. Channel is assumed to be a full pipe diameter in depth.

b) Upper section of the graph shows the water depth filling the chamber. Chamber has a greater width/diameter than the channel, so increases in depth are proportionally less.

c) The top of the graph clips the warning level and would be marked thus on the printout.

d) In many cases the invert of the offline storage is required to enter at the channel soffit level, meaning that the pipe will still surcharge but flooding risk reduced.

e) The diagram above is a general one and is not part of the current calculation.

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Job No.	833
Sheet no.	1
Date	16/09/26
Project	Marine Place
Title	Surcharge calcs for MARINE PLACE.SW

By	Checked	Reviewed

Using in-line restrictors PEAK hydrograph values printed Mean rain intens. 26.00 mm/hr Peak rain intens. 101.92 mm/hr
Return period = 1 yrs Storm duration = 15 mins Storm profile = Summer Sample period = 7.5 secs.
Climate change factor = 0 No offline storage Using FEH data

Entry No.		SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	SURCHARGE Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) x FACTOR	STATUS
1	I	1.01	SW1	31.0	1.9	150	900	4.21	4.23	4.71	0.06	0.02	0.00	0.000	170	OK
2	I	1.02	SW2	39.9	3.9	150	900	3.71	3.73	4.64	0.10	0.02	0.00	0.000	340	OK
3	I	1.03	SW3	103.6	5.8	150	900	3.21	3.23	4.65	0.06	0.02	0.00	0.000	510	OK
4	I	1.04N	STORAGE	56.6	5.8	150	1200	2.71	2.73	4.65	0.10	0.02	0.00	0.000	510	OK
5	I	1.05	SW4‡	17.6	2.0	100	900	2.40	2.42	4.65	0.11	0.02	0.00	0.000	510	OK
6	I	1.06	SW5	6.8	1.9	100	900	2.05	2.08	4.53	0.28	0.03	0.00	0.000	510	OK

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Job No.	833
Sheet no.	2
Date	16/09/26

MasterDrain SW

Project	Marine Place	By	Checked / Reviewed
Title	Surcharge calcs for MARINE PLACE.SW		

Notes

Printout headings

1) Entry no - position in file
2) Section no - pipe identifier
3) Manhole ref - Manhole identifier
4) Pipe cap - full bore capacity of that pipe
5) Rate of flow - calculated flow rate (l/s) ‡ = flow restrictor.
6) Pipe diam - outlet pipe diameter (mm)
7) Chamber diam - chamber diam. at base of MH
8) Invert level - invert level of manhole
9) Water level - calculated peak water level.
10) Grnd level - ground / cover level
11) Surch. fract - calc.flow/pipe capacity
12) Surch. depth - surcharge level above soffit
13) Overflow - surcharged flow rate (l/s)
14) Flooded vol - volume of water above cover
15) Upstrm Vol - upstream pipe vol to previous manhole(s)
16) Status - OK - outlet not surcharged
17) Status - Surcharged - outlet surcharged
18) Status - Warning - water level within 299mm of cover level
19) Status - Flooded - cover over-topped
20) § against diameter indicates throttle pipe used.

Title box

Hydrograph data

1) Ret. period - that used to calculate profile
2) Duration - length of storm (mins)
3) Profile - either Winter (75%) or Summer (50%)

Flow restrictors

Manhole reference - SW4

Restrictor flowrate - 2 l/s

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Sheet no.	3
Date	16/09/26
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MasterDrain SW

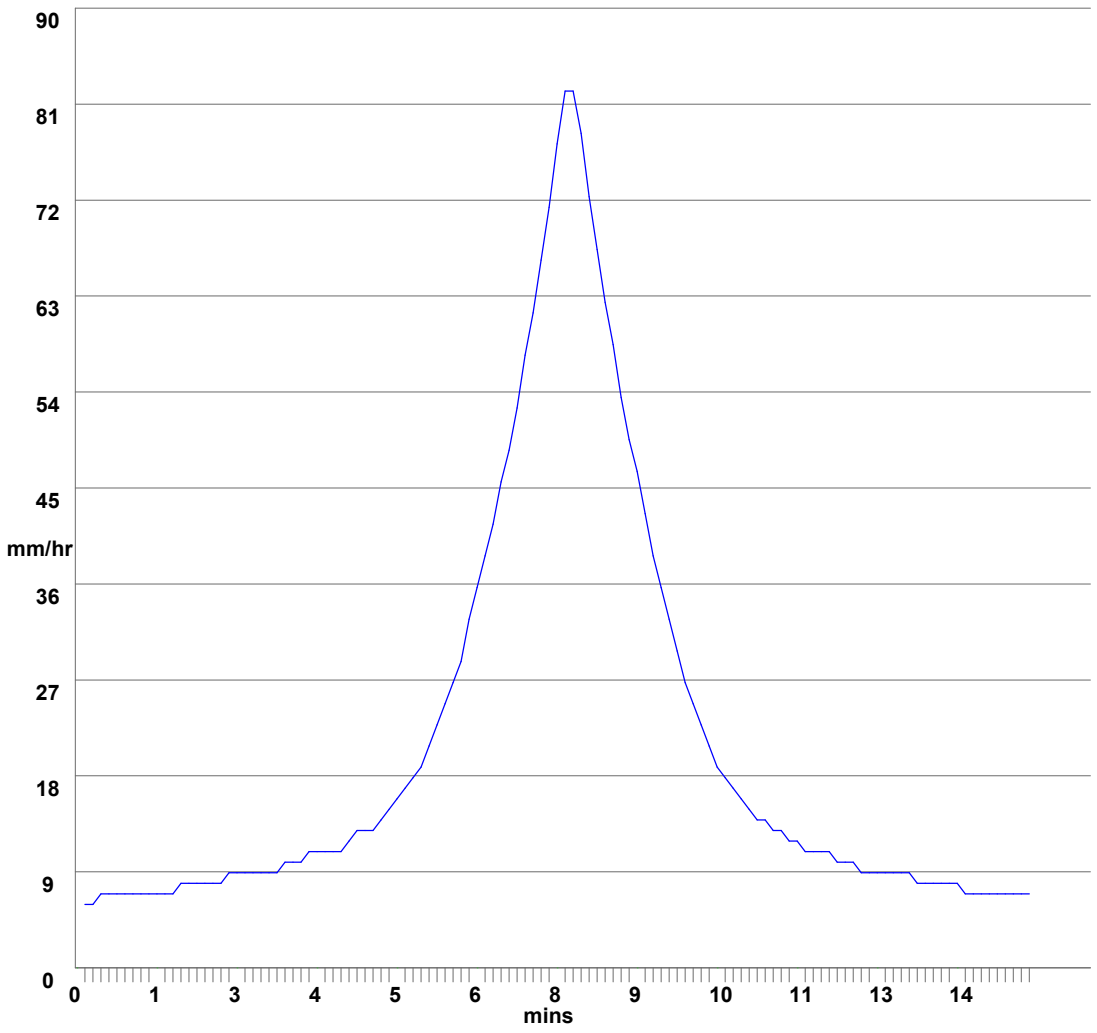
Project: Marine Place

Title: Surcharge calcs for MARINE PLACE.SW

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:08	5.96	5:08	17.02	10:08	18.30
0:15	5.96	5:15	18.08	10:15	17.23
0:22	6.81	5:22	19.15	10:22	16.17
0:30	6.81	5:30	20.64	10:30	15.11
0:38	6.81	5:38	22.55	10:38	14.47
0:45	7.02	5:45	24.89	10:45	13.62
0:52	7.02	5:52	27.02	10:52	12.98
1:00	7.23	6:00	29.36	11:00	12.55
1:08	7.23	6:08	32.55	11:08	12.13
1:15	7.45	6:15	35.74	11:15	11.91
1:22	7.45	6:22	38.93	11:22	11.28
1:30	7.45	6:30	42.34	11:30	10.85
1:38	7.66	6:38	45.95	11:38	10.85
1:45	7.66	6:45	49.36	11:45	10.64
1:52	8.08	6:52	53.19	11:52	10.42
2:00	8.08	7:00	57.87	12:00	10.21
2:08	8.08	7:08	62.34	12:08	9.57
2:15	8.30	7:15	67.02	12:15	9.36
2:22	8.51	7:22	72.33	12:22	9.15
2:30	8.72	7:30	77.87	12:30	9.15
2:38	8.72	7:38	83.40	12:38	8.94
2:45	8.94	7:45	83.40	12:45	8.72
2:52	8.94	7:52	78.93	12:52	8.72
3:00	9.15	8:00	73.19	13:00	8.51
3:08	9.36	8:08	68.08	13:08	8.30
3:15	9.57	8:15	63.19	13:15	8.30
3:22	10.00	8:22	58.51	13:22	8.08
3:30	10.42	8:30	54.25	13:30	8.08
3:38	10.64	8:38	50.21	13:38	7.66
3:45	10.85	8:45	46.59	13:45	7.66
3:52	10.85	8:52	42.98	13:52	7.45
4:00	11.28	9:00	39.36	14:00	7.45
4:08	11.49	9:08	36.38	14:08	7.45
4:15	12.13	9:15	32.98	14:15	7.23
4:22	12.55	9:22	30.21	14:22	7.23
4:30	12.98	9:30	27.44	14:30	7.02
4:38	13.40	9:38	25.10	14:38	7.02
4:45	14.25	9:45	22.98	14:45	7.02
4:52	14.89	9:52	20.85	14:52	6.81
5:00	15.96	10:00	19.36	15:00	6.81

Hydrograph profile derived from data in the Flood Studies Report

Return period= 1 yrs Duration= 15 mins Profile - summer



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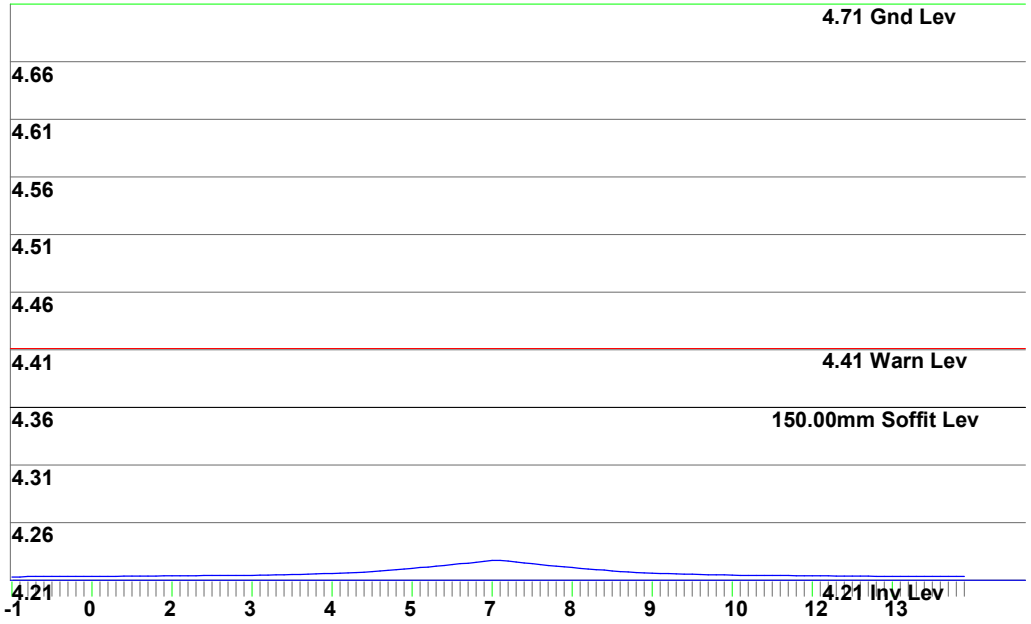
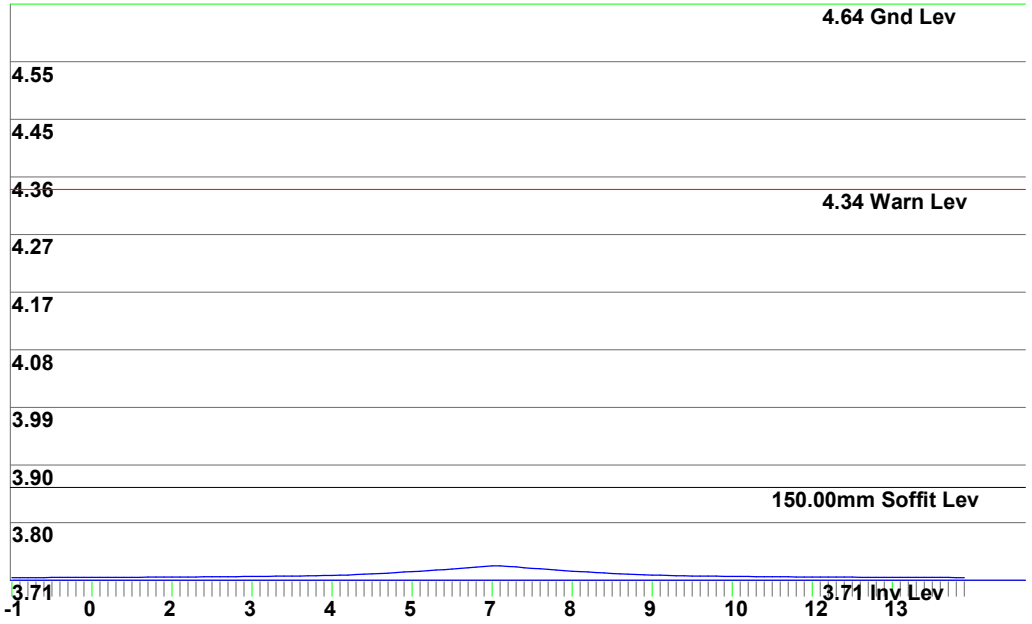
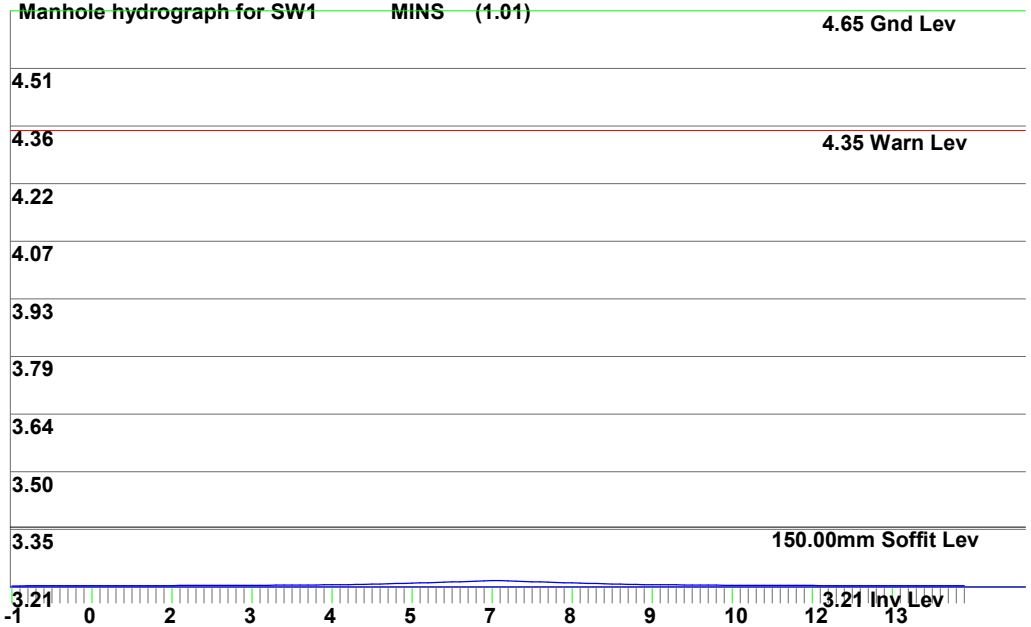
MasterDrain SW

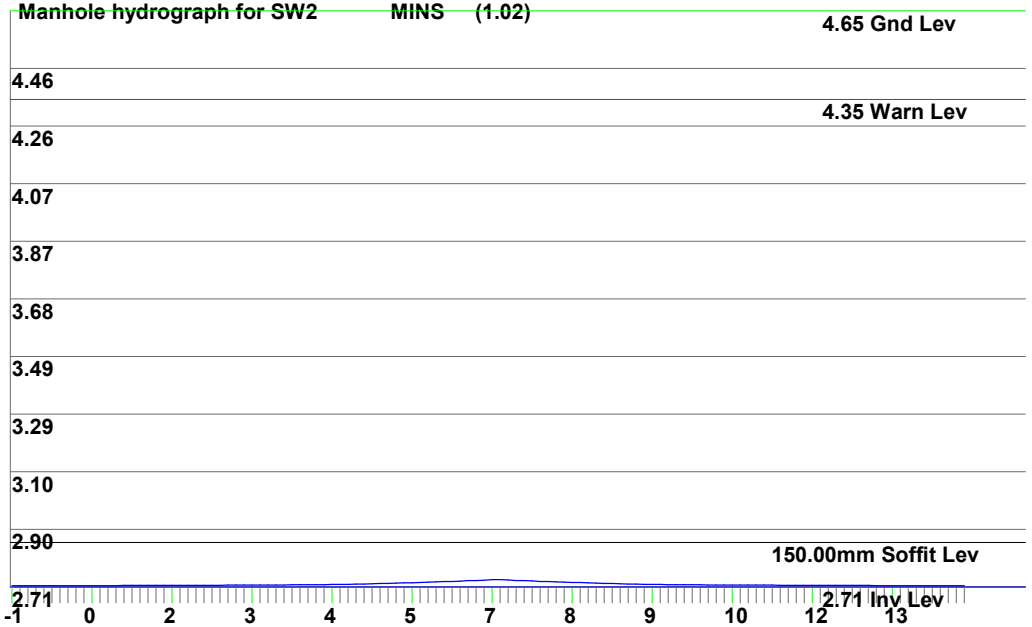
Project Marine Place

Title Surcharge calcs for MARINE PLACE.SW









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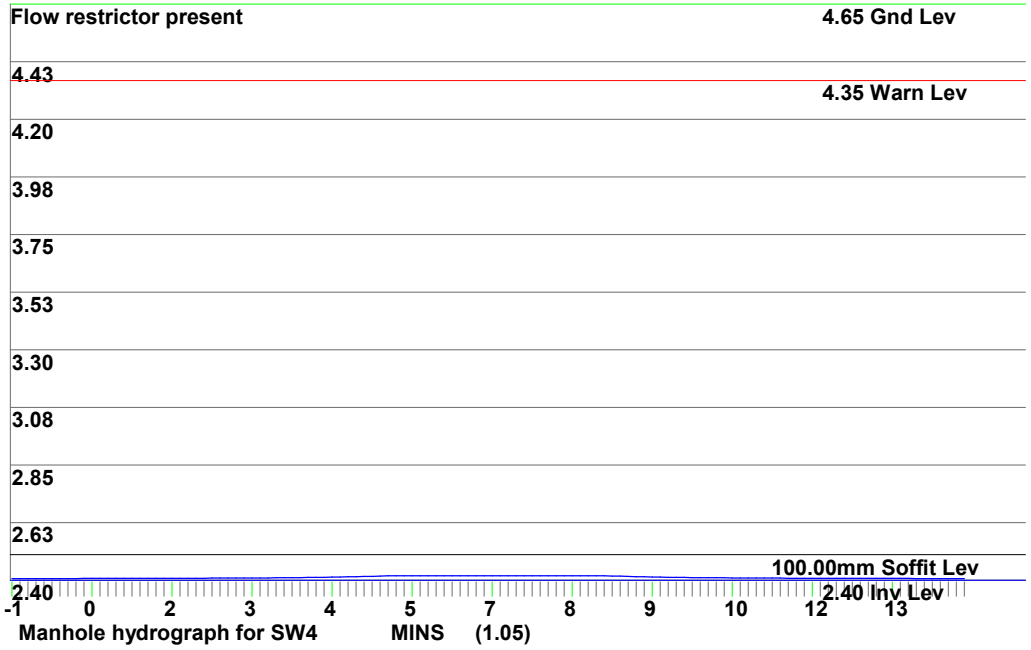
Job No.	833
Sheet no.	5
Date	16/09/26

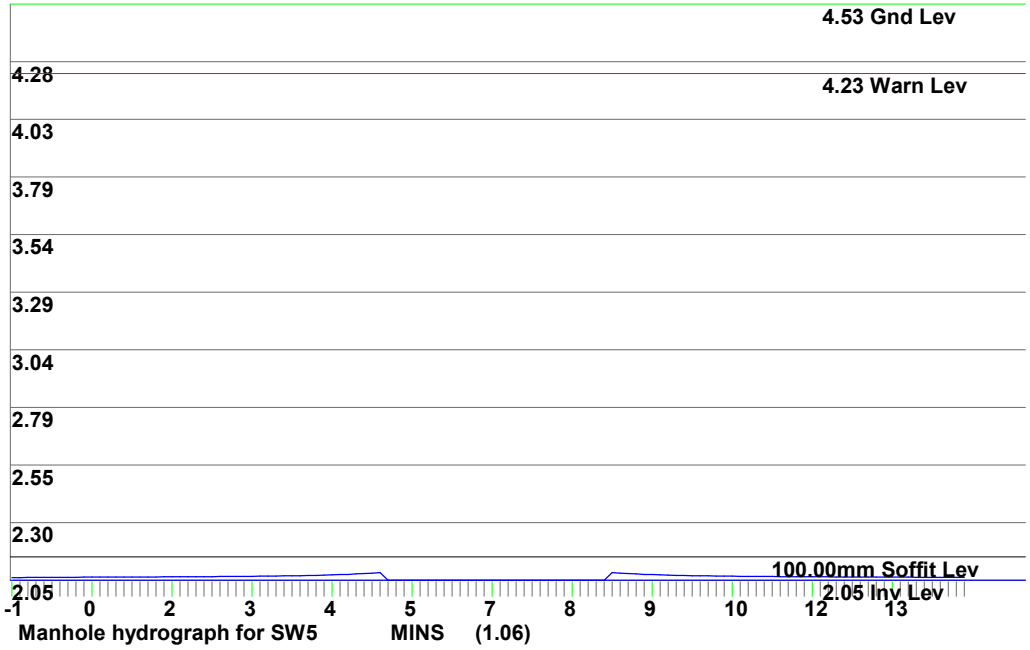
MasterDrain SW

Project: Marine Place

Title: Surcharge calcs for MARINE PLACE.SW

By	Checked	Reviewed





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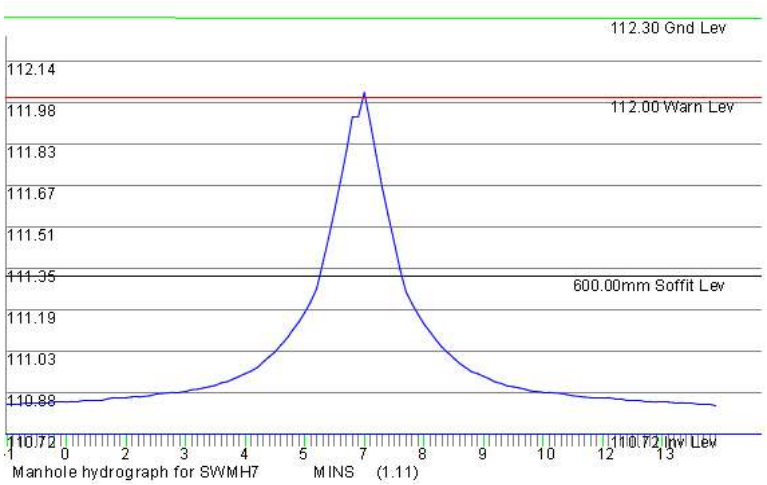
MasterDrain SW

Job No. 833			
Sheet no. 6			
Date 16/09/26			
Project Marine Place	By	Checked	Reviewed
Title Surcharge calcs for MARINE PLACE.SW			



1) Ground / cover level

2) Warning level - in this case, set at 300mm below cover level.

3) Soffit level of outflow pipe.

4) Invert level of chamber.

Notes

a) Lower section of the graph shows the water depth filling the channel. Channel is assumed to be a full pipe diameter in depth.

b) Upper section of the graph shows the water depth filling the chamber. Chamber has a greater width/diameter than the channel, so increases in depth are proportionally less.

c) The top of the graph clips the warning level and would be marked thus on the printout.

d) In many cases the invert of the offline storage is required to enter at the channel soffit level, meaning that the pipe will still surcharge but flooding risk reduced.

e) The diagram above is a general one and is not part of the current calculation.

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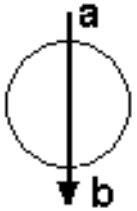
Job No.	833
Sheet no.	1
Date	16/09/26 14:30
Project	Marine Place
Title	Manhole printout for MARINE PLACE.SW

By	Checked	Reviewed

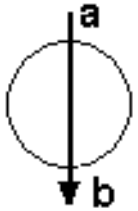
Manhole ref.	X ref	Y ref	Form	Cham diam. or length	Rect. width	Chamb. height	Shaft height	MH Volume	Exit Diam	Exit Crown	Exit Invert	Chamb const	Slab level	Cover Level	Dwnstr MH
SW1	39.47	4.41	circ	900	N/A	0.50		0.32	150	4.385	4.210	N/A	4.160	4.710	SW2
SW2	22.76	4.44	circ	900	N/A	0.93		0.59	150	3.885	3.710	N/A	3.660	4.640	SW3
SW3	3.14	4.27	circ	900	N/A	1.44		0.92	150	3.385	3.210	N/A	3.160	4.650N	STORAGE
ION STORAGE	3.14	2.84	circ	1200	N/A	1.94		2.19	150	2.885	2.710	N/A	2.660	4.650	SW4
SW4	3.28	5.81	circ	900	N/A	2.25		1.43	100	2.525	2.400	N/A	2.350	4.650	SW5
SW5	3.25	10.15	circ	900	N/A	2.48		1.58	100	2.175	2.050	N/A	2.000	4.530	0453

All manholes to be as per 'Sewers for Adoption'

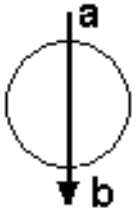
Environmental Assessment Services Ltd http://www.easltd.co.uk	London Rd, Hickstead Haywards Heath, West Sussex, RH17 5LZ Tel: 01444 882552 email: info@easltd.co.uk	Job No. 833 Sheet no. 2 Date 16/09/26 14:30		
Project Marine Place		By	Checked	Reviewed
Title Manhole printout for MARINE PLACE.SW				



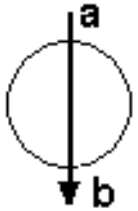
MH = SW1
a=head
b = 150



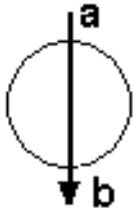
MH = SW2
a= 150
b = 150



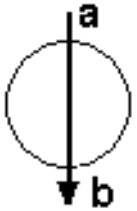
MH = SW3
a= 150
b = 150



MH = ATTENAUATION STORAGE
a=head
b = 150



MH = SW4
a= 150
b = 100



MH = SW5
a= 100
b = 100

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Job No.	833
Sheet no.	3
Date	16/09/26 14:30

Project	By	Checked	Reviewed
Marine Place			
Title: Manhole printout for MARINE PLACE.SW			

These explanatory notes should be read in conjunction with the Manhole printout

1) Manhole ref - the reference for the manhole in question
2) Form - either circular or rectangular
3) Chamber diam or length - diameter of chamber if circular, or length if rectangular - in metres
4) Rectangular width - if form is rectangular, this gives the width of the chamber
5) Chamber height - height of chamber from invert
6) Shaft height - height of access shaft if applicable, from top of chamber to ground level
7) Manhole volume - cubic capacity of manhole chamber
8) Exit diameter - diameter of pipe leaving this manhole
9) Exit crown - crown level of pipe leaving this manhole
10) Exit invert - invert level of pipe leaving this manhole
11) Chamb const - manhole construction :-
    N/A - not specified
    Conc - concrete rings
    Poly - polypropylene rings surrounded by selected fill
    Poly/conc - polypropylene rings surrounded by concrete
    Brick - brick built with waterproof render
    In situ - concrete cast in situ
12) Slab level - surface level of base slab (if no sump, this is placed at 50mm below exit invert to allow levels manipulation).
13) Manhole diameters of 9999 have exceeded the sizes available in SfA
14) Manhole diameters may have to be modified due to the number of branches

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MasterDrain SW

Job No. 883			
Sheet no. 1			
Date 17/09/26			
Project Marine Place	By XL	Checked	Reviewed
Title Hydrograph storage analysis (Winter profile) for WORTHING			

Data:-

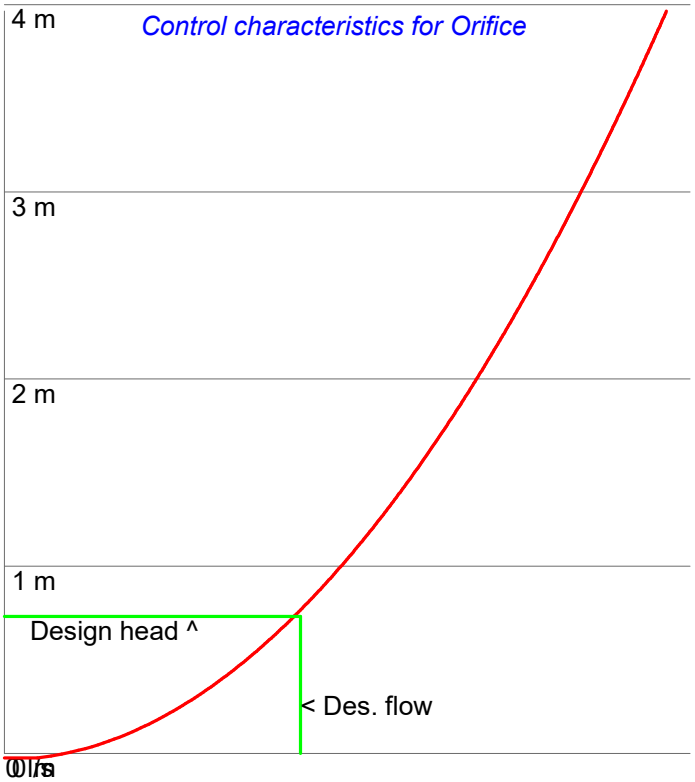
FEH Hydrology:-

Location = WORTHING Grid reference = TQ1402
c = -0.0276 d1 = 0.4047 d2 = 0.3240
d3 = 0.3565 e = 0.3141 f = 2.4152
Return period = 100 Climate change = 40%

Percentage runoff = 100.0% (manual setting)

Imperv. area	= 543 m²	Pervious area	= 45 m²
Total area	= 588 m²	Equiv area	= 588 m² (Tot. area x % runoff).
Total runoff	= 61.1 m³	Discharge rate	= 2.000 l/s
Design Head	= 0.8m	Peak flow	= 2.01 l/s
Control device	= Orifice	Orifice diam	= 32.5 mm
Max. calc. depth	= 0.82 m	Available depth	= 0.0 m³
Mean discharge	= 1.16 l/s		

Available system storage = 0.00 m³ under a system plane at the design head level.
Offline storage = 0.0 m³
Total storage = 42.0 m³ Peak input flow =8.49 l/s



Head (m)	Flow (l/s)	Head (m)	Flow (l/s)
0.01	0.22	2.01	3.17
0.05	0.50	2.05	3.20
0.10	0.71	2.10	3.24
0.15	0.87	2.15	3.28
0.20	1.00	2.20	3.32
0.25	1.12	2.25	3.35
0.30	1.22	2.30	3.39
0.35	1.32	2.35	3.43
0.40	1.41	2.40	3.46
0.45	1.50	2.45	3.50
0.50	1.58	2.50	3.54
0.55	1.66	2.55	3.57
0.60	1.73	2.60	3.61
0.65	1.80	2.65	3.64
0.70	1.87	2.70	3.67
0.75	1.94	2.75	3.71
0.80	2.00	2.80	3.74
0.85	2.06	2.85	3.77
0.90	2.12	2.90	3.81
0.95	2.18	2.95	3.84
1.00	2.24	3.00	3.87
1.05	2.29	3.05	3.91
1.10	2.35	3.10	3.94
1.15	2.40	3.15	3.97
1.20	2.45	3.20	4.00
1.25	2.50	3.25	4.03
1.30	2.55	3.30	4.06
1.35	2.60	3.35	4.09
1.40	2.65	3.40	4.12
1.45	2.69	3.45	4.15
1.50	2.74	3.50	4.18
1.55	2.78	3.55	4.21
1.60	2.83	3.60	4.24
1.65	2.87	3.65	4.27
1.70	2.92	3.70	4.30
1.75	2.96	3.75	4.33
1.80	3.00	3.80	4.36
1.85	3.04	3.85	4.39
1.90	3.08	3.90	4.42
1.95	3.12	3.95	4.44
2.00	3.16	4.00	4.47

Calculation data provided by Crown Water Ltd, SL5 7NT

MasterDrain SW

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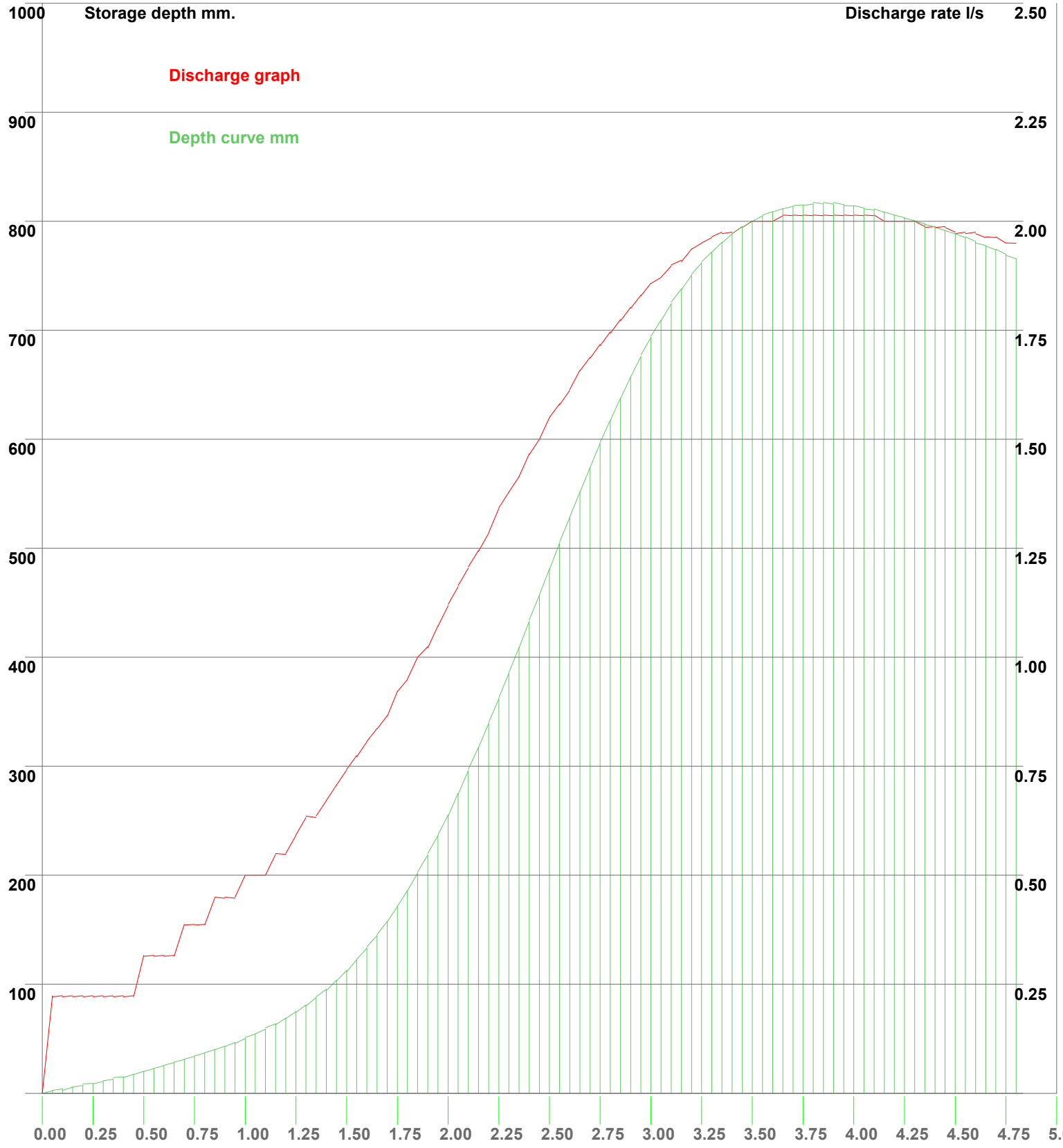
Job No. 883			
Sheet no. 2			
Date 17/09/26			
Project Marine Place	By XL	Checked	Reviewed
Title Hydrograph storage analysis (Winter profile) for WORTHING			

Storage curves for a 5 hours storm.



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Job No.	Sheet no.	Date	By	Checked	Reviewed
883	3	17/09/26	XL		

Project: Marine Place

Title: Hydrograph storage analysis (Winter profile) for WORTHING

Incremental rainfall figures.

Storm Mins	Storage Depth mm	Control Flow l/s	Storm Mins	Storage Depth mm	Control Flow l/s
3.0	2.3	0.22	153.0	504.7	1.58
6.0	3.9	0.22	156.0	528.2	1.61
9.0	5.6	0.22	159.0	551.6	1.66
12.0	7.2	0.22	162.0	574.3	1.69
15.0	9.0	0.22	165.0	596.3	1.72
18.0	10.9	0.22	168.0	617.5	1.75
21.0	13.0	0.22	171.0	637.8	1.77
24.0	15.2	0.22	174.0	657.2	1.80
27.0	17.6	0.22	177.0	675.7	1.83
30.0	20.2	0.32	180.0	693.2	1.86
33.0	22.7	0.32	183.0	709.4	1.87
36.0	25.4	0.32	186.0	724.3	1.90
39.0	28.1	0.32	189.0	737.9	1.91
42.0	31.0	0.39	192.0	750.5	1.94
45.0	33.9	0.39	195.0	761.7	1.95
48.0	37.0	0.39	198.0	771.7	1.96
51.0	40.2	0.45	201.0	780.7	1.97
54.0	43.3	0.45	204.0	788.5	1.97
57.0	46.7	0.45	207.0	795.0	1.99
60.0	50.4	0.50	210.0	800.4	2.00
63.0	54.3	0.50	213.0	804.9	2.00
66.0	58.8	0.50	216.0	808.7	2.00
69.0	63.7	0.55	219.0	811.6	2.01
72.0	69.1	0.55	222.0	813.6	2.01
75.0	74.9	0.59	225.0	815.0	2.01
78.0	81.1	0.63	228.0	815.8	2.01
81.0	87.9	0.63	231.0	816.1	2.01
84.0	95.5	0.67	234.0	815.8	2.01
87.0	103.8	0.71	237.0	815.1	2.01
90.0	112.8	0.74	240.0	813.9	2.01
93.0	122.5	0.77	243.0	812.2	2.01
96.0	133.1	0.81	246.0	810.2	2.01
99.0	144.8	0.84	249.0	808.0	2.00
102.0	157.7	0.87	252.0	805.7	2.00
105.0	171.4	0.92	255.0	803.2	2.00
108.0	186.1	0.95	258.0	800.6	2.00
111.0	202.0	1.00	261.0	797.7	1.99
114.0	218.7	1.02	264.0	794.7	1.99
117.0	236.5	1.07	267.0	791.6	1.99
120.0	255.4	1.12	270.0	788.4	1.97
123.0	275.3	1.16	273.0	785.0	1.97
126.0	296.0	1.20	276.0	781.4	1.97
129.0	317.3	1.24	279.0	777.6	1.96
132.0	339.4	1.28	282.0	773.7	1.96
135.0	362.1	1.34	285.0	769.6	1.95
138.0	385.3	1.38	288.0	765.5	1.95
141.0	409.0	1.41	291.0	761.3	1.95
144.0	433.0	1.47	294.0	757.0	1.94
147.0	456.9	1.50	297.0	752.7	1.94
150.0	480.9	1.55	300.0	748.4	1.92

Using the Get Max button causes the program to step through a series of storm durations until a maximum volume is obtained.
Each duration is sampled 600 times and the results recorded. The storm durations (hrs) are:-

0.25, 0.5, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 18, 20, 24, 30, 36, 42, 48, 54, 60, 66, 72, 84, 96, 120, 150, 175, 200, 250, 300, 375, 500, 750, 1000, 1250, 1500, 1570, 2000, 2500, 3000, 3500, 4000

It should be noted that the six hour storm frequently requested rarely demonstrates the worst case for storage.

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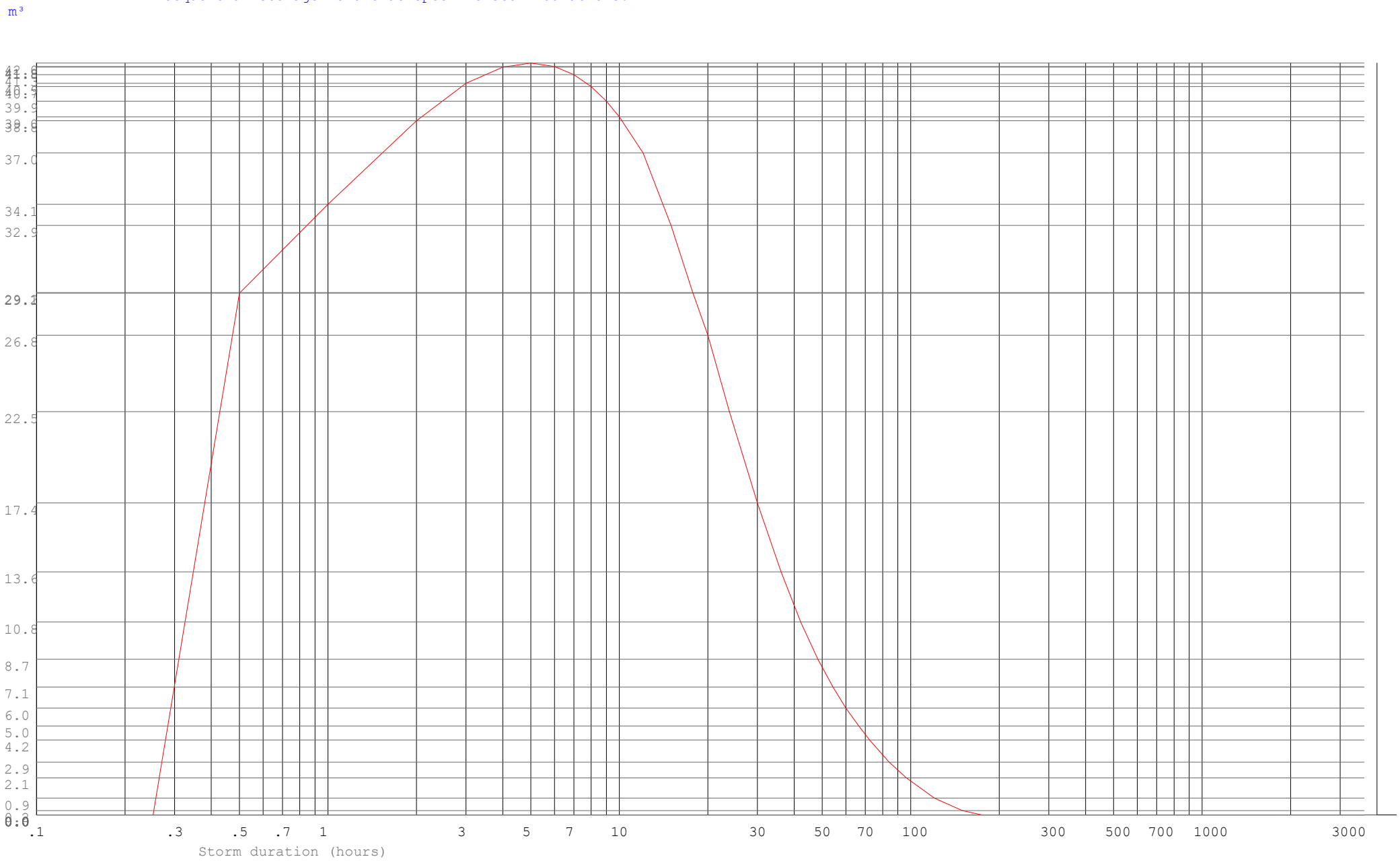
Job No.	Sheet no.	Date	By	Checked	Reviewed
883	4	17/09/26	XL		

MasterDrain SW

Project **Marine Place**

Title **Hydrograph storage analysis (Winter profile) for WORTHING**

Sequential storage volume at specific storm durations.



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MasterDrain
Foul 11.5

Job No.	883
Sheet no.	0
Date	26/03/26
Project	Marine Place
Title	Manhole printout for MARINE PLACE.FL
By	XL
Checked	
Reviewed	

Manhole ref.	Form	Cham diam. or length	Rect. width	Chamb. height	Shaft height	MH Volume	Ent. Diam	Ent. Crown	Ent. Invert	Exit Diam	Exit Crown	Exit Invert	Chamb const	Cover Level	Dwnstr MH
FW1		0	0			0.00	Head	----	----	100	4.335	4.210	N/A	4.710	FW2
FW4		0	0			0.00	Head	----	----	100	4.155	4.030	N/A	4.530	FW3
FW3		0	0			0.00	0	0.000	0.000	100	4.005	3.880	N/A	4.650	FW2
FW2		0	0			0.00	0	0.000	0.000	100	3.795	3.670	N/A	4.640	0404

All manholes to be as per 'Sewers for Adoption'

Levels calculated for level inverts

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MasterDrain
Foul 11.5

Job No. 883			
Sheet no. 0			
Date 26/03/26			
Project Marine Place	By XL	Checked	Reviewed
Title Manhole printout for MARINE PLACE.FL			

These explanatory notes should be read in conjunction with the Manhole printout

1) Manhole ref - the reference for the manhole in question

2) Form - either circular or rectangular

3) Chamber diam or length - diameter of chamber if circular, or length if rectangular - in metres

4) Rectangular width - if form is rectangular, this gives the width of the chamber

5) Chamber height - height of chamber from invert

6) Shaft height - height of access shaft if applicable, from top of chamber to ground level

7) Manhole volume - cubic capacity of manhole chamber

8) Exit diameter - diameter of pipe leaving this manhole

9) Exit crown - crown level of pipe leaving this manhole

10) Exit invert - invert level of pipe leaving this manhole

11) Manhole diameters of 9999 have exceeded the sizes available in SfA

12) Manhole diameters may have to be modified due to the number of branches

APPENDIX E:

PHOTOGRAPHS

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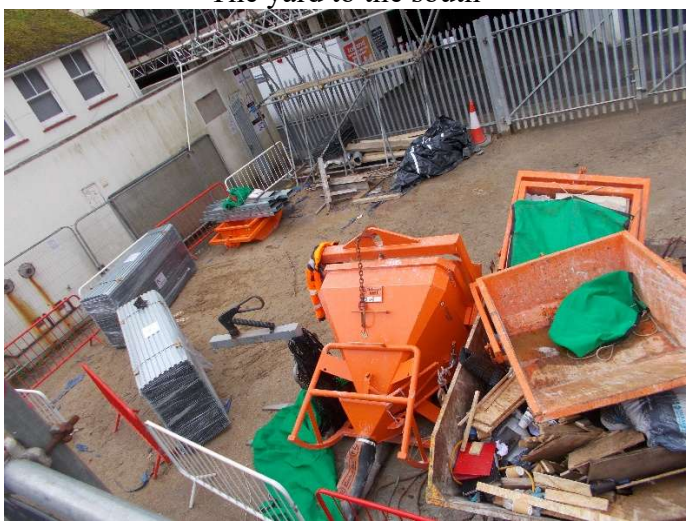
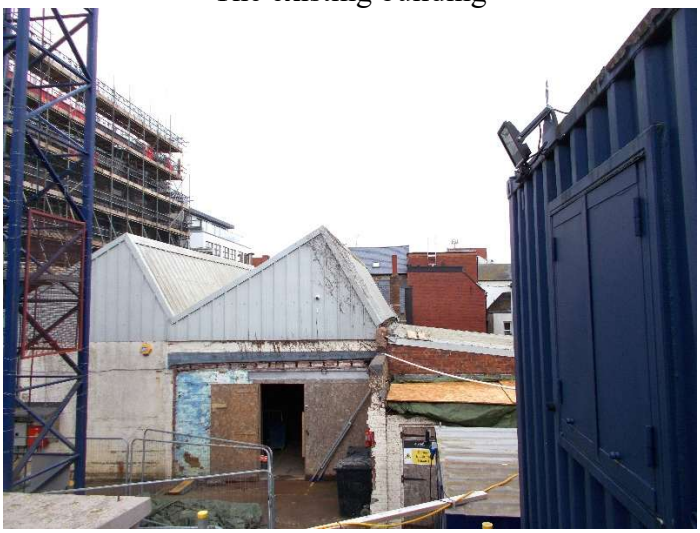
The site entrance from Marine Place



The yard to the south



The existing building



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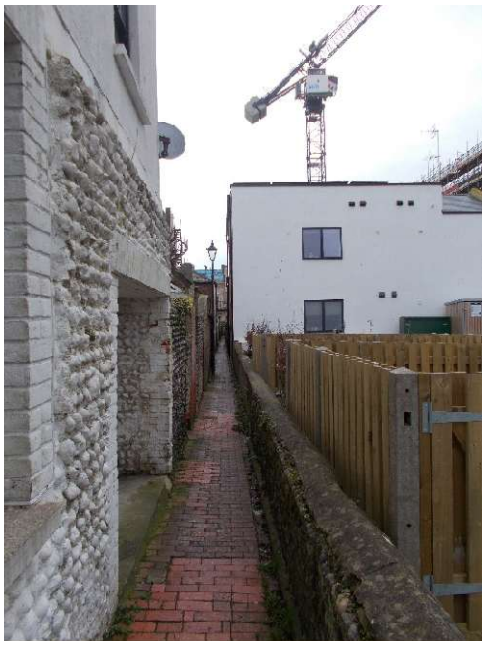
Alleyway to the east of the site





Bedford Row to the east



Drain and manhole from the existing building onsite



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Manhole onsite

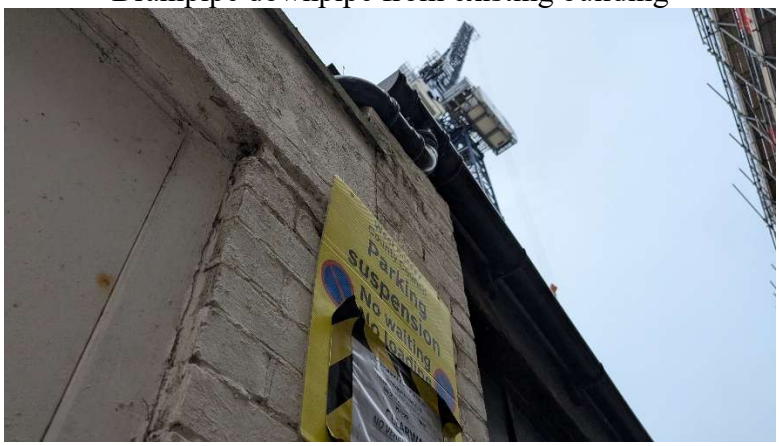








Drainpipe downpipe from existing building



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APPENDIX F

SOUTHERN WATER SEWER PLANS

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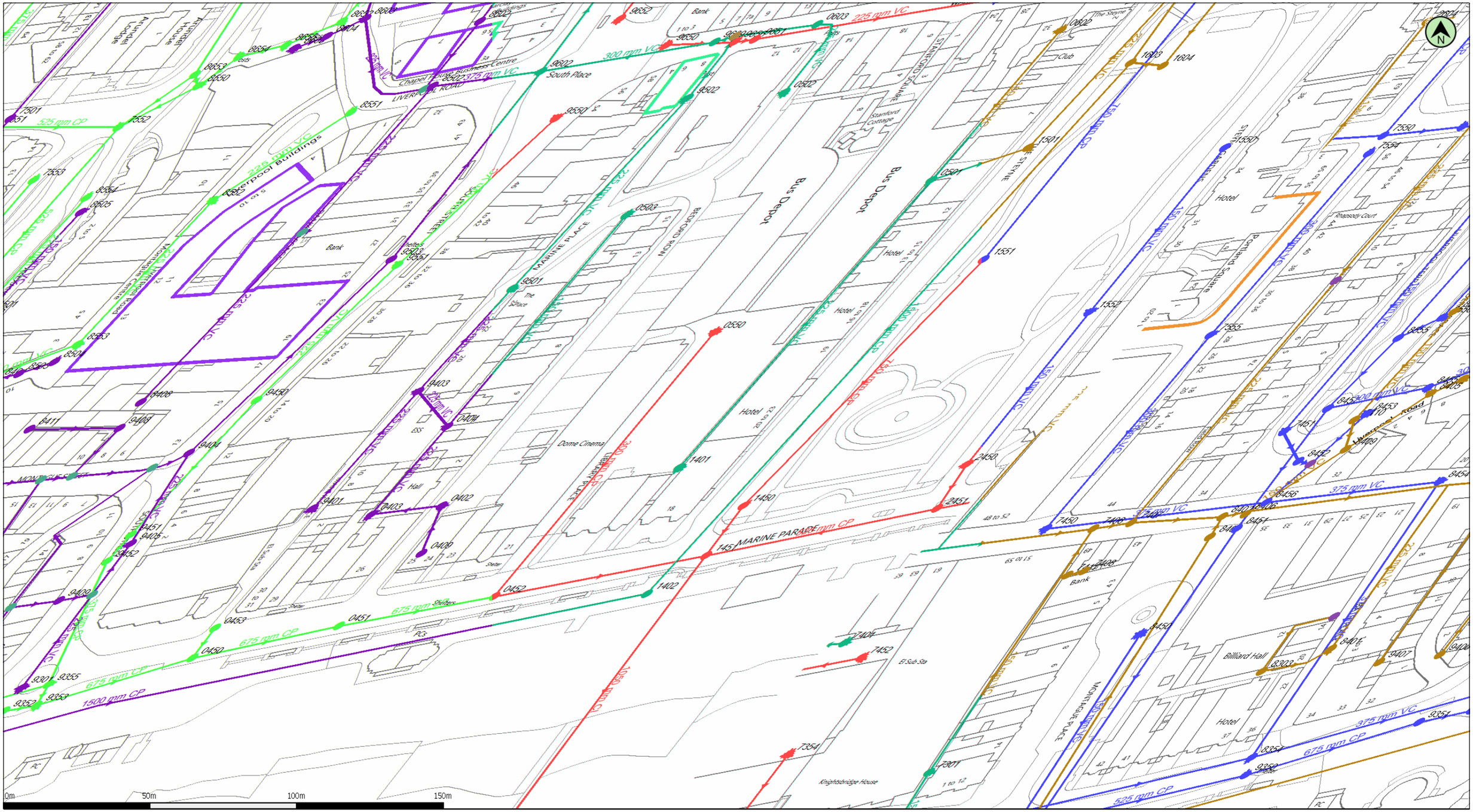

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WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

Foul Gravity Sewer
Combined Gravity Sewer
Culverted Water Course or Treated Effluent
Surface Water Gravity Sewer
Rising Main, Vacuum or Syphon
Combined Outfall
Surface Water Outfall
Foul Outfall
Surface Water Inlet
Combined Pumping Station
Surface Water Pumping Station
Foul Pumping Station
Water Treatment Works
Section 104 Area
Building Over Agreement Area
Foul Manhole
Combined Manhole
Surface Water Manhole
Side Entry Manhole, Decarcation Chamber, Dummy Manhole or Surface Water Soakaway

gareth@craigdevelopments.co.uk

marine place

WATER for LIFE from Southern Water

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0402	F	4.67	2.45	
0403	F	4.67	2.31	
0404	F	4.53	2.00	
0409	F	4.67	2.45	
0501	F	5.08	1.50	
0502	F	5.27	2.60	
0503	F	5.66	3.54	
0602	F	5.55	3.91	
0603	F	5.26	1.98	
1401	F	4.08	2.15	
1402	F	5.46	-3.48	
1501	F	5.26	1.26	
1603	F	5.34	-3.62	
1604	F	5.34	-0.37	
2604	F	5.61	0.00	
7301	F	4.84	3.28	
7401	F	3.10	1.93	
7406	F	4.89	0.77	
7407	F	4.90	0.00	
7408	F	0.00	0.00	
7411	F	0.00	0.00	
7501	F	5.51	3.94	
8303	F	0.00	0.00	
8401	F	4.67	0.00	
8402	F	4.92	0.00	
8403	F	4.97	0.00	
8404	F	5.05	2.79	
8405	F	5.07	2.70	
8406	F	4.89	0.00	
8408	F	0.00	0.00	
8409	F	4.96	2.37	
8410	F	5.14	2.45	
8411	F	0.00	0.00	
8501	F	5.08	2.78	
8502	F	5.58	1.17	
8503	F	5.05	2.83	
8504	F	5.10	3.22	
8505	F	5.24	3.16	
8602	F	5.55	0.00	
8603	F	5.51	3.38	
8604	F	5.68	3.71	
8605	F	5.51	3.88	
9301	F	5.11	2.26	
9401	F	4.64	2.22	
9403	F	4.94	1.78	
9404	F	4.40	0.60	
9405	F	4.27	0.99	
9406	F	0.00	0.00	
9407	F	0.00	0.00	
9408	F	0.00	0.00	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
9409	F	0.00	0.00	
9501	F	5.23	1.64	
9502	F	5.44	1.38	
9503	F	0.00	0.00	
9602	F	5.48	0.52	
9609	F	5.12	1.01	
0450	S	4.43	1.59	
0451	S	0.00	0.00	
0452	S	0.00	0.00	
0453	S	0.00	0.00	
0550	S	5.29	3.58	
1450	S	4.90	0.00	
1451	S	4.93	0.00	
1550	S	5.29	0.00	
1551	S	5.00	3.19	
1552	S	5.16	4.00	
2450	S	4.96	3.73	
2451	S	4.96	0.00	
7354	S	2.86	1.90	
7450	S	4.98	4.06	
7451	S	6.08	4.33	
7452	S	2.95	2.02	
7550	S	5.36	3.83	
7551	S	5.42	3.67	
7552	S	5.50	3.52	
7553	S	6.86	5.38	
7554	S	5.30	4.57	
7555	S	5.40	4.36	
8354	S	4.98	3.07	
8450	S	4.83	3.67	
8451	S	4.91	0.00	
8452	S	5.24	3.86	
8453	S	5.05	3.86	
8454	S	4.63	3.35	
8455	S	5.08	0.00	
8456	S	4.89	3.63	
8457	S	0.00	0.00	
8550	S	5.54	3.79	
8551	S	5.60	4.14	
8552	S	5.47	4.05	
8553	S	5.11	3.67	
8554	S	5.25	3.63	
8555	S	5.29	0.00	
8556	S	5.04	3.46	
8652	S	5.68	4.05	
8653	S	5.51	3.89	
8654	S	5.57	3.91	
8655	S	5.44	3.96	
9350	S	4.86	1.95	
9351	S	4.79	1.81	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
9352	S	4.66	1.81	
9353	S	4.57	1.73	
9355	S	4.65	1.94	
9450	S	4.50	0.00	
9451	S	4.37	2.45	
9452	S	0.00	0.00	
9550	S	5.07	3.49	
9551	S	4.72	3.06	
9650	S	5.18	4.52	
9651	S	5.15	4.16	
9652	S	5.66	4.53	
9656	S	5.16	4.20	

APPENDIX G

ENVIRONMENT AGENCY PRODUCT 4 INFORMATION

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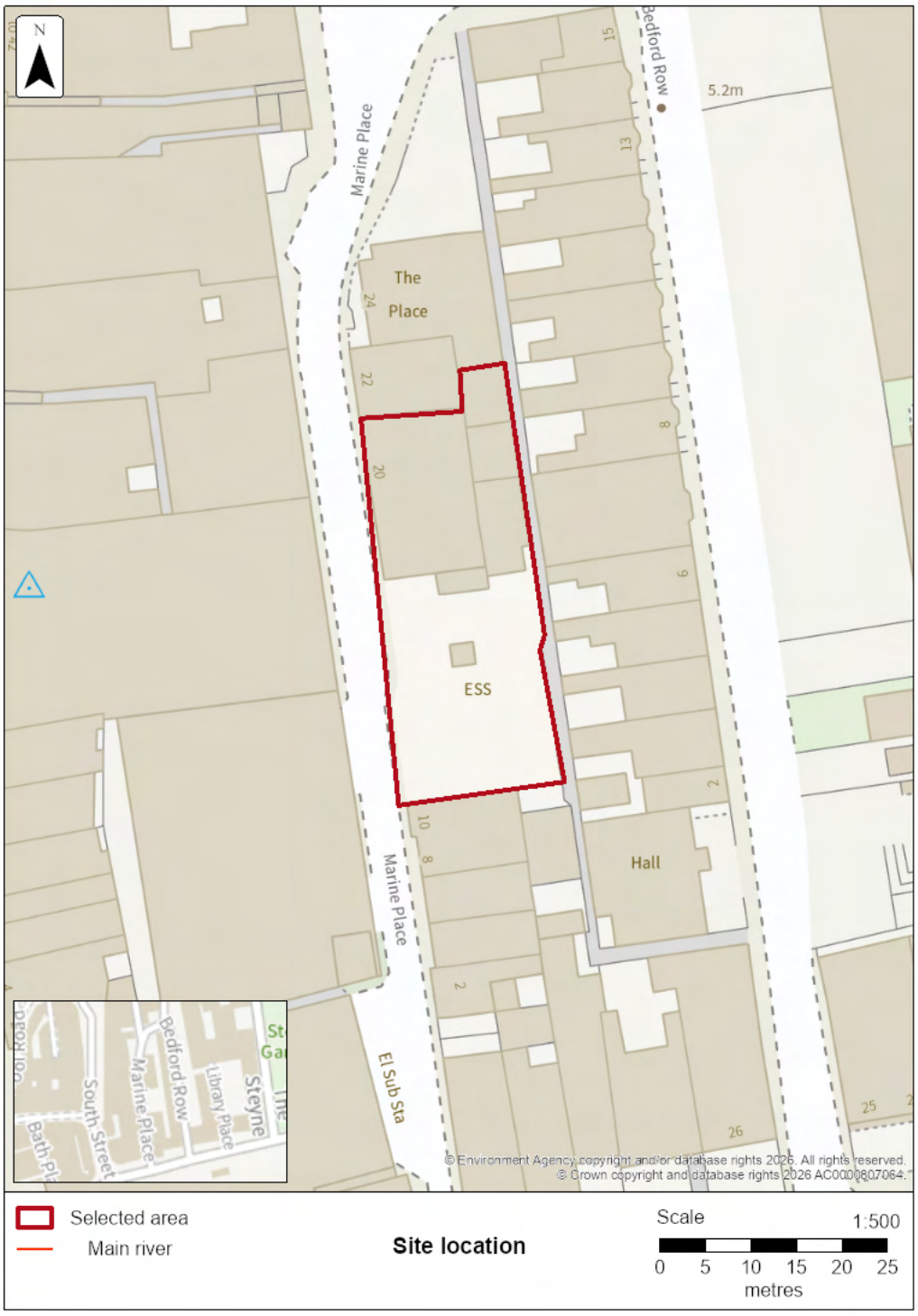
Flood risk assessment data

Location of site: 515001 / 102491 (shown as easting and northing coordinates)
Document created on: 6 March 2026
This information was previously known as a product 4.
Customer reference number: EIR2026/11646

Map showing the location that flood risk assessment data has been requested for.



How to use this information

You can use this information as part of a flood risk assessment for a planning application. To do this, you should include it in the appendix of your flood risk assessment.

> **We recommend that you work with a flood risk consultant to get your flood risk assessment.**

Included in this document

In this document you'll find:

- how to find information about surface water and other sources of flooding
- information on the models used
- definitions for the terminology used throughout
- flood map for planning (rivers and the sea)
- modelled data
- climate change modelled data
- information about strategic flood risk assessments
- information about this data
- information about flood risk activity permits
- help and advice

Information that's unavailable

This document **does not** contain:

- past floods
- flood defences and attributes

We do not have past flooding data for this location.

Please note that:

- flooding may have occurred that we do not have records for
- flooding can come from a range of different sources
- we can only supply flood risk data relating to flooding from rivers or the sea

You can contact your Lead Local Flood Authority or Internal Drainage Board to see if they have other relevant local flood information. Please note that some areas do not have an Internal Drainage Board.

We aren't able to display flood defence locations and attributes as there are no formal flood defences in the area of interest.

Surface water and other sources of flooding

When using the surface water map on the check your long term flood risk service the following considerations apply:

- surface water extents are suitable for use in planning
- surface water climate change scenarios may help to inform risk assessments, but the available data fall short of what is required to assess planned development
- surface water depth information should not be used for planning purposes

To find out about other factors that might affect the flood risk of this location, you should also check:

- reservoir flood risk
- groundwater flood risk - you could use the British Geological Survey groundwater flooding data, groundwater: current status and flood risk and the guide on mining and groundwater constraints for development - further information may be available from the lead local flood authority (LLFA)
- your local planning authority's SFRA, which includes future flood risk

Your Lead Local Flood Authority is West Sussex County.

For information about sewer flooding, contact the relevant water company for the area.

About the models used

Model name: Arun Coastal Model, 2012
Scenario(s): Defended tidal, defences removed tidal, defended climate change tidal, defences removed climate change tidal
Date: 20 August 2012

This model contains the most relevant data for your area of interest.

Terminology used

Annual exceedance probability (AEP)

This refers to the probability of a flood event occurring in any year. The probability is expressed as a percentage. For example, a large flood which is calculated to have a 1% chance of occuring in any one year, is described as 1% AEP.

Metres above ordnance datum (mAOD)

All flood levels are given in metres above ordnance datum which is defined as the mean sea level at Newlyn, Cornwall.

Flood map for planning (rivers and the sea)

Your selected location is in flood zone 3.

Flood zone 3 shows the area at risk of flooding for an undefended flood event with a:

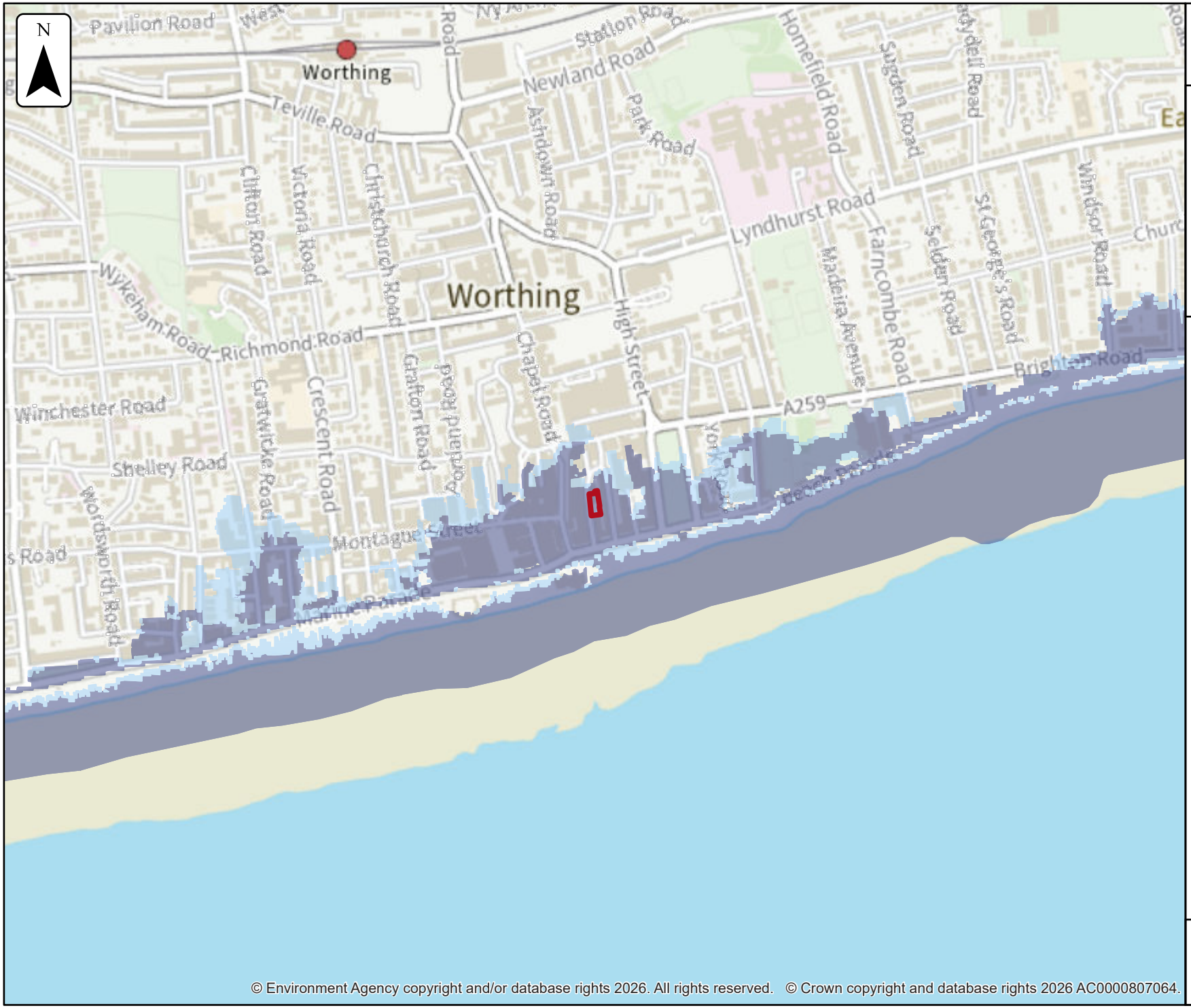
- 0.5% or greater probability of occurring in any year for flooding from the sea
- 1% or greater probability of occurring in any year for fluvial (river) flooding

Flood zone 2 shows the area at risk of flooding for an undefended flood event with:

- between a 0.1% and 0.5% probability of occurring in any year for flooding from the sea
- between a 0.1% and 1% probability of occurring in any year for fluvial (river) flooding

It's important to remember that the flood zones on this map:

- refer to the land at risk of flooding and do not refer to individual properties
- refer to the probability of river and sea flooding, ignoring the presence of defences
- do not take into account potential impacts of climate change



Environment Agency

Flood map for planning

Location (easting/northing)
515001/102491

Scale
1:10,000

Created
6 Mar 2026

- Selected area
- Flood Zone 3
- Flood Zone 2

0 100 200 300 400 500
metres

Modelled data

This section provides details of different scenarios we have modelled and includes the following (where available):

- outline maps showing the area at risk from flooding in different modelled scenarios
- map(s) showing the approximate water levels for the return period with the largest flood extent for a scenario and table(s) of sample points providing details of the flood risk for different return periods

Climate change

The climate change data included in the models may not include the latest flood risk assessment climate change allowances. Where the new allowances are not available you will need to consider this data and factor in the new allowances to demonstrate the development will be safe from flooding.

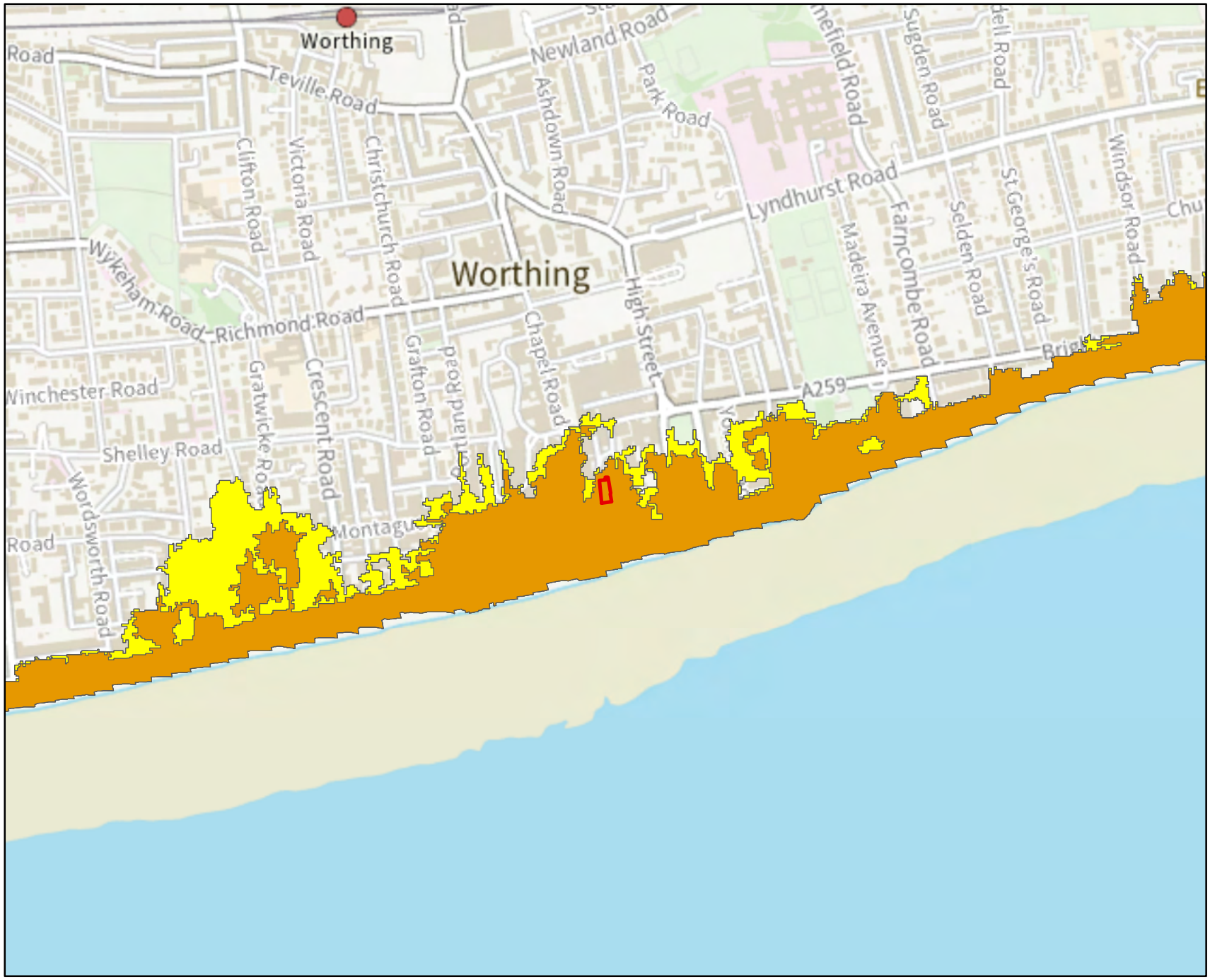
The Environment Agency will incorporate the new allowances into future modelling studies. For now, it's your responsibility to demonstrate that new developments will be safe in flood risk terms for their lifetime.

Modelled scenarios

The following scenarios are included:

- Defended modelled tidal: risk of flooding from the sea where there are flood defences
- Defences removed modelled tidal: risk of flooding from the sea where flood defences have been removed
- Defended climate change modelled fluvial: risk of flooding from rivers where there are flood defences, including estimated impact of climate change
- Defended climate change modelled tidal: risk of flooding from the sea where there are flood defences, including estimated impact of climate change
- Defences removed climate change modelled tidal: risk of flooding from the sea where flood defences have been removed, including estimated impact of climate change

Modelled Flood Outlines (Defended Tidal). Centred BN11 3DR. Created 13/03/2026.



Environment Agency

N

Legend

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

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

Scale: 1:10,000

0 0.225 0.45
Kilometers

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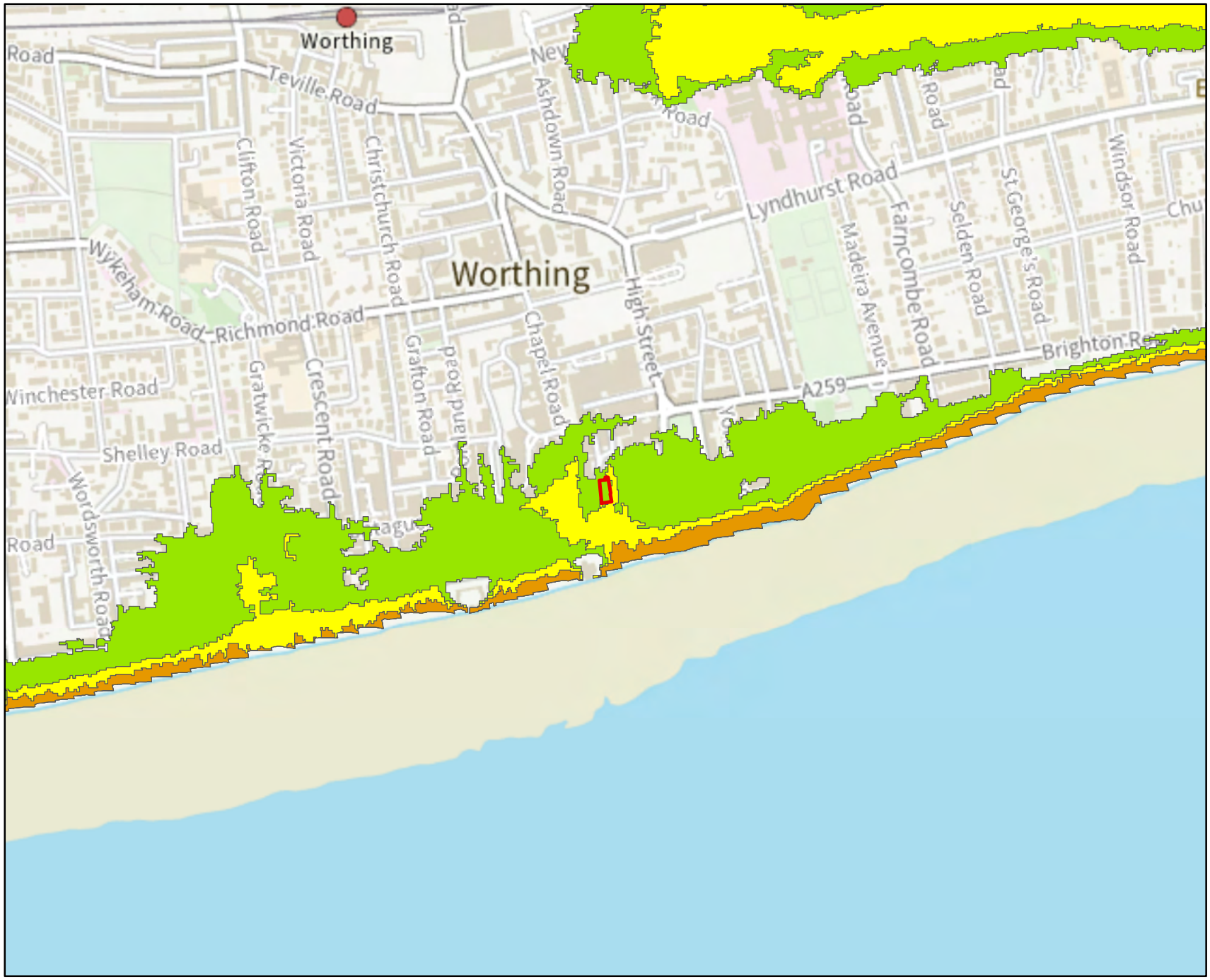
Contact us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506. Email:enquiries@environment-agency.gov.uk

Modelled Flood Outlines (Undefended Tidal). Centred BN11 3DR. Created 13/03/2026.



Environment Agency

N

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

0 0.225 0.45
Kilometers

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Contact us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506. Email:enquiries@environment-agency.gov.uk

Site Boundary and Node Points. Centred BN11 3DR. Created 13/03/2026.



Environment Agency

N

Legend

Site Boundary

Site Nodes

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

Scale: 1:294

0 0.005 0.01

Kilometers

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Contact us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506. Email:enquiries@environment-agency.gov.uk

Product 4 Flood Risk Data Requested by: Xanthe Lyford

Site: 515003,102497 (easting and northing coordinates)

Table 1: Water Levels: Tidal Undefended

	NGR		Modelled Flood Levels in Metres AOD Undefended Annual Exceedance Probability			
Node Ref	Eastings	Northings	0.5%	0.5% (2070)*	0.5% (2115)*	0.1%
1	514993	102507	-	-	5.26	-
2	515004	102515	-	-	5.26	-
3	514995	102491	-	-	5.26	-
4	515007	102492	-	-	5.26	-
5	514998	102474	-	-	5.26	-
6	515008	102476	-	-	5.26	-

Table 2: Water Levels: Tidal Defended

	NGR		Modelled Flood Levels in Metres AOD Defended Annual Exceedance Probability			
Node Ref	Eastings	Northings	0.5%	0.5% (2070)*	0.5% (2115)*	0.1%
1	514993	102507	5.05	5.21	5.01	5.15
2	515004	102515	5.05	5.21	5.01	5.15
3	514995	102491	5.05	5.21	5.01	5.15
4	515007	102492	5.05	5.21	5.01	5.15
5	514998	102474	5.05	5.21	5.01	5.15
6	515008	102476	5.05	5.21	5.01	5.15

Table 3: Water Depths: Tidal Undefended

	NGR		Modelled Flood Depths in Metres Undefended Annual Exceedance Probability			
Node Ref	Eastings	Northings	0.5%	0.5% (2070)*	0.5% (2115)*	0.1%
1	514993	102507	-	-	0.37	-
2	515004	102515	-	-	0.96	-
3	514995	102491	-	-	0.48	-
4	515007	102492	-	-	0.48	-
5	514998	102474	-	-	0.51	-
6	515008	102476	-	-	0.46	-

Office Address: Guildbourne House, Chatsworth Road, Worthing BN11 1LD.
Customer services line: 03708 506 506. Email: enquiries@environment-agency.gov.uk
www.gov.uk/government/organisations/environment-agency

Table 4: Water Depths: Tidal Defended

	NGR		Modelled Flood Depths in Metres			
			Defended Annual Exceedance Probability			
Node Ref	**Eastings**	**Northings**	**0.5%**	**0.5% (2070)***	**0.5% (2115)***	**0.1%**
1	514993	102507	0.15	0.32	0.12	0.26
2	515004	102515	0.75	0.91	0.71	0.86
3	514995	102491	0.23	0.39	0.19	0.34
4	515007	102492	0.35	0.51	0.31	0.46
5	514998	102474	0.28	0.44	0.25	0.39
6	515008	102476	0.25	0.41	0.21	0.36

All levels taken from: Arun Coastal Modelling (2012), by JBA Consulting.

Produced on: 13/03/2026

*** The flood risk data provided is based on existing EA hydraulic models with an allowance for climate change. Please note the climate change allowances provided are not up to date. These were updated on 27 July 2021.**

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.

Strategic flood risk assessments

We recommend that you check the relevant local authority's strategic flood risk assessment (SFRA) as part of your work to prepare a site specific flood risk assessment.

This should give you information about:

- the potential impacts of climate change in this catchment
- areas defined as functional floodplain
- flooding from other sources, such as surface water, ground water and reservoirs

Your Lead Local Flood Authority is West Sussex County.

About this data

This data has been generated by strategic scale flood models and is not intended for use at the individual property scale. If you're intending to use this data as part of a flood risk assessment, please include an appropriate modelling tolerance as part of your assessment. The Environment Agency regularly updates its modelling. We recommend that you check the data provided is the most recent, before submitting your flood risk assessment.

Flood risk activity permits

Under the Environmental Permitting (England and Wales) Regulations 2016 some developments may require an environmental permit for flood risk activities from the Environment Agency. This includes any permanent or temporary works that are in, over, under, or nearby a designated main river or flood defence structure.

Find out more about flood risk activity permits

Help and advice

Contact the Solent and South Downs Environment Agency team at ssdenquiries@environment-agency.gov.uk for:

- more information about getting a product 5, 6, 7 or 8
- general help and advice about the site you're requesting data for

APPENDIX H:

FLOOD WARNING AND EVACUATION PLAN TEMPLATE

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FLOOD WARNING AND EVACUATION PLAN TEMPLATE (PPS 25)

Planning Application No:	
Site Address:	
Proposal:	
etail the reason the plan is required (e.g. discharge of a planning condition? Or in order to obtain planning permission?)	
Flood Risk Assessment Attached	**Yes/No*** ***Delete as applicable.**
Applicant Contact Details:	
Agent Contact Details:	

Document Control
This Plan is owned, maintained and updated by **[insert details].** All stakeholders of the plan are asked to inform the above of any changes in circumstances that may materially affect the plan in anyway. Details of any changes should be sent to: **[insert details]** This plan should be reviewed • On first occupation • Every 3 years following first occupation or; • As a result of lessons identified following a flood event or exercise, or; • Following changes of ownership/use of the property or; • Following changes to the Flood Warning process. **Signed:** **Dated:** **Version No:**

FLOOD EMERGENCY PLAN (PPS 25)

Preface

The Emergency Management Unit, North Somerset Council, has developed this planning template from initial work undertaken by Bristol City Council to support planning applications to which PPS25 guidance and practice refers.

Disclaimer

North Somerset Council, as far as it can ascertain, acknowledges that this Flood Emergency Plan (FEP) template is suitable for the purposes set out in Planning Policy Statement 25: "Development and Flood Risks – Practice Guide". However FEP's are the sole responsibility of the applicant. North Somerset Council cannot accept responsibility for any omission or error contained in any such plan, or for loss, damage, or inconvenience, which may result from such plans' implementation. Any subsequent approval does not impute any approval of those plans from the Environment Agency or any of the emergency services.

1. Introduction

Required Information:

- Site Location Plan (A4, scale 1:2500 or 1:1250 with named roads)
- Site Layout Plan (to appropriate scale)
- Background/ brief history of the site, existing and proposed use.
- Details of site management post-development (if known) – name, contact arrangements (24hr)

2. Flood Risk

Please insert details of the types of flooding the development is at risk from, the source of the potential flooding e.g. River name, warning systems in place (if any), the frequency/ probability of flooding, depth and estimated time from warning to onset of flooding.
Attach a copy of flood risk map(s).

Flood Risk Source	Warning System in place (Eg the EA's Flood Warnings Direct service, MET Office)	Estimated Warning Time (Hrs)	Estimated Flood Depth (m AOD)	Frequency / Probability of Flooding from this source
Fluvial Flooding e.g. River Yeo				
Tidal Flooding (eg. Uphill)				
Ground Water Flooding				
Surface Water Flooding				
Reservoir Flooding				

Advisory - Flood Warnings

The Environment Agency (EA) operate a flood forecasting and warning service in areas at risk of flooding from rivers or the sea, which relies on direct measurements of rainfall, river levels, tide levels, in-house predictive models, rainfall radar data and information from the Met Office. This service operates 24hours a day, 365 days a year. If flooding is forecast, warnings are issued using a set of four easily recognisable codes see page 7.

3. Flood Mitigation Measures

Please detail any flood defence measures (hard and soft) that will be put into place to mitigate the developments risk from flooding; include the location and storage arrangements as appropriate.

Hard Defence Measures (construction) e.g. finished floor levels, SUDS, drainage and areas designed to flood etc please detail. *(If the development includes areas designed to flood these areas must contain an adequate passive flood warning system with signs highlighting the susceptibility to flooding and contain clearly signed routes to higher land. All site users should also be made aware of this risk)*.

Soft Defence measures (temporary flood barriers) – sandbags, flood gates, air brick covers etc please detail:

Signing up to Flood Warning Services

Developers should actively encourage owners/ occupiers to sign up to the Environment Agency's Flood Warning Service (Flood Warnings Direct - FWD)
FWD is a free service that provides flood warnings direct to you by telephone, mobile, email, SMS text message and fax. To sign up to the service, call 0845 988 1188 or visit the EA's web pages.

4. Flood Warning Activation Procedures

WARNINGS		EA recommended actions	SITE		
			Actions	Communications	Responsible person
 **Flood Alert**	**What it means** Flooding is possible. Be prepared. **When it's used** Two hours to two days in advance of flooding.	Be prepared to act on your flood plan. Prepare a flood kit of essential items. Monitor local water levels and the flood forecast on our website.	Detail what actions you will take e.g. Evacuation procedures? Shelter Procedures? Alternative refuge? Where? Transport? Deployment of flood mitigation products? Who? When? How?	Detail the type of communication you will use to cascade flood warnings e.g. telephone? Text? Loud hailer? Door knocking? Flood Wardens? (consider the vulnerable) Self Registration with FWD service? Contact lists?	Who will do what and when? E.g. who will deploy the use of sandbags and at what stage? Who will notify the vulnerable? Etc.
 **Flood Warning**	**What it means** Flooding is expected. Immediate action required. **When it's used** Half an hour to one day in advance of flooding.	Move family, pets and valuables to a safe place. Turn off gas, electricity and water supplies if safe to do so. Put flood protection equipment in place.			
 **Severe Flood Warning**	**What it means** Severe flooding. Danger to life. **When it's used** When flooding poses a significant threat to life.	Stay in a safe place with a means of escape. Be ready should you need to evacuate from your home. Co-operate with the emergency services. Call 999 if you are in immediate danger.			
EA Flood Warnings No longer in force	**What it means** No further flooding is currently expected in your area. **When it's used** When river or sea conditions begin to return to normal.	Be careful. Flood water may still be around for several days. If you've been flooded, ring your insurance company as soon as possible.			
MET Office Weather Warnings	Warnings of heavy rainfall Warnings of severe winter weather e.g. hail, snow, freezing rain.	Consider the impact of this type of weather – e.g. this could lead to surface water flooding, ground water flooding, increased river and sea levels etc			

5. Safe Refuge / Rest Centre

- Please insert details of any safe refuges that you have permission to occupy in an emergency and mark on a map.
  Address:

- How many people could be accommodated here?

- What resources/ equipment do you have to provide refreshments/feeding/shelter and how long could it sustain evacuees?

(Persons unable to source alternative accommodation may be provided with safe refuge at a rest centre. North Somerset Council has pre-identified rest centres across North Somerset. Appropriate refuge locations/ rest centres would be nominated at the time and widely communicated using all available media).

6. ADVISORIES

Climate Change Impacts
The nature of climate change will vary by region but current opinion suggests that the future climate change will produce more frequent short duration and high intensity rainfall events and more frequent periods of long-duration rainfall. Developers should make occupiers aware that, due to the impacts of climate change, it may not be possible to state exactly how deep the flood water will be and any flooding may be higher or lower than estimated or experienced before and this may have implications on evacuation strategies.

Decision Making/ Command & Control
Owner/occupiers are ultimately responsible for making the decision of whether to evacuate or shelter in their homes/ premises in the event of a flood incident. However owner/ occupiers should heed the advice/ warnings and follow the instructions of the emergency services. **All homes and businesses are advised to prepare an emergency kit.**

Evacuation
Evacuations should always be conducted in the dry. Flood waters contain hidden dangers and evacuation will no longer be possible but rather a rescue operation by the emergency services. Do not plan for or assume that the emergency services will be able to assist you with evacuation. The focus of any emergency response will be to those who are immediately vulnerable Consideration should be given to the road network around the site; evacuation routes should be sign posted **Residential Development:** Householders should discuss with family members their evacuation procedures and agree meeting points in case of separation. **Developments where there will be an on-site staff presence:** The evacuation procedure should include options for the evacuation of all people on site (including those with vulnerabilities). It is assumed that visitors will not have local knowledge and will need to be guided to a safe route/ location.

Shelter
In the event that a safe evacuation is not possible or householders / premise owners/ occupiers decide to remain on site, developers should make them aware that emergency service resources will be concentrated on life saving cases and its is advisable that occupants are able to sustain themselves for up to 7days without assistance.

Recovery
Following a flood there may be environmental hazards, loss of utilities and other issues that need to be rectified before people are allowed back into premises. Occupiers should consider a wide range of issues in developing their Recovery Plan. Please visit the Environment Agency's website for guidance on developing your recovery plan.

Training and Exercising
All personnel who live or work at the site should be made aware of this plan and briefed/ trained accordingly. It is recommended that the plan is exercised on an annual basis – this could be by means of a Table-top exercise or physical testing of the plan.

7. Roles & Responsibilities

There are many organisations that will play a part in response to a major flooding incident; emergency services, utility companies and voluntary agencies to name but a few. Below are the roles and responsibilities of some of the principal organisations that will be involved in the early stages of a response.

Environment Agency (EA)

- Predicting flooding from statutory main rivers and the sea including the location, timing and magnitude
- Issuing of Flood Warnings to partner agencies and ensuring that the public are warned and informed
- Maintenance and operation of sea and river flood defences. Check defences and undertake essential repairs as required.
- Monitor and clear blockages of culverts and repair breaches of defences
- Support the Police and Local Authority by providing materials, equipment and manpower as far as resources and other duties permit.
- Advisory role in dealing with pollution issues as a result of flooding

MET Office

The Met office issues severe weather warnings for heavy rain, snow, severe gales etc. These warnings are delivered directly to local authorities, the emergency services and the media.

Avon & Somerset Police

- Co-ordination of the emergency services at a major flood event, as well as helping to save lives and protect property
- Establishment of cordons where practical to facilitate the work of the emergency services
- In conjunction with other emergency services, to evacuate people from properties at risk, if necessary
- Collation and dissemination of casualty information

Avon Fire & Rescue

- Saving life and rescuing trapped persons
- Provide monitoring procedures in respect of health and safety of those persons operating within an established cordon
- Carry out essential damage control measures including pumping out flood water and salvage work
- Rendering humanitarian services in support of the local authority

Local Authority

- Providing support to the emergency services
- Mitigation of the effects of an emergency on people, including emergency feeding, accommodation and welfare.
- Co-ordination of the voluntary sector response
- Information services to the public and media
- Flood alleviation measures where possible
- Environmental health advice

- Rehabilitation of the community and restoration of the environment

Utility Companies

- In the event of a flood, will secure their services and equipment to ensure continuity of supply
- Repair services disrupted by flood
- Provide alternative means of supply during service disruption if life and death health risks are identified

8. Sources of useful information

Am I at risk of Flooding?
http://www.environment-agency.gov.uk/homeandleisure/floods/31650.aspx

EA Flood Warning Codes
http://www.environment-agency.gov.uk/homeandleisure/floods/31620.aspx

Flood Warnings Direct
http://www.environment-agency.gov.uk/homeandleisure/floods/38289.aspx

Business Flood Checklist
http://www.environment-agency.gov.uk/business/topics/flooding/32358.aspx

Make an Emergency Flood Plan for your Home
http://www.environment-agency.gov.uk/homeandleisure/floods/38329.aspx

Preparing your home or business for flooding
http://www.environment-agency.gov.uk/homeandleisure/floods/31644.aspx

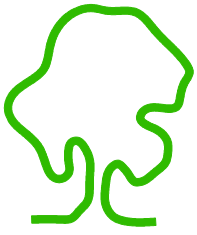
Before, During and After a Flood – Advice Guides
http://www.environment-agency.gov.uk/homeandleisure/floods/114724.aspx

Flood Protection Association
http://www.floodprotectionassoc.co.uk/

North Somerset Council Emergency Management Team Contact us at
emu@n-somerset.gov.uk

Direct Gov Preparing for Emergencies
http://www.direct.gov.uk/en/Governmentcitizensandrights/Dealingwithemergencies/Preparingforemergencies/index.htm

UK Resilience
http://interim.cabinetoffice.gov.uk/ukresilience.aspx



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