LAND OFF KINGS ROAD, ORLETON

Flood Risk Assessment and Drainage Strategy

HLEF80590
Issue 01

20th July 2021

rpsgroup.com

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
00	Internal draft document	J. Grady	D. Percival	-	16/07/2021
01	Client draft	J. Grady	J. Hughes	D. Matthews	19/07/2021

Approval for issue

D. Matthews	20 July 2021

Prepared by:

RPS Consulting Services Limited

Jessica Grady

Graduate Consultant

321 Bradford Street,

Birmingham,

B5 6ET

T +44 121 513 0083

E jessica.grady@rpsgroup.com

Prepared for:

Shropshire Homes Limited

Stewart Purcell

The Old Workhouse

Cross Houses, Shrewsbury

SY5 6JH

Contents

Appendices

1 EXECUTIVE SUMMARY

RPS Consulting Services Ltd ('RPS') has been commissioned by Shropshire Homes Limited to carry out an assessment to satisfy Herefordshire Council (HC) as the Lead Local Flood Authority (LLFA) and the Environment Agency's (EA) requirements for a Flood Risk Assessment (FRA) for a proposed residential development at Land off Kings Road, Orleton, SY8 4HQ.

It is our understanding that Shropshire Homes Limited are proposing a residential development comprising approximately 39 dwellings. This report has been prepared to support these proposals.

The southern portion of the site is located within Flood Zone 1. Land located in Flood Zone 1 is assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%), the lowest classification of fluvial flood risk. The northern section of the site is designated as Flood Zone 2, associated with an annual probability of flooding between 1:1,000 and 1:100, and Flood Zone 3, which has a 1:100 or greater annual probability of flooding. Additional hydraulic modelling has been completed using the latest climate change allowance scenarios to accurately determine potential flood impacts for the site.

An FRA is required to comply with the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance as the Application Site is over 1 hectare in size.

As part of the site appraisal process, it has been necessary to demonstrate that the proposed development can be achieved with no risk of flooding and without increasing flood risk to third parties. This report describes the methods used and the results of this study. The report takes into account the recommendations of the NPPF and its associated Planning Practice Guidance. It confirms that all residential development is located within Flood Zone 1 and is acceptable in all other respects as to flood risk, such that this does not present a constraint on site development.

The Conceptual Drainage Strategy demonstrates that the site can sustainably manage surface water arising from the development up to the 1 in 100 year +40% Climate Change storm event.

2 INTRODUCTION

2.1 Project Brief

RPS Consulting Services Ltd ('RPS') has been commissioned by Shropshire Homes Limited to carry out an assessment to satisfy Herefordshire Council (HC) as the Lead Local Flood Authority (LLFA) and the Environment Agency's (EA) requirements for a Flood Risk Assessment (FRA) for a proposed residential development at Land off Kings Road, Orleton, SY8 4HQ.

The FRA is prepared in full accordance with the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance (PPG) (February 2019). The FRA is required to identify the 1% (1 in 100 year) and 1%+allowance for climate change flood extents and levels for the site and ensure that all aspects of development are clear of the 1%+ allowance for climate change floodplain.

2.2 Assessment Procedure

This report has been prepared in accordance with the requirements of the NPPF. This assessment also gives due consideration to the guidance provided in the CIRIA publication, C624, Development and Flood Risk: Guidance for the Construction Industry, 2004, and The Floods and Water Management Act 2010.

An assessment of the flood risk to the proposed development has been considered on the basis of the best information available at the date of this report. The assessment herein is deemed appropriate to satisfy the requirements of the EA and LLFA, the scale and nature of the development, and the available data. The key elements of this assessment are as follows:

Desk study scoping exercise;

- Consultation with relevant authorities;
- HC; enquiry 03/06/2021, response provided
- EA; enquiry 03/06/2021, awaiting response
- Review of site topography and development proposals;
- Identification of data corresponding to appropriate design flood events;
- Consideration of climate change;
- Consideration of flood risks to and from the development;
- Calculation of the impact of the development on surface water run-off; and
- Recommended infiltration or attenuation measures.

2.3 National Planning Policy Framework

The NPPF sets out Government's planning policies for England and how these are expected to be applied. The purpose of the policy is ultimately to achieve sustainable development.

In relation to flood risk, the NPPF stresses the importance of considering the consequences, and not just the probability, of future flooding events. It clarifies the sequential test as a risk-based approach to be applied at all stages of the planning process, to steer new development to areas at the lowest probability of flooding.

The EA is a statutory consultee for Planning Applications designated as 'major', over 1 hectare in size or located within Flood Zone 2 or 3 and will give comment and recommendations to the Local Planning Authority (LPA) for any proposed developments affecting a watercourse.

The NPPF confirms that Strategic Flood Risk Assessments (SFRAs) should be carried out by the LPA to inform the preparation of Local Development Documents (LDDs), having regard to catchment wide flooding issues which affect the area. The SFRA will provide the information needed to apply the sequential approach.

2.4 Requirements of National Planning Policy Framework

For an FRA proportionate to the risk and appropriate to the scale, nature and location of the development the following will need to be considered;

- the risk of flooding arising from the development in addition to the risk of flooding to the development;
- the impacts of climate change;
- the potential adverse and beneficial effects of flood risk management infrastructure including raised defences, flow channels, flood storage areas and other artificial features together with the consequences of their failure;
- the vulnerability of those that could occupy and use the development, taking account of the Sequential and Exception Tests and the vulnerability classification, including arrangements for safe access where appropriate;
- a quantification of the different types of flooding (whether from natural and human sources and including joint and cumulative effects) and identify flood risk reduction measures, so that assessments are fit for the purpose of the decisions being made;
- the effects of a range of flooding events including extreme events on people, property, the natural and historic environment and river and coastal processes;
- the assessment of the remaining (known as 'residual') risk after risk reduction measures have been taken into account and demonstrate that this is acceptable for the particular development or land use;
- the ability of water to soak into the ground may change with development, along with how the proposed layout of the development may affect drainage systems; and
- be supported by appropriate data and information, including historical information on previous events.

3 SITE DETAILS

3.1 Site Overview

The Application Site is shown in Figure 3.1 below. The site is located to the west of Kings Road, Orleton (National Grid Reference 349668, 267440) and covers an area of approximately 2.8 hectares (ha).

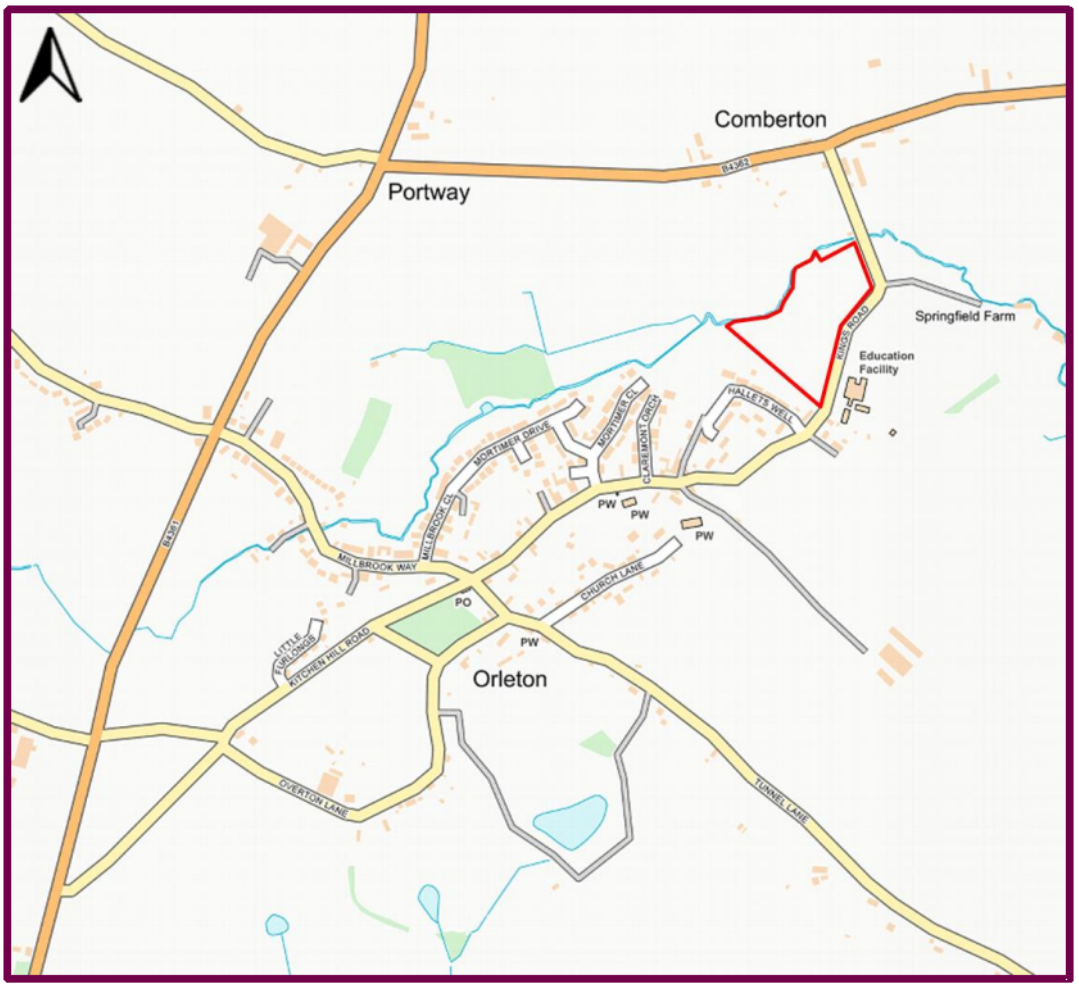


Figure 3.1: Site Location Plan Contains OS data © Crown Copyright and database right 2021.

Approximate site boundary indicated in red, for location purposes only.

The consultees associated with this location are provided in Table 3.1.

Table 3.1: Site Specific Data and Consultees

OS NGR	SO 49668 67440
Local Planning Authority	Herefordshire Council (HC)
Lead Local Flood Authority	Herefordshire Council (HC)
Sewer Utility Company	Welsh Water (WW)

3.2 Site Description and Surrounding Area

The site comprising a parcel of land of irregular shape, located approximately 670m north west of Orleton. The site is currently greenfield land, which is bounded by Kings Road and Orleton C of E Primary School to the east, residential properties on Hallets Well to the south. Brook Cottage and greenfield land are to the north and further greenfield land to the west.

There are no areas of statutory designation within or in close proximity to either of the parcels (e.g. Special Area of Conservation (SAC), Special Protection Area (SPA) or Site of Special Scientific Interest (SSSI)).

The land generally falls towards the north east, from a level of approximately 83m Above Ordnance Datum (AOD) along the south west boundary, to approximately 80m AOD along the north east border. The topographical survey is included within Appendix A for reference.

3.3 Development Proposals

It is our understanding that Shropshire Homes Limited are proposing a residential development comprising approximately 39 dwellings. The plans also indicate the development of an attenuation pond and car parking area. This report has been prepared to support these proposals.

The site layout is provided in Appendix B for reference.

4 SCOPING STUDY

4.1 Published Flood Zone

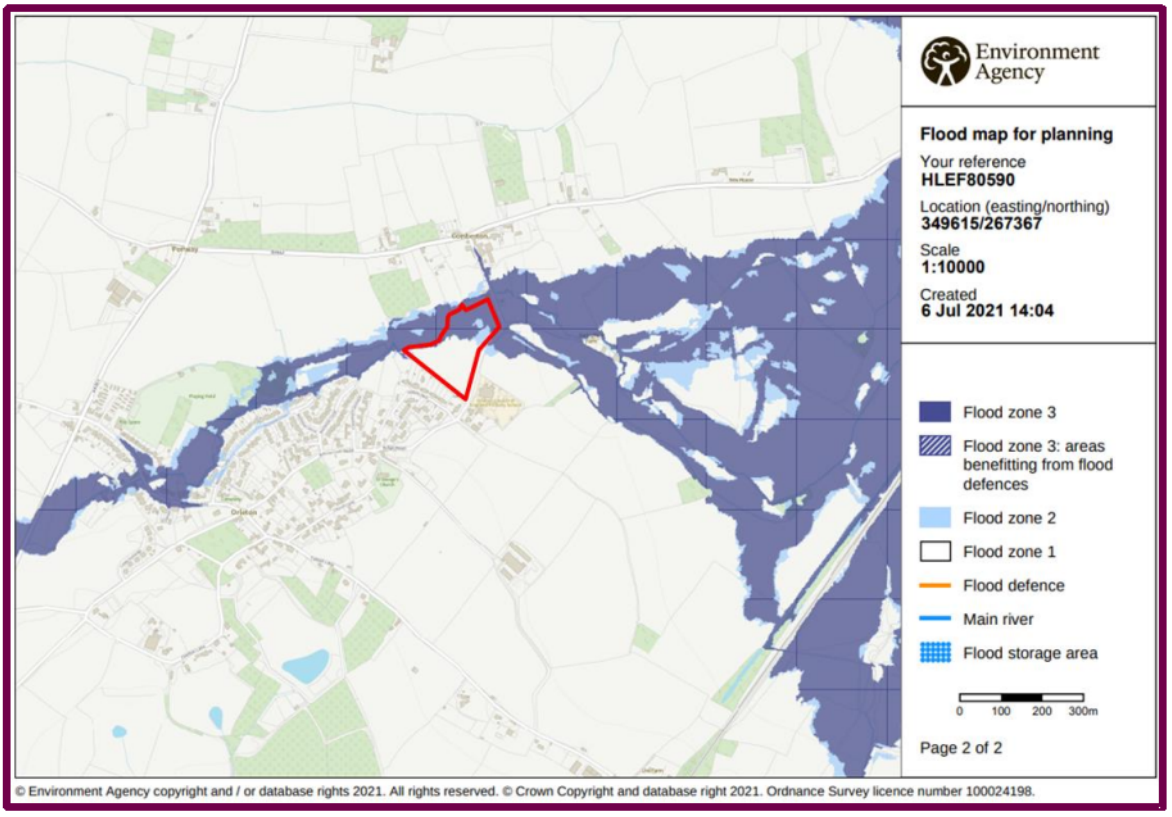
The EA is responsible for managing the risk of flooding from main rivers, reservoirs, estuaries and the sea and provides an online information service through the Flood Map for Planning hosted on the 'GOV.UK' (https://flood-map-for-planning.service.gov.uk/). This data is not intended to provide detailed flood information for individual properties, but the information can be used as part of a flood risk assessment to inform a planning application.

An extract of the Flood Map for Planning obtained from the 'GOV.UK' website is provided below in Figure 4.1.

This map demonstrates that the majority of the site (approximately 1.8 ha, 60% of the total area) is located within Flood Zone 1, this is land having a less than 1 in 1,000 annual probability of river flooding.

The remainder of the site (approximately 1.0 ha) is located within Flood Zone 2 and 3, which is land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding and land having a 1 in 100 or greater annual probability of river flooding, respectively.

Fluvial flood risk is considered further within Section 5.2.



Approximate site boundary indicated in red, for location purposes only.

Figure 4.1: Flood Map for Planning (accessed 06.07.2021)

4.2 Herefordshire Council Preliminary Flood Risk Assessment, May 2011

The Preliminary Flood Risk Assessment (PFRA) is a high level study to assess past and future surface water flooding within Herefordshire. PFRA's identify any flood risk areas of national

significance, defined as greater than 30,000 people, 3,000 non-residential properties, or 150 items of critical infrastructure at risk. There have been no nationally significant flood risk areas identified within the county, however several local flood risk areas have been identified.

The most notable historical flood events to impact the region have occurred in 1979, 1986, 1998, 2006 and 2007. Records of past floods and consequences indicates that a flood occurred in January 1965 around Orleton village which was associated with a main river and also impacted by surface water and ground water. No specific reference is made to the application site.

The information provided in the PFRA will be considered throughout this report.

4.3 Herefordshire Council Strategic Flood Risk Assessment Level 1, April 2019

A Strategic Flood Risk Assessment was prepared for HC in 2019, replacing the Level 1 SFRA prepared in 2009. The SFRA will aid in determining flood risk from all sources at a county level, inform the sustainability appraisal of the Local Plan, inform the requirements for site-specific FRAs, set out the recommended approach to flood risk management, determine acceptability of flood risk regarding emergency planning and consider opportunities to reduce risk to existing communities.

The SFRA indicates that many notable historical flood events have occurred and have been recorded by HC. Events in 2007, 2012 and 2014 are considered to be county-wide events and particular locations and likely sources have been given. For the 2007 floods, there is indication that Orleton was impacted and the likely source of flooding was Mill Brook/ Brimfield Brook.

Within the region, there are a number of flood defence schemes, managed by the EA and HC. There are currently no schemes present in Orleton, however, HC have commissioned studies to investigate options for flood alleviation and defence at Orleton.

The primary fluvial flood risk within Herefordshire is associated with the main rivers which have the most extensive floodplains, most notably the River Teme, River Lugg, River Arrow, River Frome, River Dore, River Leadon and Worm Brook. There are also many ordinary watercourses in the region which pose a significant flood risk. The majority of fluvial flood extents are contained within rural areas, however some towns and villages are indicated to be at notable risk of flooding, for the purpose of this FRA, Orleton is considered to be at risk.

The majority of surface water flooding in Herefordshire is associated with ordinary watercourses. Some areas have been earmarked for further investigation in regard to surface water flood risk, however Orleton is not mentioned as one of these areas.

There are limited records of groundwater flooding in Herefordshire, however, this may be due to inaccurate recording of flooding source as groundwater flooding can often be perceived as surface water flooding. There are several springs present in Herefordshire which indicates that groundwater emergence can be common. Within the region, there are areas of sand and gravel deposits which allow for free movement of groundwater. The land adjacent to the River Teme to the north and west of Brimfield and along the alignment of Brimfield Brook, encompassing the villages of Brimfield, Orleton and Little Hereford, has been identified as an area which may be more responsive to rising levels.

Welsh Water and Severn Trent have provided data on recorded sewer flooding incidents. The majority of sewer flooding events have been associated with the main urban areas of Herefordshire. There is no mention of the application site or surrounding areas.

There are currently no operational canals within Herefordshire. The restoration of approximately 34 miles of canal are underway and will be under the jurisdiction of Hereford and Gloucestershire Canal Trust. Any floodwaters associated with the canal would flow towards the Little Lugg and the village of Cross Keys would be at greatest risk in the event of a failure.

There is a potential risk of flooding from reservoirs within the county, however there are no records of flooding from reservoirs in Herefordshire. The EA's Risk of Flooding from Reservoirs map, indicates several flow routes through Herefordshire, should a reservoir breach occur, however none are within the vicinity of the application site. The level and standard of inspection and maintenance required under the Reservoirs Act means that the risk of flooding from reservoirs is relatively low.

The information provided in the Level 1 SFRA will be considered throughout this report.

4.4 Herefordshire Council Local Flood Risk Management Strategy, October 2017

As a Lead Local Flood Authority (LLFA) Herefordshire Council has a number of statutory duties to address local flood risk under the Flood and Water Management Act 2010. The production of a Local Flood Risk Management Strategy (LFRMS) is one of these duties. The LFRMS guides the management of local flood risk across the county, reflecting local circumstances such as the level of risk and potential impacts of flooding.

The LFRMS sets out the framework for how the council will work with other flood risk management authorities and the public to understand and manage existing and future flooding. The overarching aim of Herefordshire Council with respect to the management of local flood risk within the county is: to continually improve the way in which flood risks are managed throughout the county to reduce the impacts of flooding on lives and livelihoods.

The LFRMS has 6 strategy objectives for managing local flood risk:

Objective 1: Understand flood risks throughout Herefordshire

Objective 2: Manage the likelihood and impacts of flooding

Objective 3: Help the community help themselves

Objective 4: Manage flood warning, response and recovery

Objective 5: Promote sustainable and appropriate development

The objectives and requirements of the LFRMS will be considered within this report.

4.5 Herefordshire Local Plan, October 2015

The Local Plan guides development and change within the county up to 2031. The local plan also considers how the area functions and how different areas within the county will change over the next 20 years in response to key issues.

The Core Strategy shapes future development and sets the overall strategic planning framework. It balances environmental issues with economic and social needs to ensure that development does not cause irreversible harm to important resources.

The core strategy indicates that flood risk is a key issue in Herefordshire in some areas and can act as a barrier to development as 10% of land is in Flood Zone 2 and 9% is within Flood Zone 3. There a number of policies within the local plan which aid in delivery. Those that are relevant to flood risk or drainage are included below for reference:

Policy SD3 – Sustainable water management and water resources

Measures for sustainable water management will be required to be an integral element of new development in order to reduce flood risk; to avoid an adverse impact on water quantity; to protect and enhance groundwater resources and to provide opportunism to enhance biodiversity, health and recreation. This will be achieved by ensuring that:

1. development proposals are located in accordance with the Sequential Test and Exception Tests (where appropriate) and have regard to the Strategic Flood Risk Assessment (SFRA) 2009 for Herefordshire;
2. development is designed to be safe, taking into account the lifetime of the development and the need to adapt to climate change by setting appropriate floor levels, providing safe pedestrian and vehicular access, where appropriate, implementing a flood evacuation management plan and avoiding areas identified as being subject to Rapid Inundation from a breach of a Flood Defence;
3. where flooding is identified as an issue, new development should reduce flood risk through the inclusion of flood storage compensation measures, or provide similar betterment to enhance the local flood risk regime;
4. development will not result in the loss of open watercourse and culverts should be opened up where possible to improve drainage and flood flows. Proposals involving the creation of new culverts (unless essential to the provision of access) will not be permitted;
5. development includes appropriate sustainable drainage systems (SuDS) to manage surface water appropriate to the hydrological setting of the site. Development should not result in an increase in runoff and should aim to achieve a reduction in the existing runoff rate and volumes, where possible;
6. water conservation and efficiency measures are included in all new developments, specifically:
    - residential development should achieve Housing - Optional Technical Standards - Water efficiency standards. At the time of adoption the published water efficiency standards were 110 litres/person/ day; or
    - non-residential developments in excess of 1,000 m2 gross floorspace to achieve the equivalent of BREEAM 3 credits for water consumption as a minimum;
7. the separation of foul and surface water on new developments is maximised;
8. development proposals do not lead to deterioration of EU Water Framework Directive water body status;
9. development should not cause an unacceptable risk to the availability or quality of water resources; and
10. in particular, proposals do not adversely affect water quality, either directly through unacceptable pollution of surface water or groundwater, or indirectly through overloading of Wastewater Treatment Works.

Development proposals should help to conserve and enhance watercourses and riverside habitats, where necessary through management and mitigation measures for the improvement and/or enhancement of water quality and habitat of the aquatic environment. Proposals which are specifically aimed at the sustainable management of the water environment will, in particular, be encouraged, including where they are required to support business needs such as for agriculture. Innovative measures such as water harvesting, winter water storage and active land use management will also be supported. In all instances it should be demonstrated that there will be no significant adverse landscape, biodiversity or visual impact.

Policy LD3 – Green infrastructure

Development proposals should protect, manage and plan for the preservation of existing and delivery of new green infrastructure, and should achieve the following objectives:

1. identification and retention of existing green infrastructure corridors and linkages; including the protection of valued landscapes, trees, hedgerows, woodlands, water courses and adjoining flood plain;
2. provision of on-site green infrastructure; in particular proposals will be supported where this enhances the network; and
3. integration with, and connection to, the surrounding green infrastructure network.

The requirements of the local plan will be considered throughout this FRA.

4.6 Consultation with Herefordshire Council (HC)

HC were consulted on 14th July 2021 regarding the proposed development. HC advised to review previous commentary provided for planning permission development at the site in 2018.

The comments were obtained from the Herefordshire Council Planning Portal (P180517/F) and have been included in Appendix C. The comments are summarised below:

- Hydraulic modelling was required to confirm the extent and depth of Flood Zone 2 and 3. The modelling shows that the extents are not as extensive as indicated by the EA flood mapping. It is recommended that the results of the EA review of the model be provided to the council prior to the granting of planning permission.
- As such the development will not impact flood risk elsewhere due to land raising within the site boundary as any ground altering works will be taking place outside of the predicted flood extents.
- It is recommended that the applicant provides a revised FRA that clarifies the proposal and includes calculation of greenfield runoff rates.
- Microdrainage calculations indicate that the system will be designed to provide attenuation up to the 1 in 100yr event with 35% climate change allowance. This is acceptable subject to agreement of an appropriate discharge rate and assessment of discharge volume, noting that the submitted calculations may have to be resubmitted.
- No information has been provided around the design of the proposed soakaways. Supporting drainage calculations should be provided for each of these soakaways that demonstrate that the runoff from the properties will not increase flood risk between the 1 in 1 year and 1 in 100 year events taking climate change into account.
- The revised drainage feasibility layout show that there will be adequate space onsite to access the proposed attenuation pond. The proposed private soakaways at the southern end of the site however are shown to be within the individual gardens of the residents. Detail of how these soakaways will be accessed has not been provided on the updated layout
- The Applicant must carry out testing in specific locations and over winter to obtain detailed design infiltration rates for design and confirm groundwater levels.

4.7 Consultation with Environment Agency (EA)

The EA were consulted on 14th July 2021 regarding the proposed development. The response is awaited and will be provided in Appendix D when received.

4.8 National Planning Policy Framework – The Sequential Test

- As set out in the NPPF and the associated PPG, the aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding. SFRAs provide the basis for

applying the sequential test, where information is not available in a SFRA the Sequential Test will be based on the EA Flood Zones.

- As noted within Section 4.1 and Figure 4.1, the Application Site is partially located within Flood Zone 1; these are areas assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%), the lowest classification of fluvial flood risk. The remainder of the site is located in Flood Zone 2, associated with an annual probability of flooding between 1:1,000 and 1:100, or Flood Zone 3, which has a 1:100 or greater annual probability of flooding.
- The associated PPG (Table 2 Paragraph: 066 Reference ID: 7-066-20140306) shows:
  - the proposed residential development (dwellings) as having a Flood Risk Vulnerability classification of "More Vulnerable". This includes buildings used for; dwelling houses, student halls of residence, non-residential uses for nurseries and educational establishments.
  - the proposed car parking area is classified as 'Less Vulnerable'.
- Therefore, based on the EA Flood Zone classification of the development location, PPG Table 3 (Paragraph: 067 Reference ID: 7-067-20140306) reproduced as Table 4.1 below, shows the residential development and car parking development is appropriate within the respective Flood Zones.

Table 4.1: NPPF PPG Table 3: Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Zone	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	**Dwellings**	✓
Zone 2	✓	✓	Exception Test Required	✓	✓
Zone 3a	Exception Test Required	✓	✗	Exception Test Required	**Car Parking Area**
Zone 3b 'Functional Floodplain'	Exception Test Required	✓	✗	✗	✗

Proposed Development Site Classification Highlighted for Reference.

Key: ✓ *Development is appropriate* ✗ *Development should not be permitted*

4.9 Mechanisms of Flooding

To understand the risk of flooding to a site, it is imperative that potential sources of flooding be clearly defined. The likelihood and severity of flooding depends on the characteristics of the flood sources and the degree to which the site is currently, or can potentially, be protected against flooding from these sources. Table 4.2 reviews the potential risk of flooding from different sources for the proposed development site.

Table 4.2: Potential Risk of Flooding to the Proposed Development

Source of Flooding	Potential			Comments
	High	Med	Low	
Fluvial (Rivers)		X		The majority of the application site is located within Flood Zone 1; the remainder of the site is located in Flood Zone 2 and Flood Zone 3.
Tidal / Coastal			**N/A**	Application Site is located inland and not considered at risk of tidal flooding.
Pluvial (drainage system)			X	Low risk as drainage systems within the development will be designed to accommodate flows up to the 1 in 100 year + climate change event.
Surface water runoff		X		Most of the site is at 'very low' risk of surface water flooding, an area of 'low to high' surface water risk has been identified within the site boundary. Suitable mitigation measures have been recommended.
Ponding			X	Proposed drainage should prevent significant occurrences of ponding.
Groundwater		X		The SFRA has limited records of groundwater flooding incidences. Orleton has been identified as an area which may be more responsive to rising groundwater.
Reservoir			X	The whole site is located outside of the maximum extent of reservoir flooding.

5 FLOOD RISK ASSESSMENT

5.1 Introduction

Following the scoping exercise, the potential flood risks to the proposed development site have been assessed in greater detail.

5.2 Fluvial

Main Rivers are designated by the EA. This means that the EA is responsible for the maintenance, improvement, or construction to manage flood risk associated with the river. The nearest watercourse designated as an EA Main River is located approximately 3.2km from the site. The data available from Flood Map for Planning hosted on the 'GOV.UK' (https://flood-map-for-planning.service.gov.uk/), indicates that the stretch of main river is classed as Flood Zone 3. The flood extents associated with this main river do not impact the proposed development site.

Other rivers which are not classified as a 'main river' are known as 'ordinary watercourses'. This means that lead local flood authorities, district councils and internal drainage boards will carry out flood risk management work on these watercourses. The SFRA indicates that Orleton has been impacted in previous flood events and the sources most notably have been Mill Brook and Brimfield Brook. There has been no specific mention of the site at Kings Road. The nearest ordinary watercourse to the site, Orleton Brook, runs along the north eastern boundary of the site.

The EA's Flood Map for Planning (Figure 4.1) shows that Orleton Brook appears to pose a risk to the northern section of the site, which is designated as Flood Zone 2, associated with an annual probability of flooding between 1:1,000 (0.1%) and 1:100 (1.0%), or Flood Zone 3, which has a 1:100 (1.0%) or greater annual probability of flooding. The southern portion of the site amounting to approximately 60% of the total area is located within Flood Zone 1 as shown in Figure 4.1. Land located in Flood Zone 1 is assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%), the lowest classification of fluvial flood risk.

The Flood Zones shown on the Environment Agency's Flood Map for Planning do not take account of the possible impacts of climate change. Consequently, hydraulic modelling has been updated by Hydro-Logic Services in June 2018 using the latest climate change allowance scenarios to determine potential impacts for the Site. This report '*Hydraulic Modelling and Flood Extent Mapping*' (Ref: Report K0832B/03) is provided in Appendix E for reference.

The 1 in 100 year plus 35% climate change allowance represents a 'Higher Central' allowance for potential future climate change anticipated for the '2080s' (2070 to 2115) according to the latest Government guidance. The Environment Agency Climate Change guide also states that an FRA should aim to incorporate managed adaptive approaches/measures for the 'upper end' allowance (70%) where feasible. The 1 in 100 year plus 70% climate change allowance represents a 'Upper End' allowance for potential future Climate Change anticipated for the '2080s' (2070 to 2115) according to the latest Government guidance.

In summary, the modelled flood extents for the 1.0% and 0.1% events with allowance for climate change are not as extensive as shown on Environment Agency flood mapping (see Figure 5.1). Consequently, the detailed modelling flood extents and levels indicate that a greater proportion of the site would be appropriate for development than that indicated by Environment Agency flood mapping, even when allowances of 35% and 70% for potential climate change impacts are included. This information should be used to inform managed adaptive approaches and measures, considered within Section 6.

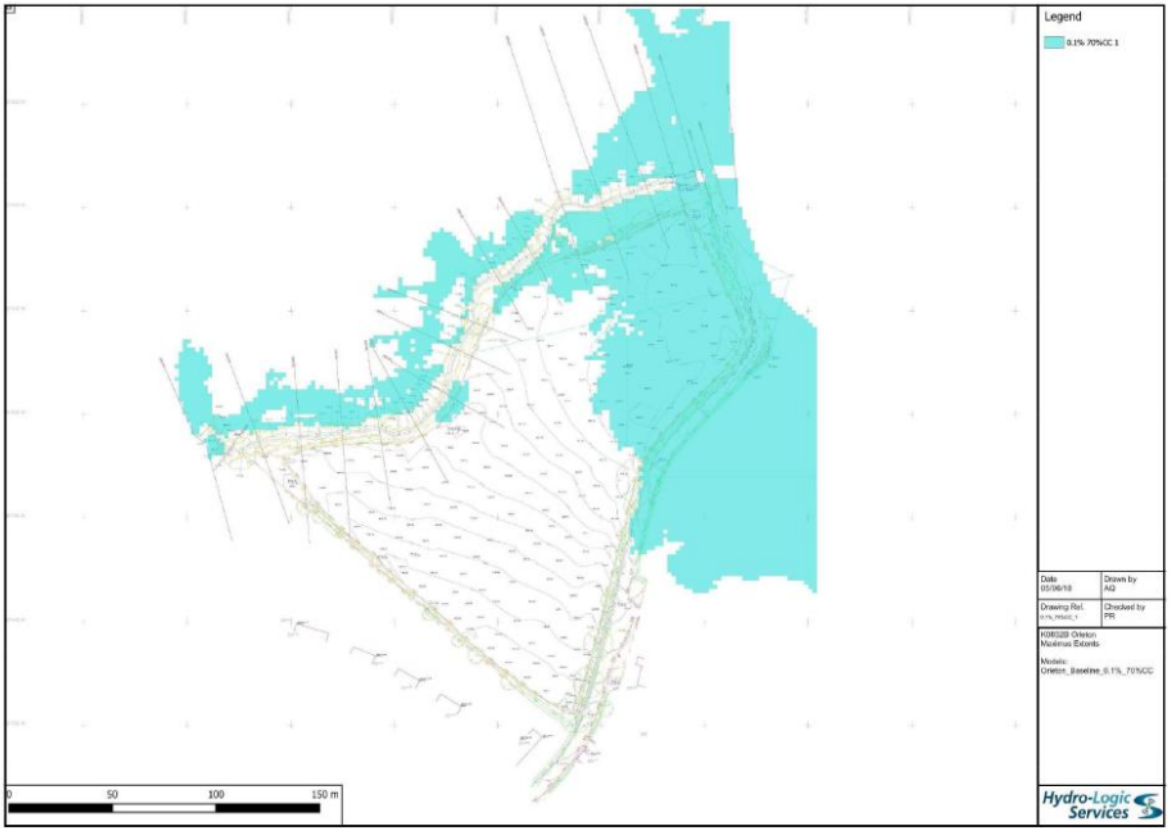


Figure 5.1: 0.1% AEP plus 70% climate change maximum extent

(extract from Report K0832B/03)

The mapping for the 1.0% plus 70% climate change maximum event illustrates that with the exception of a narrow band adjoining the Orleton brook the north east of the site the entire site remains free from fluvial flooding. Based upon the proposed planning layout (Appendix B), all the dwellings are outside of the 0.1% AEP plus 70% climate change maximum extent.

5.3 Pluvial, Surface Runoff and Ponding

Surface water flooding happens when rainwater does not drain away through the normal drainage systems or soak into the ground but lies on or flows over the ground instead. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast.

Surface water flooding can be caused by rainfall-generated overland flow, before the runoff enters any watercourse or sewer, and is usually associated with high intensity rainfall events (typically >30mm/h). However, it can also occur with lower intensity rainfall or melting snow where the ground is saturated, frozen, developed or otherwise has low permeability. This can result in overland flow and ponding in depressions of the topography. Surface water flooding can also arise from high intensity 'extreme' rainfall events resulting in underground sewerage or drainage systems and surface watercourses becoming completely overwhelmed.

The EA Flood Map for Surface Water has been created to provide an indication of the broad areas likely to be affected by surface water flooding. It is suitable for identifying the approximate extent of flooding and estimating the shallower and deeper areas of flooding. It is unlikely to be reliable at a very local scale because it is imprecise due to national assumptions made about rainfall, surface water run-off, topography and the stormwater drainage network.

Surface water flood risk is defined by the EA as:

- 'Very low' risk of surface water flooding; land assessed as having less than 1 in 1,000 (0.1%) chance of flooding in any given year.
- 'Low' risk of surface water flooding; land assessed as having between 1 in 100 (1%) and 1 in 1,000 (0.1%) chance of flooding in any given year.
- 'Medium' risk of surface water flooding; land assessed as having between 1 in 30 (3.3%) and 1 in 100 (1%) chance of flooding in any given year.
- 'High' risk of surface water flooding; land assessed as having greater than 1 in 30 (3.3%) chance of flooding in any given year.

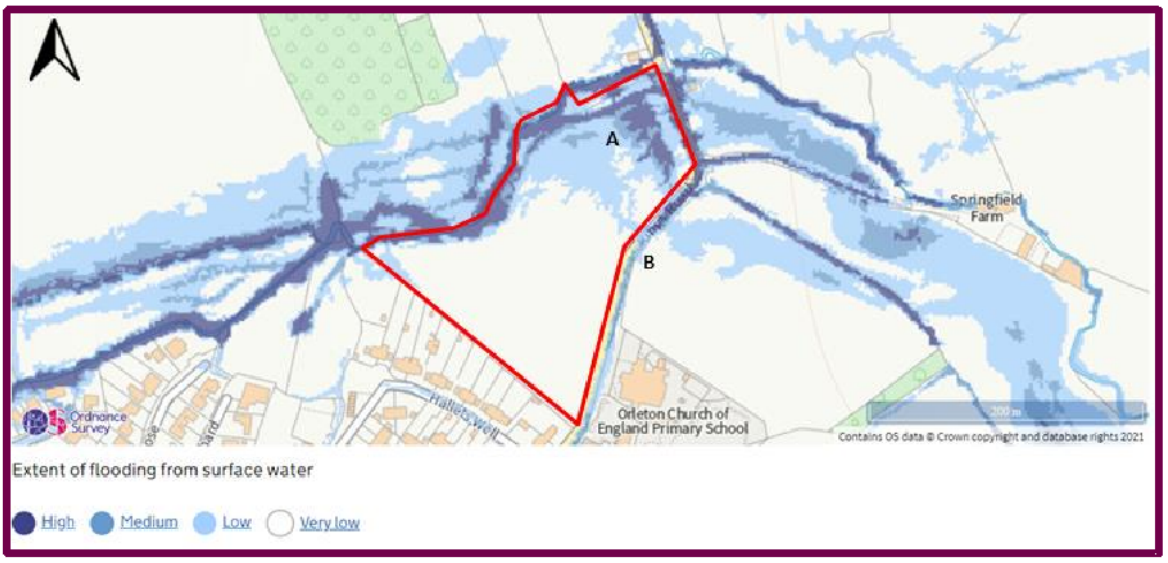
Approximate site boundary indicated in red, for location purposes only.

Figure 5.1: EA Flood Map for Surface Water (accessed 06.07.2021)

As illustrated within Figure 5.1 above, most of the application site is assessed as being at 'very low' risk of surface water flooding. There are areas of 'Low' and 'High' risk from surface water located in the northern section of the site, indicated as Area A. There are also sections of 'Low' and 'Medium' risk along Kings Road, indicated as Area B.

Figure 5.2 provides a closer view of the two areas of potential surface water risk at the site.

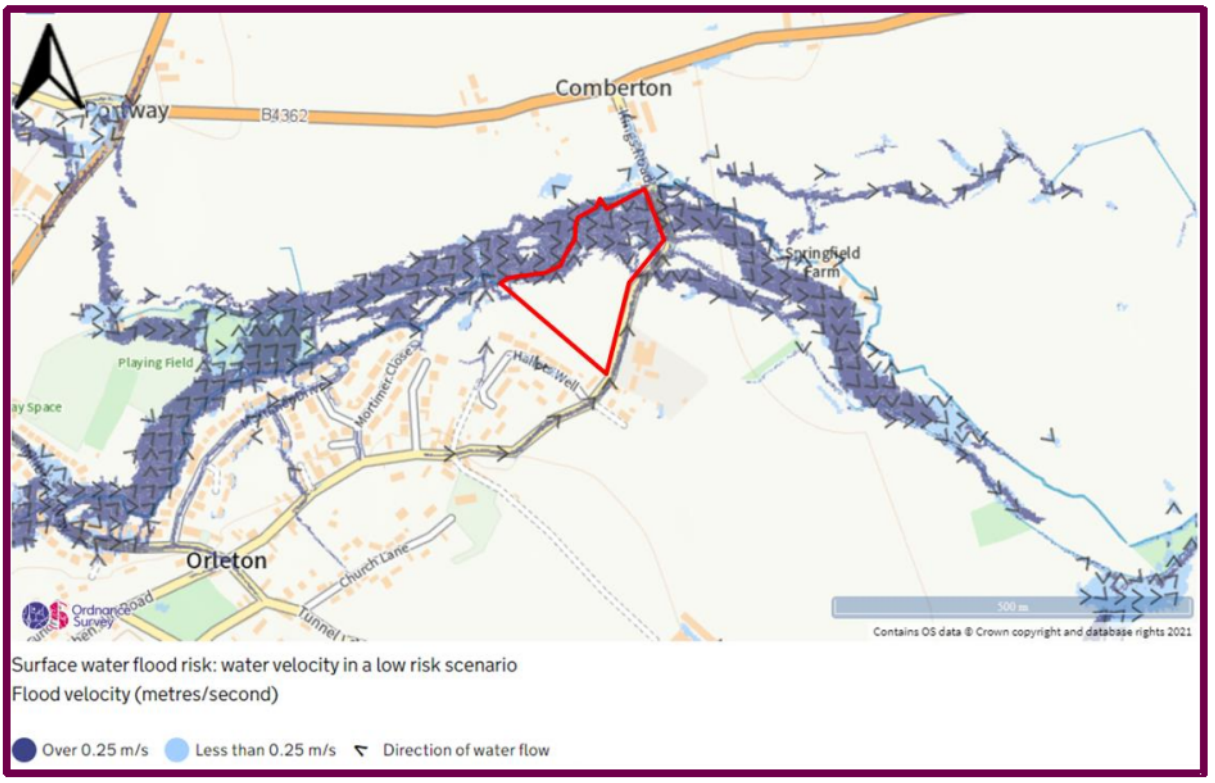
Area A appears to source from the stretch of Orleton Brook running alongside the site, and is therefore most likely to be fluvial in origin. Based upon information from the topographic survey, the site falls towards the north east boundary, therefore surface water at the site would convey towards this area, away from the proposed residential development. This is confirmed by Figure 5.3, indicating that that area of surface water risk would not affect the dwellings proposed for the southern portion of the site.



Approximate site boundary indicated in red, for location purposes only.

Figure 5.2: EA Flood Map for Surface Water- A and B (accessed 19.07.2021)

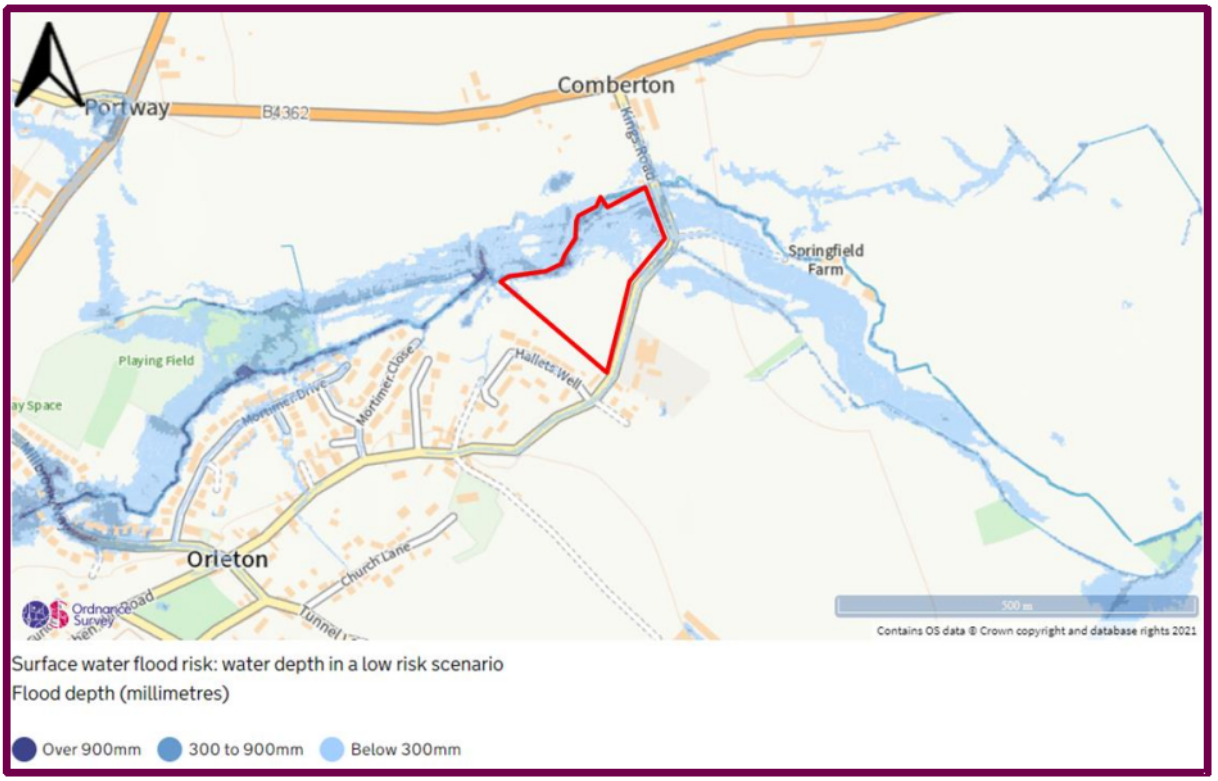
Area B, along Kings Road, is shown to have 'Low' and 'Medium' risk of surface water flooding. As shown by Figure 5.3 below, the area of surface water risk along Kings Road appears to be a surface water flow route. In the extreme scenario the water flows in a north easterly direction towards Orleton Brook along the existing highway. The direction of water flow displayed in Figure 5.3 indicates that water moves along the Kings Road and does not flow towards the site.



Approximate site boundary indicated in red, for location purposes only.

Figure 5.3: EA Flood Map for Surface Water: Velocity (accessed 06.07.2021)

Figure 5.4 shows the potential depth of surface water flooding. For the 'Low Risk' scenario, the area of surface water within the site is estimated to be below 300mm. Based upon the topographic survey, the site falls towards Orteton Brook at the north of the site, therefore ensuring that where the existing levels are retained or increased the risk of inundation by surface water is reduced.



Approximate site boundary indicated grey with specific parcel boundaries in red, for location purposes only.

Figure 5.4: EA Flood Map for Surface Water: Depth (accessed 06.07.2021)

In summary, none of the proposed dwellings or site access are significantly y impacted by potential surface water flooding.

5.4 Groundwater

Groundwater flooding is defined as flooding caused by the emergence of water originating from underground. This water may emerge from either point or diffuse locations. Groundwater flooding is a significant but localised issue that has attracted an increasing amount of public concern in recent years. Unlike flooding from rivers and the sea, groundwater flooding does not pose a significant risk to life. It is however associated with significant damage to property, with some types of groundwater flooding persisting over many weeks.

As noted within the SFRA, information on the occurrences of groundwater flooding is limited. There are several springs in the region indicating groundwater emergence could be common. The area of Orleton has been identified as an area which may be more responsive to rising groundwater.

There are no groundwater abstractions within the vicinity of the site, and it is not within a Source Protection Zone (SPZ).

A soakaway test investigation was undertaken by Ruddlesden Geotechnical Ltd in July 2017, an extract from the report is provided in Appendix F for reference. During the investigation, groundwater was encountered in one of the boreholes at 2.3m below ground level.

Based upon the information available, shallow groundwater was not encountered within the site, consequently the risk of groundwater flooding is considered to be low.

5.5 Reservoir

An area is considered at risk from reservoir flooding if peoples' lives could be threatened by an uncontrolled release of water from a reservoir. If a location is at risk, flooding from reservoirs is extremely unlikely. There has been no loss of life in the UK from reservoir flooding since 1925.

Long term flood risk information is hosted on the 'GOV.UK' website. The assessment provides mapping to illustrate the probability that a location will flood and the possible causes of flooding including flood risk from reservoirs.

The Flood Risk from Reservoirs Map in Figure 5.4 demonstrates that the whole site is outside of the maximum flood extent. As confirmed by the SFRA, no major reservoirs are located within close proximity to the site. Therefore, reservoir flooding will not pose a risk to the proposed development site.

Approximate site boundary indicated in red, for location purposes only.

Figure 5.4: EA Flood Map, Flood risk from Reservoirs (accessed 06.07.2021)

6 RECOMMENDED FLOOD MITIGATION

6.1 Introduction

This section discusses mitigation options that should be considered to reduce the severity of flood risk and to minimise the potential hazards associated with any residual flood risk.

6.2 Design Levels

The proposed residential development area is fully within Flood Zone 1, with no residential development proposed within Flood Zone 2 or 3. The residential development area is also shown to be at 'very low' risk of surface water flooding.

Development should be kept clear of the greatest areas of future fluvial flood risk on the site based on the 1:100+Climate Change ('higher central allowance) flood extent and levels. Environment Agency guidance recommends that finished floor level (FFL) should be set a minimum of 600 mm above the 1:100 year+35% Climate Change fluvial flood level.

6.3 Site Topography and Flood Routing

Where possible, levels should fall away from buildings, and areas where water could dam up against structures should be avoided, even if drainage is provided.

The development proposals will be designed to ensure that any overland flows are routed away from buildings, intercepted by gullies and or drainage channels.

If any permeable areas are not formally drained, the risk of these areas flooding should be assessed. It should then be demonstrated that flood flow routes and depths would not affect property, car park areas or other such infrastructure. Flood flow routes should be incorporated as part of detailed engineering designs. Overland flows should be routed towards gullies where applicable and not into third party land.

Implementing a surface water drainage system for the site suitable for conveying flows up to and including the 1 in 100 year + climate change event, will protect third parties as surface water will be intercepted and not be allowed to run-off at an uncontrolled rate.

6.4 Sustainable Drainage Systems (SuDS)

It is a planning requirement to consider utilising Sustainable Drainage Systems (SuDS) if it is appropriate to the specific site conditions. These systems are diverse, but generally aim to provide drainage systems that may facilitate flood and/or pollution control, related to run-off. Such systems are generally 'soft engineering' and as a result can be financially, as well as environmentally, attractive engineering solutions.

Details of the potential use of SuDS are further investigated in Section 7.

6.5 Flood Resistance and Resilience

A basic level of flood resistance and resilience can be achieved by following good building practice and complying with the requirements of the Building Regulations 2010 and the supporting 'Approved Documents'. Considering the location of the proposed residential dwellings at the site are in Flood Zone 1 it is not deemed necessary to incorporate any flood proofing measures outlined in the EA's Floodline Publication 'Damage Limitation'.

6.6 Residual Risk

A residual risk remains for the proposed development from rainfall events greater than the 1 in 100 year + climate change design criteria of the proposed drainage system. The risk will be mitigated, as on-site sewers shall be designed in accordance with Building Regulations and the latest Sewerage Sector Guidance as appropriate, to take account of overland flood flow routes and to divert any excess surface water around and away from proposed buildings.

Where feasible and appropriate, finished floor levels will be set 150mm above adjacent site levels which further mitigates any residual pluvial flood risk.

7 DRAINAGE STRATEGY

7.1 Introduction

To demonstrate that all forms of flooding have been considered as required by the NPPF a drainage strategy has been developed. The aim of including this strategy as part of the FRA is so that it can easily be seen that the Proposed Development will not adversely affect the surface water regime in the area and that overall the current situation will be improved.

7.2 Existing Surface Water Drainage

Based on the topographic survey, included for reference in Appendix A, there are no surface water sewers located within the site boundary. The survey does pick up a 150/300mm diameter surface water sewer located along Kings Road, to the east of the site.

Owing to the present greenfield nature of the site, surface water will slowly soak into the ground (infiltrate), be intercepted by vegetation or run off by way of overland flow, following the topography of the site. Greenfield runoff rates for the site have been calculated by way of ICP SUDS, which implements a pro rata IOH124 methodology, for sites below 50ha in size. The calculation has been included for reference within Appendix G and outputs are summarised within Table 7.1, below, based upon a hypothetical 1ha area.

Return Period	Greenfield Runoff Rate (l/s)
Q1	1.8
QBar	2.1
Q30	4.2
Q100	5.5

Table 7.1: Greenfield Runoff (for hypothetical 1ha area)

7.3 Existing Foul Water Drainage

The topographic survey, included for reference in Appendix A, indicates that a 225mm diameter foul water sewer transects the site. This foul water sewer enters the site from the southwest corner and heads in a northeast direction through the site, before leaving the site in the northeast corner. A 150mm diameter foul water sewer is also located within the site, running along the southwest site boundary. The sewers located within the site will be retained and the appropriate easements provided.

Further foul water sewers are also located within the vicinity of the site, most notably a 150mm diameter sewer located in Kings Road to the east.

7.4 Proposed Surface Water Drainage

Under the terms of Section 3 of Approved Document H3 of the Building Regulations 2010 (2015 edition), soakaways should be utilised as the primary means of surface water disposal. If infiltration testing undertaken in accordance with BRE:365 (2016) provides an unfavourable infiltration rate across the site or contaminated ground is present within the site, other methods of sustainable drainage should be considered. A surface water connection to an existing watercourse should be considered prior to a connection into the public sewerage system.

A soakaway test investigation was undertaken by Ruddlesden Geotechnical Ltd in July 2017, an extract from the report is provided in Appendix F for reference. Soakaway testing was undertaken at four locations across the site, however only two of the locations produced suitable infiltration rates. Given the variability of the soakaway test results, the most suitable drainage solution for this site would be on-site attenuation with an off-site discharge.

The Conceptual Drainage Strategy illustrating drainage proposals based upon a discharge to the Orleton Brook located to the northwest is provided within Appendix H. The strategy has been designed based upon the following parameters:

- Total Site Area = 2.800 ha
- Total Impermeable Area = 0.799 ha
- Restriction Rate = 5.0 l/s

It is proposed that surface water will be conveyed by a gravity sewer system and attenuated prior to discharge within an attenuation basin located in the north of the site. Flows will then be discharged at the restricted rate (5.0 l/s) by way of a flow control (Hydrobrake) to the Orleton Brook located to the northwest of the site.

Surface water storage is provided within an attenuation basin located to the north of the proposed development. The attenuation basin provides 600m³ of storage. MicroDrainage calculations are provided in Appendix I, demonstrating that the proposed surface water drainage system and attenuation basin can accommodate flows up to the 1 in 100 year +40% climate change storm event, without causing a flood risk to existing or proposed development.

A surface water outfall is proposed to the Orleton Brook located to the northwest of the site; a headwall will be constructed within the banks of the watercourse. Ordinary watercourse consent has been obtained from HC for the surface water outfall from the site.

No existing surface water drainage has been identified within the boundary of the site. Should any further drainage features be located serving off site areas, it may be necessary that these are diverted or incorporated within the on-site drainage proposals.

It should be noted that both the Conceptual Drainage Strategy indicated within Appendix H, and supporting calculations within Appendix I, are preliminary, and as such, subject to further detailed design and approval by the relevant authorities. However, the designs illustrate that surface water arising from the development may be sustainably managed such that it does not pose a flood risk, either to proposed or existing development, to the 1:100+40% climate change storm event.

7.5 Site Specific SuDS Benefits

Sustainable drainage is a departure from the traditional approach to draining sites. There are some key principles that influence the planning and design process enabling SuDS to mimic natural drainage by:

- storing run-off and releasing it slowly (attenuation);
- allowing water to soak into the ground (infiltration);
- slowly transporting (conveying) water on the surface;
- filtering out pollutants;
- allowing sediments to settle out by controlling the flow of water.

CIRIA has produced several guidance documents covering a range of water management scenarios. A summary of the publications used as reference when the site drainage strategy was produced are listed below.

- Planning for SUDS – making it happen (C687)

- Site handbook for the construction of SUDS (C698)
- The SUDS Manual 2015 (C753)
- Sustainable Drainage Systems – Hydraulic, structural and water quality advice.

7.5.1 Attenuation Basin

The attenuation basin will allow peak flow rates to be reduced and enable flows to be limited to significantly below the existing run-off rate during storm events. These SuDS features are also useful in providing water treatment predominantly through the settlement of silts and suspended sediments. The basin will take the form of a depression within the application site and can be landscaped to provide aesthetic and amenity value. Planting can be used to improve biodiversity and attract wildlife.

To demonstrate that surface water arising from the development will be appropriately treated prior to discharge, the Simple Index Approach, as outlined within the SuDS Manual (CIRIA C753) has been followed.

The most significant pollutant load within the site will arise from individual property driveways, residential car parks, low traffic roads and non-residential car parking with infrequent change. These have an identified pollutant hazard level of 'Low as per the SuDS Manual (CIRIA C753) Table 26.2, with identified pollutant hazard indices of 0.5 for Total Suspended Solids (TSS), 0.4 for Metals, and 0.4 for Liquid Hydrocarbons.

The proposed attenuation basin has identified mitigation indices (The SuDS Manual, CIRIA C753, Table 26.3), of 0.5 for TSS, 0.5 for Metals and 0.6 for Liquid Hydrocarbons. Mitigation indices therefore exceed maximum anticipated pollutant hazard indices. This confirms that surface water arising from the development will receive an appropriate level of treatment in advance of discharge from site. Landscaping and planting may also provide additional surface water treatment in advance of discharge.

7.6 Proposed Foul Water Drainage

As illustrated by the Conceptual Drainage Strategy in Appendix H, it is proposed that foul water will be conveyed by a gravity sewer system to a foul water sewer located in Kings Road to the east of the site.

A foul water connection is proposed to the 150mm diameter foul water sewer located in Kings Road. A connection will be made to existing manhole 6402, adjacent to the site entrance.

7.7 Maintenance and Adoption

A foul water connection into the existing network will be subject to the successful submission of a Section 106 agreement under the Water Industry Act and approval from WW. Ordinary watercourse consent has already been obtained from HC for the surface water outfall from the site.

Subject to detailed engineering designs, it is likely that both foul and surface water drainage systems within the development will be adopted by WW. A specialist management company will be identified at the detailed design stage and appointed to maintain the SuDS features for the lifetime of the development.

Tables 7.2 to 7.4, below, indicate the envisaged maintenance activities associated with the proposed attenuation basin, associated headwalls and the flow control manhole, along with the approximate frequency within which they should be completed.

Table 7.2: Attenuation Basin Suggested Maintenance Schedule

Maintenance schedule	Require Action	Typical Frequency
Regular Maintenance	Remove litter and debris	As required potentially monthly
	Cut grass – public areas	Monthly (during growing season)
	Cut grass – meadow grass in and around basin	Half yearly (spring, before nesting season, and autumn)
	Inspect vegetation to pond edge and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from waters edge to a minimum of 1m above water level	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from forebay	1 – 5 years, or as required
	Remove sediment from one quadrant of the main body of ponds without sediment forebays	2 – 10 years (usually)
Occasional Maintenance	Remove sediment from the main body of big ponds, when pool volume is reduced by 20%	>25 years (usually)
Remedial Actions	Repair of erosion or other damage	As required
	Aerate pond when signs of eutrophication are detected	As required
	Realignment of rip rap or other damage	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
Monitoring	Inspect structures for evidence of poor operation	Monthly/after large storms
	Inspect banksides, structures, pipework etc. for evidence of physical damage	Monthly/after large storms
	Inspect water body for signs of eutrophication	Monthly (May - October)
	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly
	Check penstocks and other mechanical devices	Half yearly

Table 7.3: Inlet and Outlet Headwalls Suggested Maintenance Schedule

Maintenance schedule	Require Action	Typical Frequency
Regular Maintenance	Litter removal	As required
	Inspect vegetation above and around headwall and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from aprons	Annually
	Flap valves and grilles: Check for and clear obstructions	Quarterly
Remedial Actions	Repair of erosion or other damage around headwalls	As required
Monitoring	Inspect structures for evidence of poor operation	Monthly/after large storms
	Inspect structures, pipework etc. for evidence of physical damage	Monthly/after large storms
	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly
	Check flap valves	Half yearly

Table 7.4: Flow Control Manhole Suggested Maintenance Schedule

Maintenance schedule	Require Action	Typical Frequency
Regular Maintenance	Inspect vegetation above and around flow control chamber and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Remove sediment from flow control chambers	Annually
	Flow control devices: Check for and clear obstructions	Quarterly
Remedial Actions	Repair of Penstock and flow control device	As required
Monitoring	Inspect structures for evidence of poor operation	Monthly/after large storm
	Inspect structures, flow control and pipework etc. for evidence of physical damage	Monthly/after large storm
	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly

8 CONCLUSIONS AND RECOMMENDATIONS

The proposed residential development at Kings Road, Orleton has been assessed with regards to flood risk. It is not considered that flooding poses a risk to the proposed residential development of the site subject to implementation of the recommended flood mitigation measures and implementation of the drainage strategy.

8.1 Review of Flood Risk

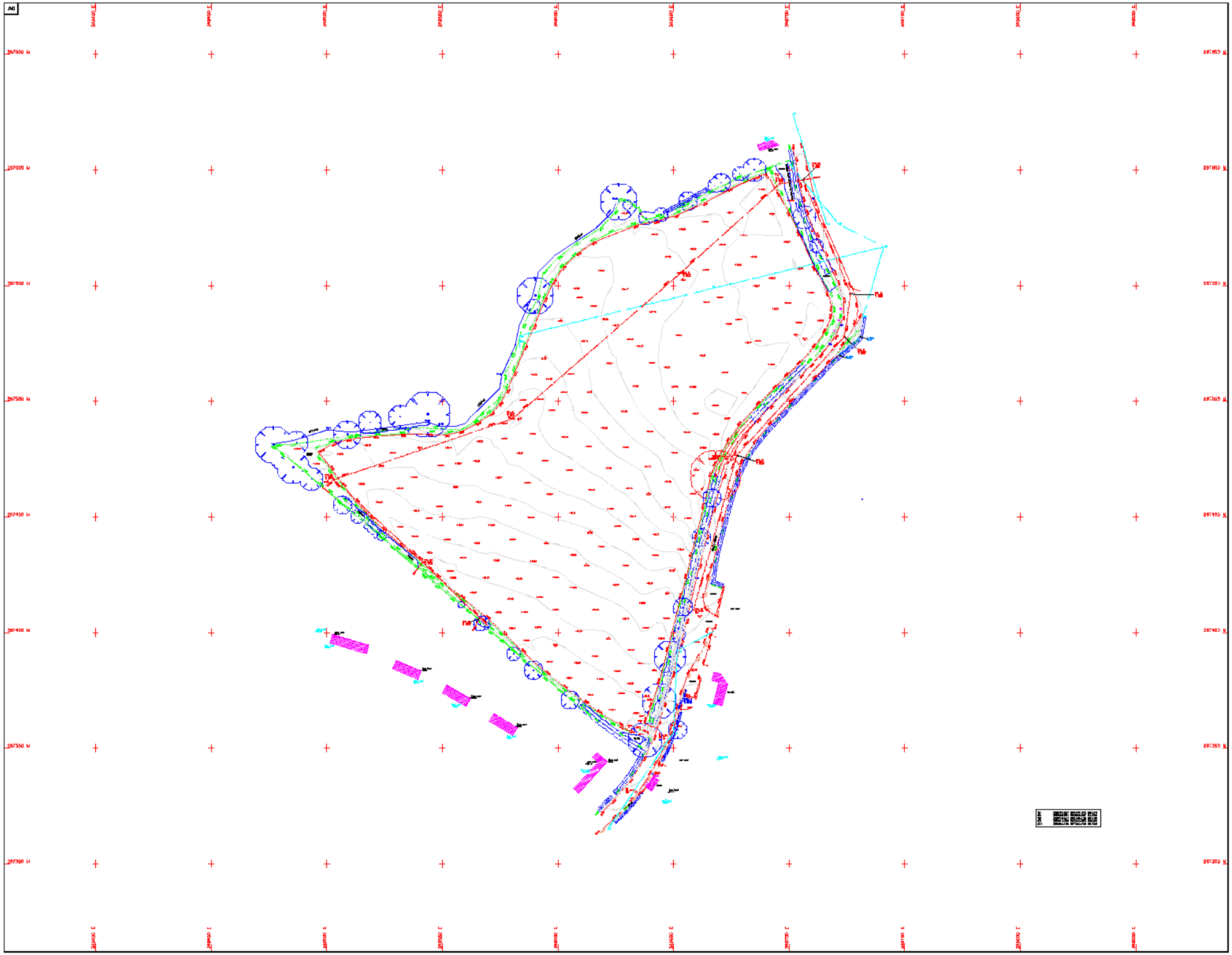
- The majority of the site including all of the land proposed for residential development is located within Flood Zone 1.
- The exception test is not required for this assessment as the whole residential development is located within Flood Zone 1 and has a vulnerability classification of “more vulnerable”.
- The measures proposed to deal with the effects and risks are appropriate.
- The development will not increase flood risk elsewhere.
- Other sources of flooding have also been assessed and it has been found that there will be no increase in risk of flooding from land, groundwater or other sources as a result of this development.
- There are no anticipated negative impacts associated with the proposed development. Positive social, economic and environmental impacts will result from the proposed development provided mitigation measures outlined in Section 6 are adhered to.
- The FRA was prepared in line with the requirements of the NPPF.

8.2 Review of Drainage Strategy

- Soakaway testing produced highly variable infiltration rates across the site, consequently infiltration methods have not been used to dispose of surface water at the site.
- The proposed on site drainage solution will be suitable to attenuate flows up to and including the 1 in 100 year + 40% rainfall event.
- On site storage of surface water will be provided within an attenuation basin.
- Surface water will be discharged from the site at the restricted rate of 5.0 l/s.
- Surface water will be discharged to the Orleton Brook, located to the northwest of the site.
- Ordinary watercourse consent has been obtained from Herefordshire Council for the surface water outfall from the site.
- Foul water will connect into an existing foul water sewer located in Kings Road to the east of the site.
- The onsite sewers are likely to be adopted by Welsh Water.
- A foul water connection to the existing public sewerage system will be subject to Section 106 approval from Welsh Water.
- A specialist management company will be identified at the detailed design stage and appointed to maintain the SuDS features for the lifetime of the development.

Appendix A – Topographic Survey

A0



NOTES

GRID & LEVELS TO OS NATIONAL GRID BRV GPS

CLIENT

FLOREAT HOMES

JOB TITLE

LAND OPPOSITE PRIMARY SCHOOL,
ORLETON, HEREFORDSHIRE

DRAWING TITLE

TOPOGRAPHIC SURVEY

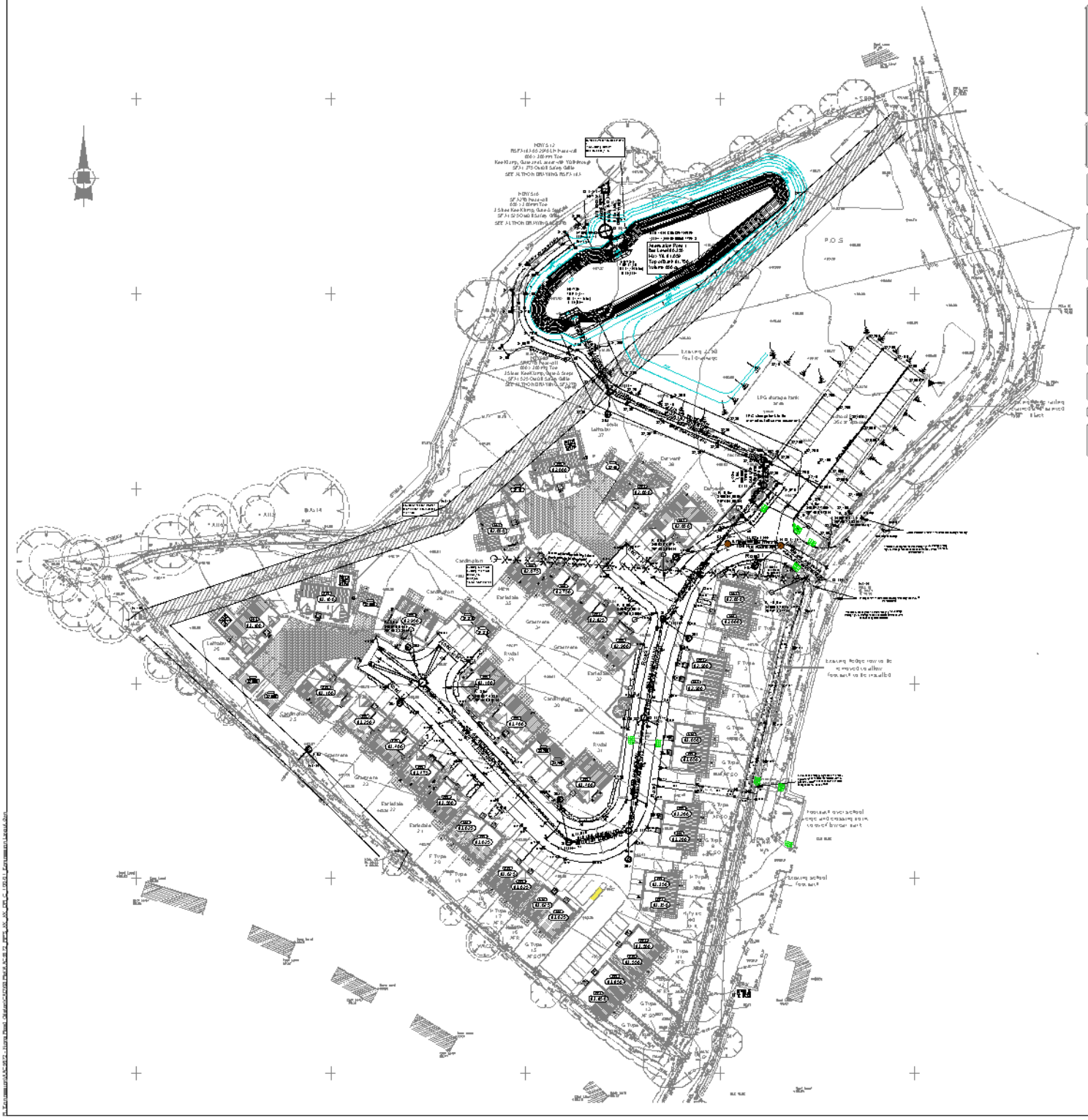
SCALE 1:500	DRAWN 01006/1
DATE 14/06/2017	DRAWN BY IGM

INVAR MAPPING SURVEYS

PROVIDING SURVEY NG SERV CES TO THE DESGN, CONS TRUCT ON AND PROPERTY INDUSTR ES FOR OVER FH RTY YEARS

www.invarmapping.co.uk

Appendix B - Planning Layout



MATERIALS FOR ADOPTABLE SEWERS

PIPES (100mm - 300mm DIA)

SURFACE AND FOUL WATER PIPES ARE TO BE EXTRA STRENGTH VITRIFIED CLAY WITH FLEXIBLE MECHANICAL JOINTS. PIPES MUST COMPLY WITH THE RELEVANT REQUIREMENTS OF BS EN **295-1:2013** AND **BS 65:1991** (surface water pipes only).

PIPES > 300mm

ALL SURFACE AND FOUL WATER PIPES ARE TO BE HIGH STRENGTH CONCRETE. CONCRETE PIPES AND FITTINGS WITH FLEXIBLE JOINTS SHALL COMPLY WITH THE RELEVANT PROVISIONS OF **BS 5911-1:2002.**

POLISHED STONE VALUES, AGGREGATE SIZES, AGGREGATE ABRASION VALUES AND PENETRATION VALUES OF ALL SURFACE COURSE MATERIALS MUST BE CHECKED WITH HIGHWAY AUTHORITY AND COMPLY WITH ALL CODES OF PRACTICE PRIOR TO ORDERING AND LAYING OF MATERIALS

FOUNDATIONS FOR PLOTS ADJACENT TO ADOPTABLE SEWERS LESS THAN 3m AWAY FROM PLOT WALL TO BE LOWER THAN THE INVERT LEVELS OF SEWER TO PREVENT ANY LOADING FORCES ON THE PIPEWORK

SURFACE WATER MANHOLE **S11** IS TO BE FITTED WITH A HYDROBRAKE. FOR DETAILS REFER TO DRAWING NO **AAC5672_RPS_XX_XX_DR_C_100-04**

LEVEL OF EXISTING ROAD AT POINT OF TIE IN WITH PROPOSED SITE ROAD MUST BE CHECKED BEFORE COMMENCEMENT OF WORKS AND ANY DISCREPANCIES REPORTED IMMEDIATELY.

A SCREEN AND SUMP IS TO BE FITTED OVER THE OUTGOING PIPE TO THE LAST NEW SURFACE AND FOUL MANHOLES BEFORE ENTERING THE EXISTING SEWERS IN ACCORDANCE WITH SEWERS FOR ADOPTION 6. THE SCREEN SHALL ONLY BE REMOVED ONCE ON SITE CONSTRUCTION WORKS HAVE BEEN COMPLETED

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT DESIGN DRAWINGS AND OTHER INFORMATION

ALL EXISTING SEWER LEVELS AND LOCATIONS TO BE CHECKED AND VERIFIED PRIOR TO ANY CONSTRUCTION WORKS AND ANY DISCREPANCIES REPORTED IMMEDIATELY.

MANHOLE RINGS SHALL NOT BE CUT

SURFACE WATER SEWER NETWORK DESIGNED IN ACCORDANCE WITH ROADS IDENTIFIED ON ORIGINAL DRAINAGE AND LEVELS CONCEPT LAYOUT AND POSITIONS ARE SUBJECT TO CHANGE

HEADWALLS TO BE PRE-CAST CONCRETE. REFER TO ALTHON DRAWINGS FOR DETAILS

MINIMUM DIMENSIONS FOR MANHOLES

Type	Size of largest pipe (DN)	Min internal dimensions¹ Rectangular length and width	Circular diameter	Min clear opening size² Rectangular length and width	Circular diameter
Manhole [illegible] depth to soffit	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] depth to soffit	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Manhole > 3.0m depth to soffit	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOTES:
1) LARGER SIZES MAY BE REQUIRED FOR MANHOLES ON BENDS OR WHERE THERE ARE JUNCTIONS.
2) MAY BE REDUCED TO 675 BY 675 WHERE REQUIRED BY HIGHWAY LOADING CONSIDERATIONS, SUBJECT TO A SAFE SYSTEM OF WORK BEING SPECIFIED.
3) NOT APPLICABLE DUE TO WORKING SPACE NEEDED.
4) MINIMUM HEIGHT OF CHAMBER IN SHAFTED MANHOLE 2M FROM BENCHING TO UNDERSIDE OF REDUCING SLAB.
5) MIN CLEAR SPACE BETWEEN LADDERS OR STEPS AND THE OPPOSITE FACE OF THE SHAFT SHOULD BE APPROXIMATELY 900MM.
6) WHICH ONLY - NO STEPS OR LADDERS, PERMANENT OR REMOVABLE
7) THE MINIMUM SIZE OF ANY MANHOLE SERVING A SEWER (I.E. ANY DRAIN SERVING MORE THAN ONE PROPERTY) SHOULD BE 1200 MM X 675 MM RECTANGULAR OR 1200 MM DIAMETER

SEVERN TRENT WATER MANHOLE REQUIREMENTS FOR DESIGN AND CONSTRUCTION GUIDANCE

GENERAL REQUIREMENTS

COPIES OF DELIVERY NOTES FOR CONCRETE AND PIPE BEDDING WILL BE REQUIRED INTERMITTENTLY AS THE JOB PROGRESSES. ALL OTHER COMPONENT UNITS MUST BE KITE-MARKED.

CHANNELS AND BENCHING

ALL CHAMBERS WITH PIPE SIZES 150MM, 225MM, 300MM MUST HAVE SWEPT BENDS AND CHANNELS. ALL BENCHING TO BE A MINIMUM 40MM THICK GRANOLITHIC CONCRETE TROWELLED TO A SMOOTH FINISH.

IRONWORK IN MANHOLES

IF THE CHAMBER IS LESS THAN 3M DEEP WE REQUIRE DOUBLE ENCAPSULATED STEP RUNGS UNLESS OTHERWISE APPROVED. IF THE CHAMBER IS OVER 3M DEEP WE REQUIRE HOT DIPPED GALVANISED MILD STEEL LADDERS. THERE MUST BE 900MM BETWEEN LADDER AND BACK OF SHAFT. DEPTH IS MEASURED FROM FINISHED COVER LEVEL TO THE TOP OF THE BENCHING. THE MAXIMUM DISTANCE BETWEEN COVER LEVEL AND THE FIRST STEP MUST BE 675MM.

BRICKWORK

MIN 2 MAX 4 COURSES UNDER FRAME AND MUST BE SOLID CLASS B ENGINEERING BRICKS OR CONCRETE SPACING RINGS NEATLY POINTED UP. ENGLISH BOND TO BE USED ON ALL BRICKWORK. SULPHATE RESISTING CEMENT MUST BE USED IN ALL LOCATIONS.

COVER AND FRAMES

COVER SLAB OPENING, COVER AND FRAMES MUST BE 675 X 675 UNLESS OTHERWISE APPROVED
D400 SHALL BE USED AT ALL LOCATIONS. ON SPINE ROADS MUST BE 150MM DEEP. ON RESIDENTIAL CUL-DE-SACS 100MM MAY BE USED SUBJECT TO APPROVAL. FRAMES FOR MANHOLE COVERS SHOULD BE BEDDED IN A POLYESTER RESIN BEDDING MORTAR IN ALL SITUATIONS WHERE COVERS ARE SITED IN HAUNA ROAD CATEGORIES I, II OR III.

'INFILL' TYPE COVERS SHOULD NOT BE USED.

IN BLOCK PAVED AREAS 150MM DEEP FRAMES MUST BE USED IN ACCORDANCE WITH DESIGN AND CONSTRUCTION GUIDANCE P2.2

LATERALS

THEY SHOULD BE LAID TO THE SAME STANDARD AS PUBLIC SEWERS. THEY SHOULD HAVE NO CHANGES OF LINE OR GRADIENT BETWEEN THE SEWER AND THE DEMARCATION CHAMBER. THEY SHOULD HAVE AN ADOPTABLE MANHOLE AS THE DEMARCATION CHAMBER UNLESS THERE IS ONLY ON PROPERTY WHEN A PLASTIC CHAMBER TO BS EN 13598-2:2009 IS ALLOWED. LOCKABLE B125 AND A15 COVERS MAY BE ALLOWED IN CERTAIN LOCATIONS SUBJECT TO APPROVAL. THE DEMARCATION SHOULD BE INSIDE THE BOUNDARY OF THE PROPERTY, NO MORE THAN 1M INSIDE THE BOUNDARY, PREFERABLY IN THE DRIVEWAY AND NOT IN THE WHEEL TRACKS OF VEHICLES.

S106 APPLICATION

A SECTION 106 APPLICATION TO SEVERN TRENT WATER MUST BE COMPLETED FOR THE REUSE OF ANY EXISTING CONNECTION INTO THE EXISTING PUBLIC SEWERAGE SYSTEM OR THE CONSTRUCTION OF A NEW CONNECTION.

AN APPLICATION WILL BE REQUIRED FOR THE FOUL AND SURFACE WATER DRAINAGE ARRANGEMENTS AND THIS SHOULD BE COMPLETED BY THE CONTRACTOR.

ALL SEWERS ARE TO COMPLY WITH THE DESIGN AND CONSTRUCTION GUIDE AND SEVERN TRENT WATER REQUIREMENTS

ANY POND BED LINING OR BANK STABILISATION METHODS REQUIRED FOR BALANCING POND TO BE ASSESSED BY STRUCTURAL ENGINEER

IMPORTANT: HEADWALLS WILL REQUIRE THE ENVIRONMENT AGENCY'S PRIOR WRITTEN CONSENT UNDER SECTION 109 OF THE WATER RESOURCES ACT 1991 BEFORE ANY CONSTRUCTION TAKES PLACE

WHERE PIPE CROSSING, PLASTIC MEMBRANE TO BE USED FOR PROTECTION TO ELIMINATE CHANCES OF CROSS CONTAMINATION

PIPES OF DIFFERENT DIAMETERS ENTERING MANHOLES SHOULD BE INSTALLED WITH SOFFITS AT THE SAME LEVEL

THE OUTSIDE OF THE SEWER SHOULD BE IN VEHICLE CARRIAGEWAY (NOT FOOTPATH) AND BE AT LEAST 1m FROM KERB LINE. THE OUTSIDE MANHOLES SHOULD BE AT LEAST 0.5m FROM THE KERB LINE.

THE MATERIALS TO BE USED ARE SUITABLE FOR THE GROUND CONDITIONS

TREES ON THE DRAWING ARE EXISTING OR PROPOSED AND ADHERE TO B.2.1 (PAGE 33) OF SFA6. THE TREES SPECIFIED WILL BE AS PER SEWERS FOR ADOPTION AND POSITIONED. WHERE CLEARANCES WITH VEGETATION IS NOT ACHIEVABLE, APPROPRIATE ROOT PROTECTION WILL BE PROVIDED

PRELIMINARY
SUBJECT TO SECTION 38 & 104
APPROVAL

Notes
1. This drawing has been prepared in accordance with the scope of RPS's appointment with its client and is subject to the terms and conditions of that appointment. RPS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
2. If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.
3. This drawing should be read in conjunction with all other relevant drawings and specifications.

For guidance only. Do not scale off this drawing

PUBLIC DRAINAGE

FOUL WATER
MANHOLE ●
PIPE LINE
DIRECTION ARROW
RISING MAIN
DEMARCATION CHAMBER*

SURFACE WATER
MANHOLE ○
PIPE LINE
DIRECTION ARROW
DEMARCATION CHAMBER*

HIGHWAY DRAINAGE
MANHOLE
GULLY
HIGHWAY DRAIN / GULLY CONNECTION

OTHER
EXISTING SEWERS TO BE ABANDONED ✕ ✕ ✕
GRUBBED UP IN ACCORDANCE WITH SEVERN TRENT WATER SPECIFICATION

* DEMARCATION CHAMBERS TO BE CONSTRUCTED AS PER ADOPTABLE MANHOLE CONSTRUCTION DETAILS DEPENDING ON CHAMBER DEPTH. A 450Ø INSPECTION CHAMBER CAN BE USED PROVIDING LATERAL ONLY SERVES ONE PLOT.

Rev	Description	By	Chd	Date
P03	Drawing updated following comments from STW on S104.	FO	ma	23.04.21
P02	Updated to match external levels layout plot 17-18 lowered	ma	AG	11.12.20
P01	First Issue	ma	AG	03.12.20

MAKING COMPLEX EASY

321 Bradford Street, Birmingham,
West Midlands B5 6ET
T +44 121 622 8520 E [illegible]@rpsgroup.com

Client SHROPSHIRE HOMES Quality & Character

Project Kings Road
Orleton

Title Engineering Layout

Status Preliminary
Scale @ A1 1:500
Date Created 02.12.2020
Task Team Manager AG
Information Author ma
Task Information Manager x
Document Number AAC5672-RPS-xx-xx-DR-C-100-01
Project Code - Originator - Zone - Level - Type - Role - Drawing Number
RPS Project Number AAC5672
Suitability S4
Revision P03

rpsgroup.com

Appendix C - Correspondence with Herefordshire Council

From: Allen, Jennifer (02)
To: RPS Hydrology Services
Subject: RE: Guidance on Flood Information Request
Date: 15 July 2021 15:25:00
Attachments: image001.png

CAUTION: This email originated from outside of RPS.

Hi Jessica,

We have already been consulted on a planning application for this site. Our comments can be found on the Hereford Council Planning portal if you search under 'Kings Road, Orleton.' Please do not hesitate to contact me if you have any further queries.

Kind regards,

Jenny

Jennifer Allen
Assistant Drainage Engineer | Balfour Beatty | Services | Living Places | Herefordshire Public Realm

M: 07849 570146 | E: jennifer.allen2@balfourbeatty.com
(Please note that due to working from home, I have poor mobile signal, therefore email is the best form of contact)
Balfour Beatty Living Places | Unit 3, Thorn Business Park | Rotherwas | Hereford | HR2 6JT

Download the : Herefordshire SuDS Handbook and the Strategic Flood Risk Assessment (Level 1)

From: RPS Hydrology Services <RPSHydrologyServices@rpsgroup.com>
Sent: 15 July 2021 15:20
To: Allen, Jennifer (02) <Jennifer.Allen2@balfourbeatty.com>
Cc: Hockenhull, Joel <Joel.Hockenhull@balfourbeatty.com>
Subject: RE: Guidance on Flood Information Request

STOP: This email originated from outside of **Balfour Beatty**.**THINK BEFORE YOU CLICK:** Do not click links or open attachments unless you recognise the sender and know the content is safe. Definitely do not enter your ID and password.

Good afternoon,

Thank you for your response.

We wish to enquire regarding flood information for a proposed development at Land off Kings Road, Orleton, SY8 4HQ. Please find attached a location plan for your reference.

Please could you provide any flood information you hold for the site and surrounding area, such as flood maps (fluvial, surface water, groundwater) and historic flood records in the vicinity of the site.

We will be completing a Flood Risk Assessment to support a planning application for this site. **Do you have any site-specific comments and drainage requirements for this site?**

Kind regards,

Jessica

RPS Hydrology Services
RPS | Consulting UK & Ireland
T +44 121 622 8520
E RPSHydrologyServices@rpsgroup.com

From: Allen, Jennifer (02) <Jennifer.Allen2@balfourbeatty.com>
Sent: 15 July 2021 11:44
To: RPS Hydrology Services <RPSHydrologyServices@rpsgroup.com>
Cc: Hockenhull, Joel <Joel.Hockenhull@balfourbeatty.com>
Subject: RE: Guidance on Flood Information Request

CAUTION: This email originated from outside of RPS.

Good Morning Jessica,
Please can you provide us with a location plan or postcode of the proposed development site? In the first instance, we advise you to refer to the Herefordshire Council Level 1 Strategic Flood Risk Assessment - Strategic Flood Risk Assessment – Herefordshire Council
Kind regards,
Jenny

Jennifer Allen
Assistant Drainage Engineer | Balfour Beatty | Services | Living Places | Herefordshire Public Realm

M: 07849 570146 | E: jennifer.allen2@balfourbeatty.com
(Please note that due to working from home, I have poor mobile signal, therefore email is the best form of contact)
Balfour Beatty Living Places | Unit 3, Thorn Business Park | Rotherwas | Hereford | HR2 6JT
Download the : Herefordshire SuDS Handbook and the Strategic Flood Risk Assessment (Level 1)

From: RPS Hydrology Services <RPSHydrologyServices@rpsgroup.com>
Sent: 14 July 2021 16:58
To: Hodges, Steve <StHodges@herefordshire.gov.uk>
Subject: Guidance on Flood Information Request

Good afternoon,
We are looking to request flood information relating to a proposed development.
We were unable to find a general email address or guidance on submitting a request for flood information to the flood team at Herefordshire Council.
My colleague advised you may be able to recommend the best way to submit a request to the flood team for information regarding a development site.
Kind regards,
Jessica Grady

RPS Hydrology Services
RPS | Consulting UK & Ireland
United Kingdom
T +44 121 622 8520
E RPSHydrologyServices@rpsgroup.com

We’ve recently launched our Summer issue of The Expert, the magazine for everyone at Balfour Beatty. Check it out here.

This email may contain information which is confidential and is intended only for use of the recipient/s named above. If you are not an intended recipient, you are hereby notified that any copying, distribution, disclosure, reliance upon or other use of the contents of this email is strictly prohibited. If you have received this email in error, please notify the sender and destroy it. 'Think before you print - please do not print this email unless you really need to' Balfour Beatty plc is registered in England as a public limited company; Registered No: 395826; Registered Office: 5 Churchill Place, Canary Wharf, London E14 5HU Warning: Although the company has taken reasonable precautions to ensure no viruses or other malware are present in this email, the company cannot accept responsibility for any loss or damage arising from the use of this email or attachments.

Full Planning Applications: Flood Risk and Drainage Checklist

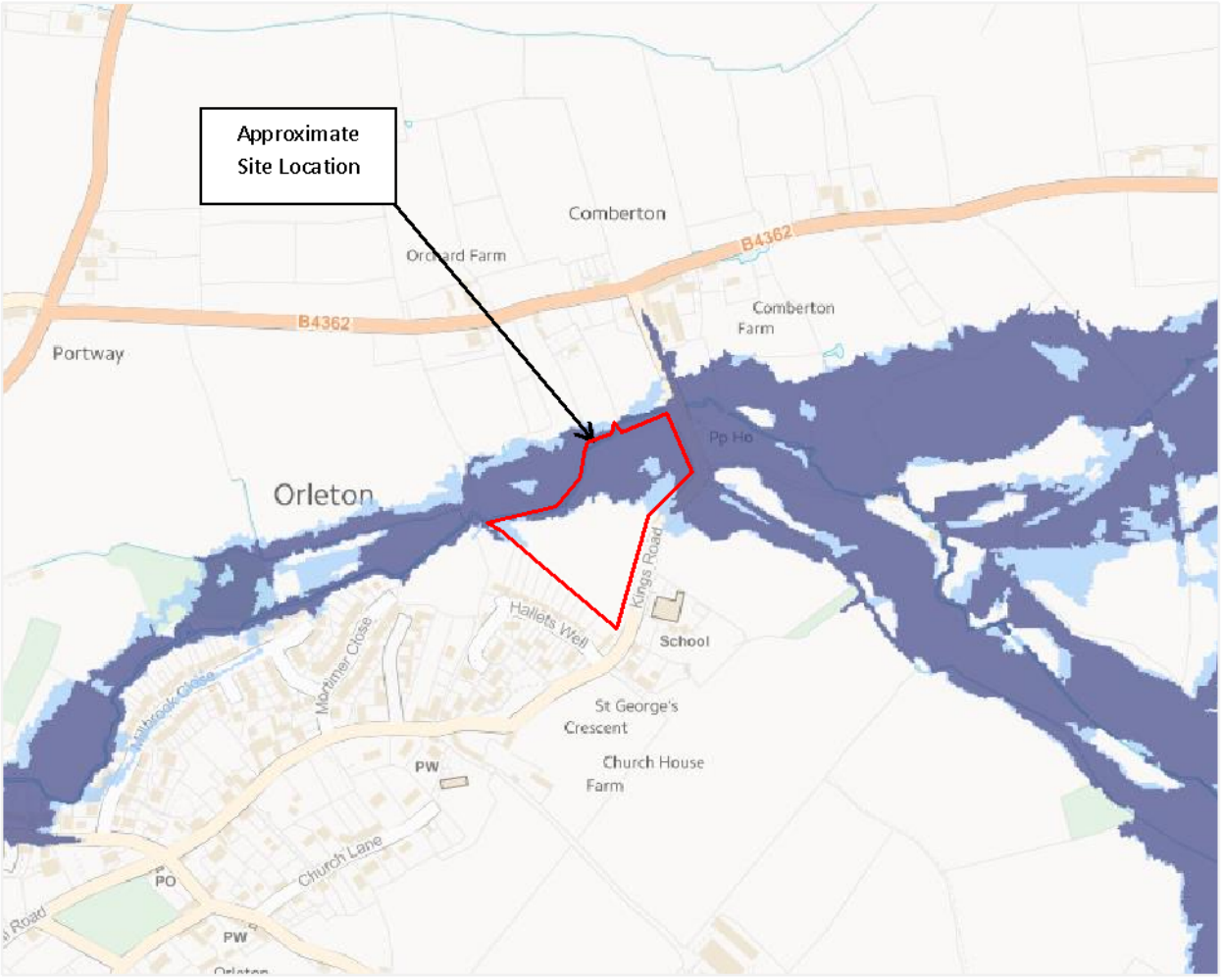
This document provides a list of the information that, in general, must be submitted to support full planning applications in relation to flood risk and drainage.

Application details

SITE:	Land to the north west of, Kings Road, Orleton, Herefordshire
DESCRIPTION:	Proposed 39 dwellings with associated access, parking and landscaping.
APPLICATION NO:	180517
GRID REFERENCE:	OS 349597, 267474
APPLICANT:	South Shropshire Housing Association
DATE OF THIS RESPONSE:	30/10/2018 Rev 2.1

Site location and extract of flood map(s)

Figure 1: Environment Agency Flood Map for Planning (Rivers and Sea), October 2018



Development description

The Applicant proposes the construction of 39 dwellings with associated garages and access roads. The site occupies an area of 2.7ha and is currently used for agricultural purposes. An ordinary watercourse flows along the northern boundary of the site. The topography of the site slopes down from approximately 83.6m AOD in the south-east to approximately 80.8m AOD in the north-east.

Development Background

WSP previously provided feedback on this application on the 16th of March 2018. Concerns were noted that the development was near the mapped flood extents without the support of hydraulic modelling or consideration of climate change effects. The Applicant was also suggesting land re-profiling within areas of flood risk without an assessment of impacts elsewhere and development of appropriate mitigation. There were also contradictions in the drainage strategy and little information provided around the proposed discharge rates and volumes. It was therefore recommended that the following information be provided prior to the Council granting planning permission:

- Detailed modelling confirming the extent and depth of Flood Zone 2 and 3 and taking climate change into account. We recommend a 35% increase is adopted to inform design mitigation (i.e. floor levels) and a 70% increase is adopted to ensure that internal flooding of properties will not flood during this event and that safe access/egress is available.
- Assessment of impact to flood risk elsewhere associated with development/land raising located in the mapped Flood Zone 2 and 3 and taking climate change into account, and proposed mitigation measures to ensure no flood risk elsewhere.
- Revised FRA / Drainage Layout that are not contradictory.
- Supporting drainage calculations to demonstrate that runoff rates and volumes will not increase flood risk elsewhere between the 1 in 1 year and 1 in 100 year events, and taking climate change into account.
- Demonstration that consideration has been given to the risk of water backing up the drainage system and/or limiting discharge when water levels in Mill Brook are high.
- Confirmation of agreement in principle of proposed adoption and maintenance arrangements for the surface water drainage system.
- Demonstration that appropriate access is available to maintain SuDS features, notably the private soakaways that are proposed to be adopted by a third party management company.

The applicant has provided the following updated documents to address these comments:

- Hydraulic Modelling and Flood Extent Mapping report (June 2018 ref:K0832B\03)
- Updated Drainage Feasibility Layout (Ref: J01745/A1/001)
- Microdrainage Calculation results and summary sheets

The above has been assessed against the requested information and detailed below.

✓ Information provided is considered sufficient

✘ Information provided is not considered sufficient and further information will be required

Information required	Reviewer comments	✓✗
Detailed modelling confirming the extent and depth of Flood Zone 2 and 3 and taking climate change into account. We recommend a 35% increase is adopted to inform design mitigation (i.e. floor levels) and a 70% increase is adopted to ensure that internal flooding of properties will not flood during this event and that safe access/egress is available.	The Applicant has commissioned detailed 1D-2D hydraulic modelling of the existing scenario. We agree that the methodology of the detailed hydraulic modelling is sound. The updated modelling shows that the mapped extents of 1 in 100yr and 1 in 1000yr events with allowance for climate change is not as extensive as shown on EA flood mapping, with the 1 in 100yr with 35% and 70% climate change events showing negligible flooding within the northern extent of the site, and the 1 in 1000yr with 35% and 70% climate change events showing reduced flood extent in comparison to EA mapped Flood Zone 2. The hydraulic modelling report states that there is no flow record for the Orleton Brook and therefore it is not possible to calibrate the model. The accuracy of the model therefore relies on realistic estimation of key hydraulic parameters, principally roughness. The report states that the hydraulic model is to be submitted to the EA for review. As the flood extents from the modelling show a significant difference to the flood extents presented in current EA mapping and there is a lack of flow data for calibration, it is recommended that the results of the EA review of the model be provided to the council prior to the granting of planning permission.	✓ (with note)
Assessment of impact to flood risk elsewhere associated with development/land raising located in the mapped Flood Zone 2 and 3 and taking climate change into account, and proposed mitigation measures to ensure no flood risk elsewhere.	An assessment of the updated drainage feasibility layout against the updated flood extents calculated by the detailed hydraulic modelling has not been provided. Our own comparison of the provided flood extents and the updated drainage design shows that the updated design lies within close proximity to but outside the predicted 1 in 1000 yr event with 70% climate change flood extent and well outside the 1 in 100yr event with 35% climate change flood extent (this flood extent is shown to not affect the development site at all). While it is noted that an EA review of the model has not yet been completed it is considered that the predicted flood extents are unlikely to undergo extensive changes following this review. As such the development will not impact flood risk elsewhere due to land raising within the site boundary as any ground altering works will be taking place outside of the predicted flood extents. It is however recommended that the results of the EA review of the hydraulic model are made available to the council prior to the granting of planning permission.	✓ (with note)
Revised FRA / Drainage Layout that are not contradictory.	A revised FRA has not been provided. The updated drainage feasibility layout shows a drainage system that utilises private soakaways for 8 properties at the southern end of the site. The remainder of the proposed drainage is collected by a pipe system that directs it to an onsite attenuation basin that discharges to the ordinary watercourse bordering the site. The proposed basin is designed to contain the 1 in 100yr event with 35% climate change and to discharge at 5l/s providing a storage volume of 3500m^3. As before the suggested 5l/s is not backed by calculation of greenfield runoff rates and is contradicted by the previous FRA that has not been properly updated. We recommend that the applicant provides a revised FRA that clarifies the proposal and includes calculation of greenfield runoff rates. This should be addressed prior to the Council granting planning permission.	✗

Information required	Reviewer comments	✓✗
Supporting drainage calculations to demonstrate that runoff rates and volumes will not increase flood risk elsewhere between the 1 in 1 year and 1 in 100 year events, and taking climate change into account.	As per above, it is not yet certain how the proposed discharge rate of 5l/s compares with the equivalent greenfield runoff rate for events between the 1 in 1 year and 1 in 100 year events. Consideration will also need to be given to the potential increase in discharge volume. The provided Microdrainage calculations indicate that the system will be designed to provide attenuation up to the 1 in 100yr event with 35% climate change allowance. This is acceptable subject to agreement of an appropriate discharge rate and assessment of discharge volume, noting that the submitted calculations may have to be resubmitted. No information has been provided around the design of the proposed soakaways. Supporting drainage calculations should be provided for each of these soakaways that demonstrate that the runoff from the properties will not increase flood risk between the 1 in 1 year and 1 in 100 year events taking climate change into account.	✗
Demonstration that consideration has been given to the risk of water backing up the drainage system and/or limiting discharge when water levels in Mill Brook are high.	This has not been provided	✗
Confirmation of agreement in principle of proposed adoption and maintenance arrangements for the surface water drainage system.	This has not been provided	✗
Demonstration that appropriate access is available to maintain SuDS features, notably the private soakaways that are proposed to be adopted by a third party management company.	The revised drainage feasibility layout show that there will be adequate space onsite to access the proposed attenuation pond. The proposed private soakaways at the southern end of the site however are shown to be within the individual gardens of the residents. Detail of how these soakaways will be accessed has not been provided on the updated layout. It is recommended that this is clarified prior to the council granting planning permission.	✗

Overall Comment

The drainage strategy is still contradictory to what is stated in the previous FRA and little information has been providing regarding greenfield runoff rates and discharge from the site. We therefore recommend that the following information is provided prior to the Council granting planning permission:

- An update to the FRA and Surface Water Drainage Strategy that is not contradictory to the proposed Drainage Layout and contains details of greenfield runoff rates and proposed discharge rates from the site.
- Supporting drainage calculations for each of the proposed soakaways that demonstrate that the runoff from the properties will not increase flood risk between the 1 in 1 year and 1 in 100 year events taking climate change into account.
- Demonstration that consideration has been given to the risk of water backing up the drainage system and/or limiting discharge when water levels in Mill Brook are high.
- Confirmation of agreement in principle of proposed adoption and maintenance arrangements for the surface water drainage system.

- Clarification of how appropriate access will be achieved to the proposed soakaways at the southern end of the development that are proposed to be adopted by a third party management company.

We also wish to stress the following point:

- Regarding infiltration it appears to be feasible for part of the site but prior to construction the Applicant must carry out testing in specific locations and over winter to obtain detailed design infiltration rates for design and confirm groundwater levels. This may require an amendment to the currently proposed drainage design.

Appendix D - Correspondence with Environment Agency

A consultation enquiry was sent to the Environment Agency on 14/07/21, to establish any site-specific flooding issues.

RPS are currently awaiting a response from Environment Agency and the report will be updated upon receipt of this.

Appendix E – Hydraulic Modelling Report

South Shropshire Housing Association

Hydraulic Modelling and Flood Extent Mapping of land opposite Orleton Primary School, Orleton, Herefordshire SY8 4HH

Report K0832B/03

June 2018

Prepared and submitted by

Hydro-Logic Services
(part of Hydro International plc)

Unit 6
Commerce Park
Brunel Way
Theale
RG7 4AB

T: 01189 331325
F: 01189 331486

enquiries@hydro-logic.co.uk

http://www.hydro-logic.co.uk

1. Statement of Objectives

The objective of this report is to provide a high-level technical summary of the hydraulic modelling and flood extent mapping of land opposite Orleton Primary School, Orleton, Herefordshire SY8 4HH (the site) undertaken by Hydro-Logic Services for South Shropshire Housing Association during May and June 2018. It supports the submission of the associated Flood Risk Assessment (FRA) and has been scoped to address the flood risk issues raised in the planning application response document[1] produced by external consultants on behalf on Herefordshire Council, in accordance with National Planning Policy Framework (NPPF).

The response confirms that the existing Environment Agency Flood Zone 2 and 3 boundaries at the site, corresponding to the 0.1% AEP[2] (1 in 1,000 year) and 1.0% AEP (1 in 100 year) flood extents respectively, are not considered to be sufficiently accurate to permit building as proposed. Furthermore, the existing flood extents do not include the anticipated effects of climate over the lifetime of the proposed development.

The response recommends that additional analysis in the form of hydraulic modelling is undertaken at the site as a prior condition to granting planning permission. The response states that climate change allowances of 35% and 70% should be considered. The revised flood extents and levels produced would inform aspects of the proposals, such as the site layout, elevation of finished floor levels, the location of potential SuDS feature(s), and the identification of safe access and egress route(s).

In order to address the recommendation, a hydrodynamically-linked, 1D-2D (1-dimensional and 2-dimensional) model has been developed using *Flood Modeller* (1D) and *TUFLOW* (2D) hydraulic modelling software. The model incorporates a 345 m reach of Orleton Brook and covers the existing undeveloped site and additional surrounding land, to an extent appropriate for the assessment of potential flood risk across the site.

The format of this report is based on the *Best Practice Guidance* provided by the Environment Agency entitled *Using Computer River Modelling as part of a Flood Risk Assessment* (Environment Agency, May 2006). This report would also support the submission of the hydraulic model for assessment by the Environment Agency. This report has been prepared in anticipation of this review, whereby the format follows that preferred by the Environment Agency.

2. Justification for Model Development

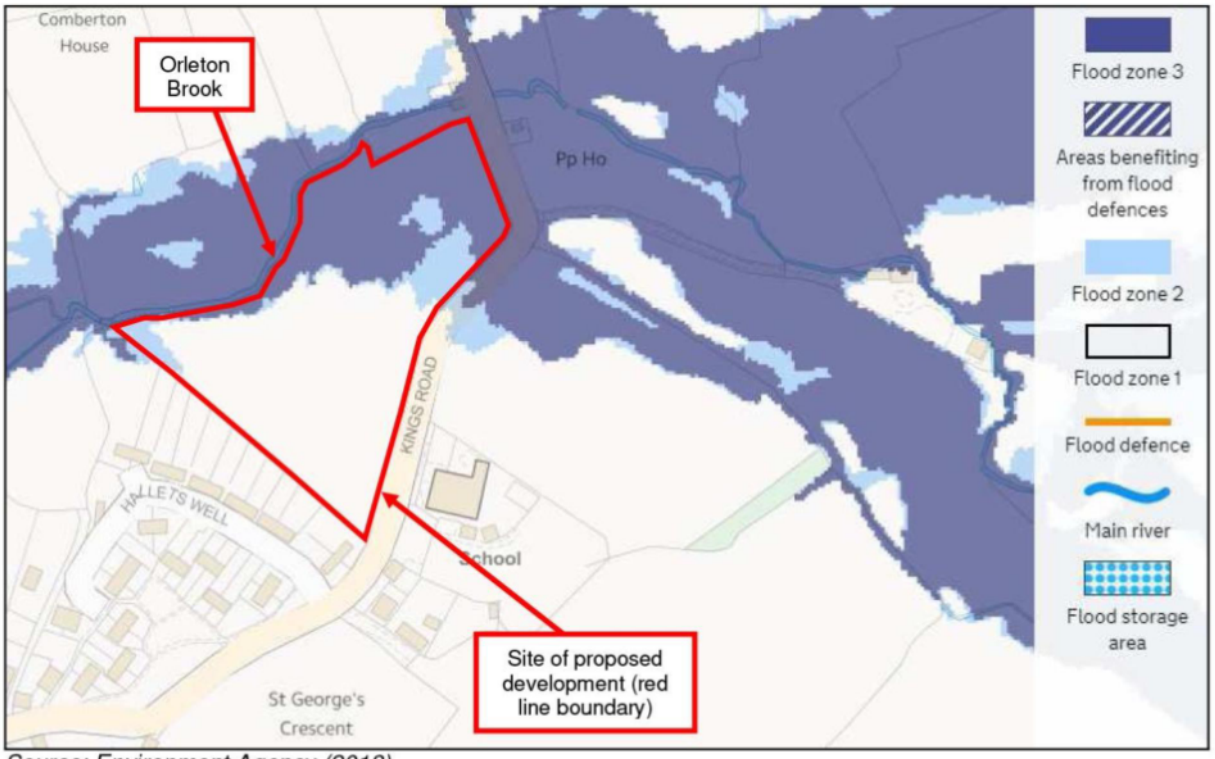
The Environment Agency flood map for planning at the site is shown in Figure 1. The map indicates extensive flood risk at the site, with an estimated 40% of the site (delineated in red) falling within Flood Zone 2 and 3, corresponding to the 0.1% AEP and 1.0% AEP flood extents respectively.

However, and as indicated in the Herefordshire Council planning application response, the Environment Agency Flood Zone 2 and 3 boundaries at the site are not considered to be sufficiently accurate to permit building as proposed. The flood extents have been generated using the J-Flows software, and while this software does provide broad-scale flood extent mapping, it does not generate flood levels. Furthermore, the existing flood extents do not include the anticipated effects of climate over the lifetime of the proposed development.

The justification for the development of a hydraulic model to better assess flood risk at the site therefore derives directly from the above referenced Herefordshire Council planning application response.

[1] *Full Planning Applications: Flood Risk and Drainage Checklist (ExtConsResp 4)*, Herefordshire Council / WSP / Balfour Beatty, 23/03/2018
[2] Annual exceedance probability

Figure 1 Environment Agency Flood Map for Planning (site boundary in red)



Source: Environment Agency (2018)

3. Method Statement

A hydrodynamically-linked, 1D-2D (1-dimensional and 2-dimensional) model has been developed using *Flood Modeller* (1D) and *TUFLOW* (2D) hydraulic modelling software. The 1D domain was developed to model the Orleton Brook channel, which forms the northern boundary of the site. The 2D domain was developed to model the land adjacent to the channel and incorporating the floodplain, including land to the north of channel (left bank), and land to the south of the channel (right bank) that includes the location of the site. The extent of the 1D and 2D domains were sized appropriately for the assessment of potential flood risk across the site.

Hydrological analysis using the ReFH2 and WINFEH4 (formerly WINFAP) software was undertaken in order to develop the inflow hydrographs for the 1.0% AEP and 0.1% AEP storm events. Flows were increased by 35% and 70% to reflect the *Central* and *Upper End* climate change allowances anticipated for the lifetime of the proposed development.

The resultant 1.0% AEP and 0.1% AEP plus climate change extents were overlaid on the site survey and coloured using the standard Environment Agency flood map format (light blue for 0.1% AEP or Flood Zone 2, dark blue for 1.0% AEP or Flood Zone 3).

The model was sensitivity tested by analysing simulation outputs with the following changes applied to the 1.0% 35%CC scenario.

- 1D and 2D *Manning's n* (hydraulic roughness) values varied by +/- 20%.
- Downstream (*NCDBDY*) boundary slope varied by +/- 20%.

4. Data Sources

The data used for the current modelling exercise was as follows.

- A survey of the Orleton Brook throughout its course adjacent to the site, undertaken by Invar Mapping Surveys on 19/04/2018 using standard levelling techniques. The

survey included left and right bank crest elevations, and channel cross-sections extending well into the adjacent floodplain on both left and right banks. The survey data was provided as CAD (.dwg) files and comma separated value files (.csv), supported by photographs taken from each channel cross-section of the view upstream and downstream, and of the left and right banks.

- 2 m resolution LiDAR digital terrain model (DTM) and digital surface model (DSM) data tiles covering the site was obtained from the Open Government Licence survey website[3]. Single DTM and DSM tiles were sufficient for coverage of the site (SO4967_DTM_2M and SO4967_DSM_2M). The DTM data was used as the basis for the 2D domain of the model. The DSM data was used to inform the schematisation of the material (or *Manning's n* hydraulic roughness) model layer.
- The catchment descriptor dataset at the downstream limit of the site was obtained using the FEH webservice[4]. The catchment descriptor dataset was used as the basis for ReFH2 and WINFEH4 (formerly WinFAP) analysis undertaken to develop the model flow-time boundaries (*QTBDY*).
- Ordnance Survey data and aerial photographs accessed via Bing Maps were used to inform the schematisation of the material (or *Manning's n* hydraulic roughness) model layer. This data was also of assistance for the interpretation of DSM data during the process of linking the 1D and 2D domains.

5. Model Development and Optimisation

5.1 Overview

The *Flood Modeller* hydraulic modelling software (version 4.3.6458.29637) was used to develop and run the 1D domain of the model in order to simulate flow in the channel.

The QGIS (version 3.0.2 Girona) software was used to develop the set of layers constituting the 2D domain of the model as shapefiles (.shp format).

TUFLOW (TUFLOW_iDP_w64.exe version 2018-03-AA) was used to simulate the 2D out of bank floodplain flows.

The 1D and 2D domains of the model were run in tandem using the dynamic *Flood Modeller-TUFLOW* link which allows exchange between the 1D and 2D model domains during simulation.

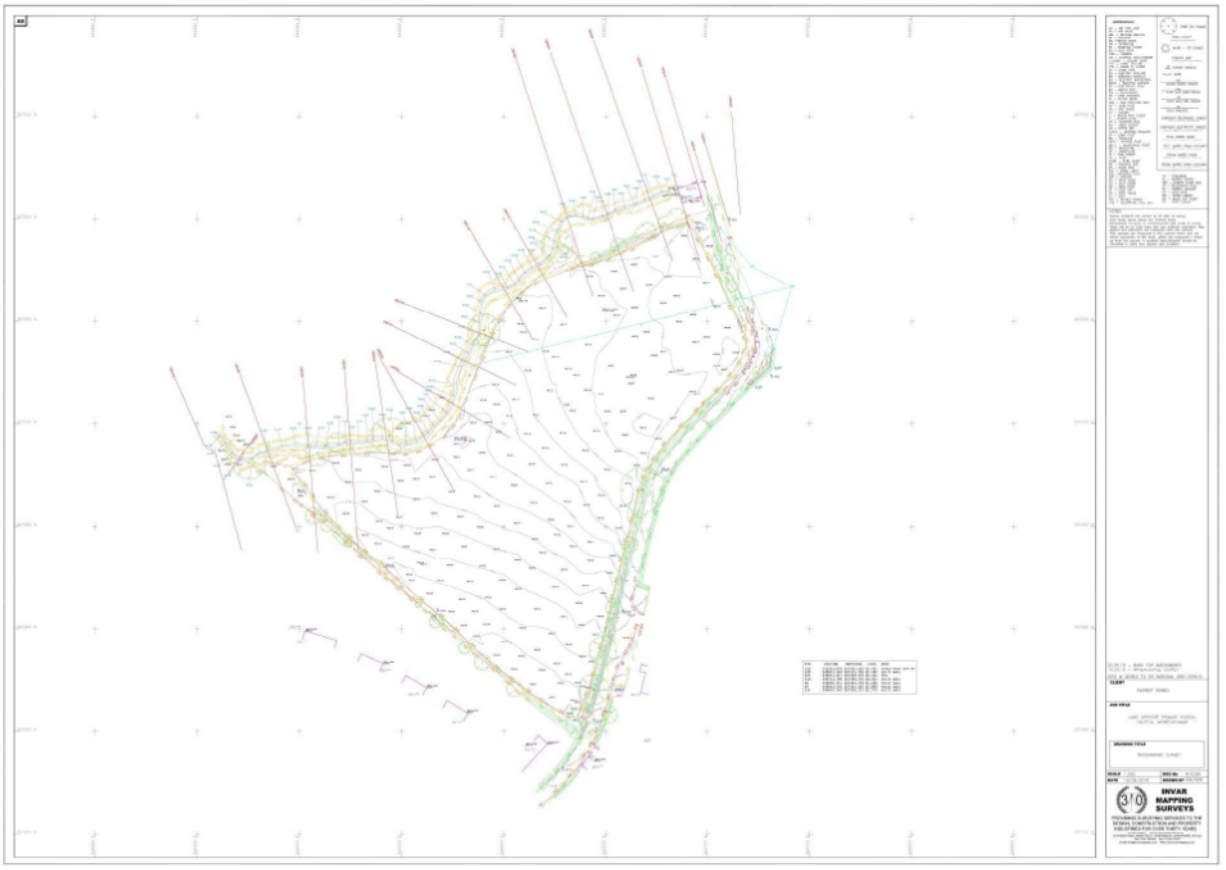
5.2 1D Model Development

The 1D element of the model was developed based on survey data provided by Invar Mapping Surveys. The survey included left and right bank crest elevations, and channel cross-sections extending well into the adjacent floodplain on both left and right banks. The survey data was provided as CAD (.dwg) files and comma separated value files (.csv), supported by photographs taken from each channel cross-section of the view upstream and downstream, and of the left and right banks.

Twenty cross-sections were surveyed from the upstream limit of the site to 10 m downstream of Kings Road bridge. An image of the site survey is shown in Figure 2.

[3] *https://environment.data.gov.uk/ds/survey/index.jsp#/survey*
[4] *https://fehweb.ceh.ac.uk/*

Figure 2 Survey Plan of Site



The survey cross-section data was imported from the .csv data files into *Flood Modeller* and saved as a 1D network. Each cross-section was saved as a *River* unit, with the chainage, elevation, easting and northing values populated directly from data. *Manning's n* values were populated manually according to the rules described later in this section (Table 1), with panel markers denoting a change in *Manning's n*. Relative path lengths (RPLs) of each *River* section were estimated using QGIS. All cross-section rows were left activated in order to model the full width of the surveyed cross-sections.

The footbridge at cross-section OB0318 was modelled as a USPBR1978 bridge unit in parallel with a *Spill* unit. The bridge section and spill deck data was provided with the OB0318 cross-section data.

The culverts between cross-sections OB0029 and OB0019, and OB0016 and OB0010, were modelled as pairs of sprung-arch conduit units and modelled in parallel with *Spill* units. The culvert section and spill deck data was provided with the respective cross-section data.

The sprung-arch conduit units are constrained to have a consistent cross-sectional profile for the full length of the conduit, and so the limiting upstream face profile was used for both upstream and downstream conduit units. The conduit units are also constrained to have a level invert, and so the mean channel bed level was applied at each unit.

Two interpolated cross-sections were inserted between OB0345 and OB0318 in order to stabilise model simulations.

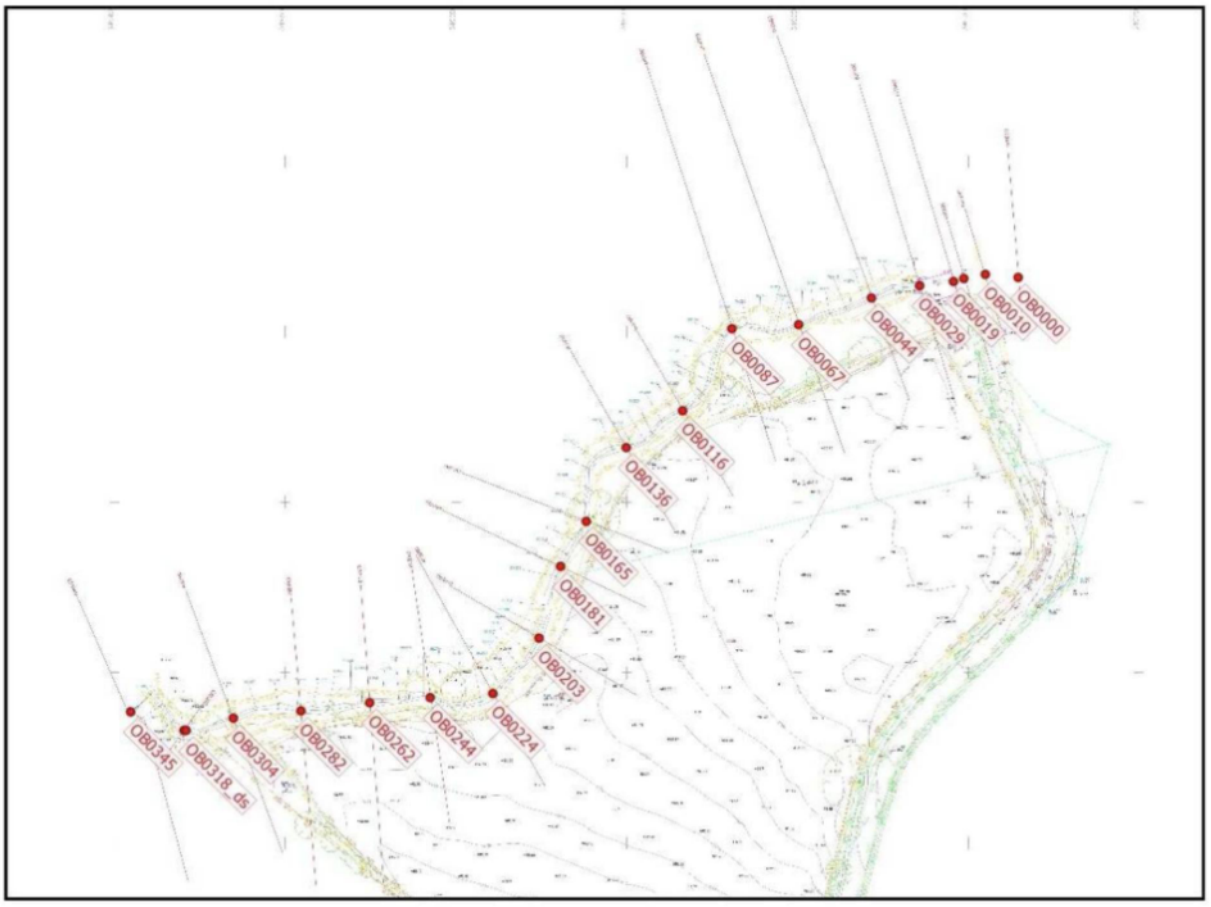
The upstream boundary was configured as a flow-time boundary (*QTBDY*) unit which directly applies flow-time hydrographs produced by ReFH2 and WINFEH4 analysis (see section 6).

The downstream boundary was configured as a normal-critical depth boundary (*NCDBDY*) unit set to normal depth mode. The slope between the last two *River* sections (OB0010 and OOB0000) is very shallow, with a value of 0.0016, and is not representative of the slope of

the river downstream of this point. Accordingly, QGIS was used to estimate the slope of the channel and bank crest based on the DTM 100 m downstream of the last *River* unit OB0000. The slope was found to be 0.004 and this was applied directly to the *NCDBDY* unit as a user-defined slope.

A section of the survey plan showing the location of the 1D *River* units, with the labelled nodes showing the lowest point (bed depth) of the surveyed channel, is shown in Figure 3.

Figure 3 Survey Plan showing location of 1D *River* unit nodes



Estimates of hydraulic roughness and corresponding values of *Manning's n* for the 1D domain were made based on photographs of the site provided as part of the survey, aerial photographs of the site, and interrogation of colour scaled and contoured layers of the DSM using QGIS. The *Manning's n* values are at the conservatively high end of the range of representative values and are similar to those used in other studies undertaken by Hydro-Logic Services. The values selected in the 1D model are summarised in Table 1.

Table 1 1D hydraulic roughness

Surface characteristics	Manning's n
Channel	0.035
Bank – concrete, smooth brickwork	0.020
Bank – hardstanding, roads	0.020
Bank – grass (meadow)	0.050
Bank – overgrown vegetation	0.070
Bank – trees with undergrowth	0.070

The integrated 1D model was run using Flood Modeller prior to linking to the 2D domain in order to assess and manage simulation stability. The 1D run featured the full channel widths as surveyed, which included much of the adjacent floodplain. On linking with the 2D domain, the extended cross-sections were deactivated beyond the bank crest (see Section 5.4).

5.3 1D Model Limitations

No flow records are available for the Orleton Brook and therefore it was not possible to calibrate the 1D model. The accuracy of the 1D model therefore relies on realistic estimation of key hydraulic parameters, principally roughness.

5.4 2D Model Development and 1D-2D Linking

The 2D domain of the model referenced by the *TUFLOW* software was developed to include the site and surrounding land adjacent to, and on both banks of, the Orleton Brook channel. The 2D domain was schematised to be significantly larger than the area of the site, and of extent adequate to ensure accurate mapping of flood extents across the site.

The western (upstream) and eastern (downstream) boundaries of the 2D domain were schematised to be approximately perpendicular to the upstream and downstream survey cross-sections respectively that define the upstream and downstream limits of the 1D model. The southern and northern boundaries of the 2D domain extend well beyond land shown as inundated in the Environment Agency flood map. The extent of the 2D domain is shown as the broken red line in Figure 4.

Figure 4 2D domain boundary (broken red line)

The underlying DTM dataset (SO4967_DTM_2M) comprises a 2 m grid (.asc) file, and given the relatively small size of the site and the requirement for accurate mapping of flood extents, a 2 m cell size was selected for the 2D domain. The DTM is referenced directly at model run-time in order to constitute the 2D terrain model.

A 1d_nodes layer was schematised to represent the location of the lowest points of each channel cross-section. The location of the 1D nodes is shown in Figure 3.

Modifications were made to the 2D terrain model via a superseding thick (ridge) 2d_zln layer, with a 2d_zln_pts layer defining the elevation of the ridge, in order to ensure that key bank elevations dictating the transition from channel (1D) to floodplain (2D) flow were well-represented. LiDAR survey does not generally provide reliable levels for longitudinal, elevated features such as bank crests, particularly when occluded by trees or other vegetation. The modifications were based on the more reliable bank crest elevations collected by the survey.

The area of the 2D domain corresponding to the Orleton Brook channel was removed (or *carved*) from the 2D domain. Care was taken to ensure that, generally, the width of channel removed corresponded to the bank crest width of the 1D channel at the cross-section. This approach was not always applied in cases where the channel bank crests were not well defined by survey.

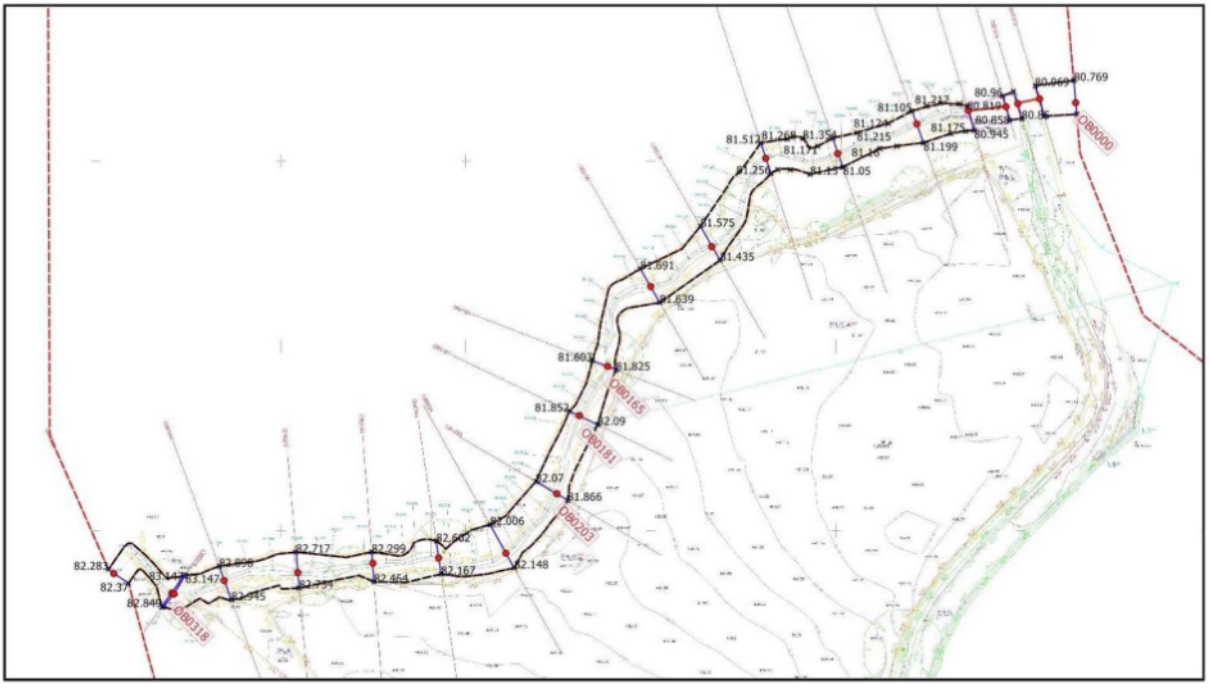
A 2D boundary condition layer (named as a 2d_hx layer) was referenced in order to model the transition from 1D to 2D domains. Discrete lines of type HX lines were digitised on both banks between each channel cross-section and snapped to the 2d_zln vertices. Discrete lines of type CN were digitised to connect the 1D nodes (in the 1d_nodes layer) to the 2D domain (where the vertices of the 2d_zln and 2d_hx layers are crossed by the channel survey cross-sections).

The 1D *River* unit cross-sections where deactivated at the points where the cross-section fall within the 2D domain, generally at bank crest, such that the floodplain was modelled entirely in the 2D domain. This is required in order not to over-estimate the area of the floodplain.

Inflows to the 2D domain were entirely from the linked 1D channel via the HX boundaries (i.e. the only inflow boundary in the model is from the Flood Modeller *QTBDY*).

The 1D-2D linking scheme is shown in Figure 5.

Figure 5 1D-2D domain linking schema



Estimates of hydraulic roughness and corresponding values of *Manning's n* for the 2D domain were made based on photographs of the site provided as part of the survey, aerial photographs of the site, and interrogation of colour scaled and contoured layers of the DSM using QGIS. As with the 1D *Manning's n* values, the 2D *Manning's n* values are at the conservatively high end of the range of representative values and are similar to those used in other studies undertaken by Hydro-Logic Services.

A blanket value of 0.050 (grass/meadow) was applied to the entire 2D domain, and areas of different roughness were manually digitised as polygons in a subsequently applied 2d_mat layer. This enabled a simplified approach to sensitivity testing of hydraulic roughness as required (see section 7.2). The values applied to the 2D domain are summarised in Table 2.

Table 2 2D hydraulic roughness

Surface characteristics	Manning's n
Land, meadow, grass	0.050
Trees, bushes, undergrowth	0.070
Roads	0.020
Buildings, other blocking structures	1.000

The following should be noted.

- The entire area within the site boundary was modelled using the blanket roughness default value of 0.050. This reflects the current condition of the floodplain as open fields under agricultural use, and is consistent with the *Manning's n* values encoded in the 1D domain.
- The relatively high *Manning's n* value of 1.000 for buildings reflects the standard approach for modelling buildings as blockages to overland flow.

6. Hydrology and Flow-Time Boundaries

The catchment descriptor dataset at the downstream limit of the site was obtained using the FEH webservice[5]. Adopting a precautionary approach, the downstream limit was used in order to allow for flow accretion over the length of the modelled channel.

The catchment descriptor dataset was imported into the ReFH2 software application in order to generate a series of hydrographs for the 1.0% AEP and 0.1% AEP storms for a range of durations from 2 to 16 hours. Applying the set of 1.0% AEP flood hydrographs to the 1D model flow-time boundary (*QTBDY*), simulations showed the critical storm duration for the model (i.e. the storm duration resulting in the highest peak levels) to be 10 hours. This storm duration was used for all simulations produced by the 1D-2D linked model.

The peak values generated by ReFH2 for the 10 hour 1.0% AEP and 0.1% AEP hydrographs were shown to be approximately 2.603 m^3/s and 4.225 m^3/s respectively. The ratio of the 0.1% AEP and 1.0% AEP peak flows is therefore approximately 1.623.

Design hydrological peak flow estimates for the 1.0% AEP storm event were undertaken based on the FEH Statistical Method, using the WINFEH4 (formerly WinFAP) software. The results of this analysis produced a peak flow of 2.742 m^3/s, a factor of approximately 1.054 greater than that produced by the ReFH2 analysis. Adopting a precautionary approach, the peak flows estimated by ReFH2 analysis were adjusted upwards by this factor, resulting in peak values for the 10 hour 1.0% AEP and 0.1% AEP hydrographs of 2.742 m^3/s and 4.451 m^3/s respectively.

Climate change allowances were applied to the adjusted hydrographs to produce the final hydrographs suitable for undertaking the required analysis. The set of peak values for the 10 hour, 1.0% AEP and 0.1% AEP plus climate change hydrographs are presented in Table 3.

[5] *https://fehweb.ceh.ac.uk/*

Table 3 Hydrograph peak flows

Storm	Peak flow (m^3/s)		
	without CC	35%CC	70%CC
1.0% AEP	*2.742*	3.702	4.661
0.1% AEP	*4.451*	6.009	7.567

The WINFEH4 datasets and analysis spreadsheet used to generate the scaled peak values, and a spreadsheet showing the development of the flow-time hydrographs, are provided in the *Hydrology&FEH* sub-folder of the project folder (see section 9).

When running the model, a minimum flow of 0.5 m^3/s was applied to all hydrographs in order to stabilise the simulations. This minimum or "sweetening" flow was well below peak flood flows, does not cause flooding at the site and makes no contribution to flood extents.

7. Model Development Assumptions

7.1 Calibration

As summarised in section 5.3, no flow records are available for the Orleton Brook and therefore it was not possible to calibrate the 1D model. The accuracy of the 1D model, and therefore the 1D-2D linked model, therefore relies on realistic estimation of key hydraulic parameters, principally roughness.

7.2 Sensitivity Testing

Sensitivity testing was undertaken by applying the following changes to the 1.0% AEP plus 35% climate change scenario.

- Implementing global changes to both 1D and 2D roughness values. Values for *Manning's n* were decreased and increased by 20%.
- Implementing changes to the slope of the downstream (*NCDBDY*) boundary. Slope was decreased and increased by 20%.

The flood extents produced by the four sensitivity test simulation are shown in figures 10 to 13, and the results are interpreted in section 8.5. In general, although small differences in sensitivity extents are observed, the results confirm that the models are not significantly sensitive to changes in roughness values.

8. Model Simulation Results

8.1 Description of Model Runs

The following scenarios were investigated by applying the respective 1D *QTBDY* units as 1D event files at run time.

- 1.0% AEP plus 35% climate change
- 1.0% AEP plus 70% climate change
- 0.1% AEP plus 35% climate change
- 0.1% AEP plus 35% climate change

8.2 Model Timesteps

A 1D domain simulation timestep of 2 seconds was applied.

A 2D domain simulation timestep of 1 second was applied, in line with "rule of thumb" guidance that the 2D timestep (in seconds) should be between one quarter and half the 2D cell size (in metres).

These timestep values produced highly stable simulation for all scenarios tested.

8.3 Model Output

In addition to the flood extent maps reproduced at the end of the current section, the model simulation has produced the following outputs for examination.

- Water Depths
- Water Levels (elevations)
- Flow Velocities
- UK Hazard

8.4 Flood Extent Maps

The flood extents produced by the four scenarios are shown in figures 6 to 9 and summarised in section 8.7.

It should be noted that the flood extent maps show flooding in the 2D domain of the model only. The river channels are modelled as the 1D domain, are outside the 2D domain and therefore excluded from the mapping.

8.5 Sensitivity Flood Extent Maps

The sensitivity test scenarios produced small differences to the resulting flood extents. However, the sensitivity test results did not result in any changes to flood risk at the site. The flood extents produced by the four scenarios are shown in figures 10 to 13. The results may be summarised as follows.

- The *Mannings n* +20% scenario indicates increased flood risk along Kings Road and downstream of the site compared with the *Mannings n* -20% scenario. There are no changes in flood risk at the site as a result of changing Mannings n values.
- No significant differences in flood risk are indicated as a result of varying the slope of the downstream (*NCDBDY*) boundary by +/- 20%. No changes in flood risk at the site as a result of varying the slope are indicated.

In general, although small differences in sensitivity test extents are observed, the results confirm that the model is not significantly sensitive to changes in *Manning's n* or downstream boundary slope.

8.6 Peak Water levels

Table 4 shows the peak 1D in-channel water depths for each scenario. This data will be important in setting finished floor levels across the site.

Table 4 1D peak in-channel water depths

	Peak water elevation (mAOD)			
River unit (node)	***1.0% AEP 35%CC***	***1.0% AEP 70%CC***	***0.1% AEP 35%CC***	***0.1% AEP 70%CC***
OB0345	82.500	82.616	82.759	82.897
OB0318	82.269	82.377	82.537	82.684
OB0304	82.139	82.253	82.382	82.508
OB0282	81.984	82.090	82.226	82.362
OB0262	81.867	81.962	82.074	82.183
OB0244	81.717	81.806	81.933	82.048
OB0224	81.686	81.823	81.943	82.033
OB0203	81.671	81.799	81.912	81.996
OB0181	81.481	81.573	81.697	81.820
OB0165	81.396	81.504	81.620	81.711
OB0136	81.347	81.462	81.581	81.661
OB0116	81.231	81.348	81.446	81.503
OB0087	81.149	81.268	81.354	81.400
OB0067	81.060	81.178	81.250	81.290
OB0044	81.006	81.117	81.178	81.216
OB0029	80.943	81.101	81.213	81.313
OB0019	80.832	80.948	81.038	81.175
OB0016	80.791	80.905	81.051	81.198
OB0010	80.715	80.834	81.006	81.188
OB0000	80.700	80.789	80.908	81.036

8.7 Model Runs Summary

The Environment Agency flood map for planning (Figure 1) flood map shows the 1% AEP and 0.1% AEP flood extents. It was expected that the modelling of the four scenarios summarised in section 8.1 would result in flood extents that are different from those produced by the Environment Agency flood mapping.

The modelling allows the following observations to be made.

- All modelled extents are significantly smaller than the Environment Agency flood mapping.
- The 1.0% AEP plus 35% climate change scenario shows no flood risk on the site. Small areas of out-of-bank flood risk are indicated on the north (left) bank near the upstream and downstream limits of the modelled channel.
- The 1.0% AEP plus 70% climate change scenario shows limited flood risk around the north-eastern perimeter of the site. Larger areas of out-of-bank flood risk are indicated on the north (left) bank near the upstream and downstream limits of the modelled channel, along and to the east of Kings Road.
- The 0.1% AEP plus 35% climate change scenario shows a substantial area of flood risk at the north-eastern corner of the site, with a small area of flood risk on the site midway along the Orleton Brook. Moderately larger areas of flood risk are indicated on the north (left) bank near the upstream and downstream limits of the modelled channel, with increased flood risk along and to the east of Kings Road.
- The 0.1% AEP plus 35% climate change scenario shows a larger area of flood risk at the north-eastern corner of the site, with a small but increased area of flood risk on

the site midway along the Orleton Brook. Extensive areas of flood risk are now indicated throughout the north (left) bank. Further increased flood risk is indicated near the upstream and downstream limits of the modelled channel, with increased flood risk along and to the east of Kings Road.

In summary, the revised modelling presented in this Report allows the following observations to be made.

- The mapped extents of 1.0% and 0.1% with allowance for climate change is not as extensive as shown on Environment Agency flood mapping.
- The detailed modelling flood extents and levels indicate an even greater proportion of the site would be appropriate for development than that indicated by Environment Agency flood mapping, even when allowances of 35% and 70% for increased river flows are made.

Figure 6 1.0% AEP plus 35% climate change maximum extent

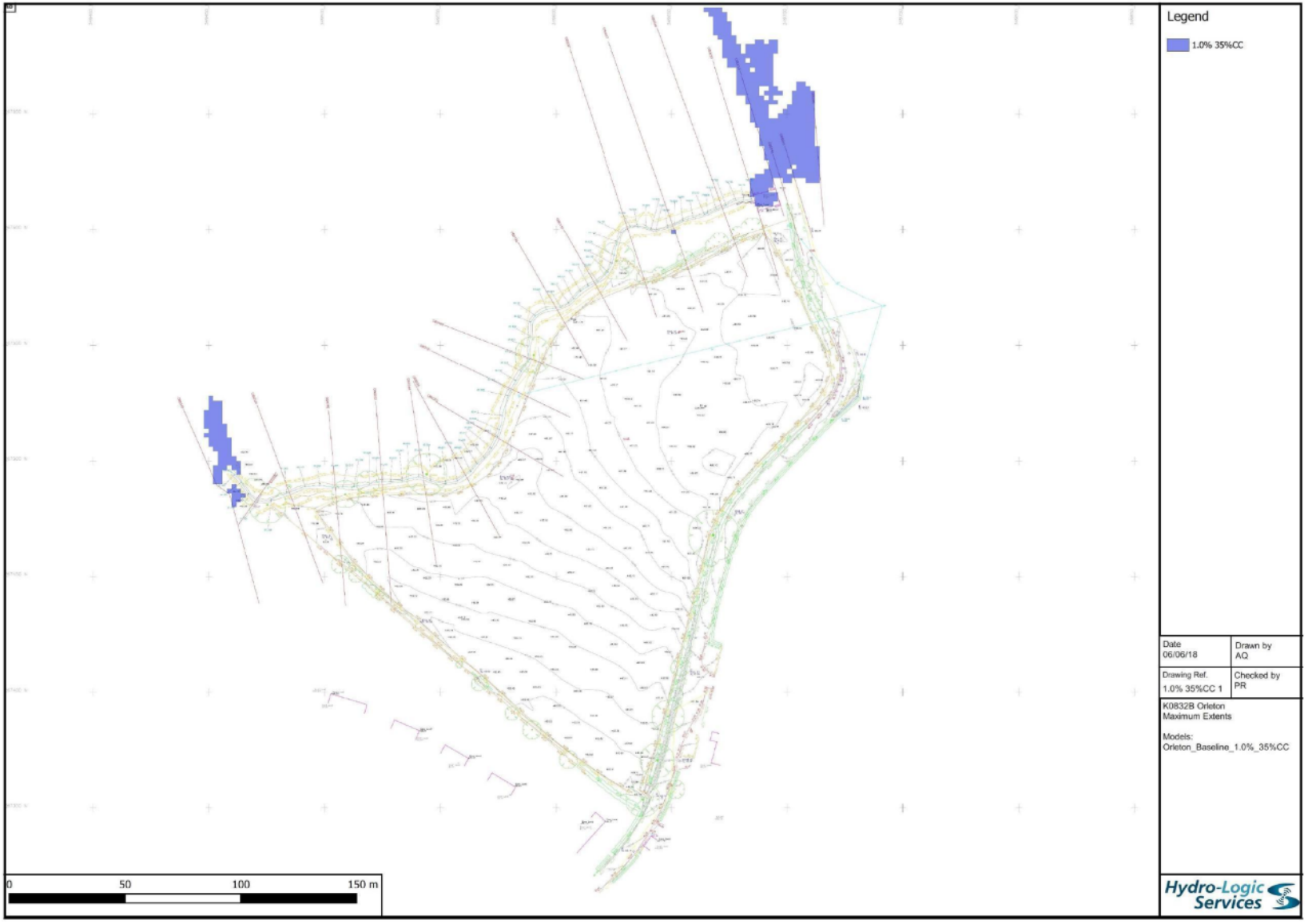


Figure 7 1.0% AEP plus 70% climate change maximum extent

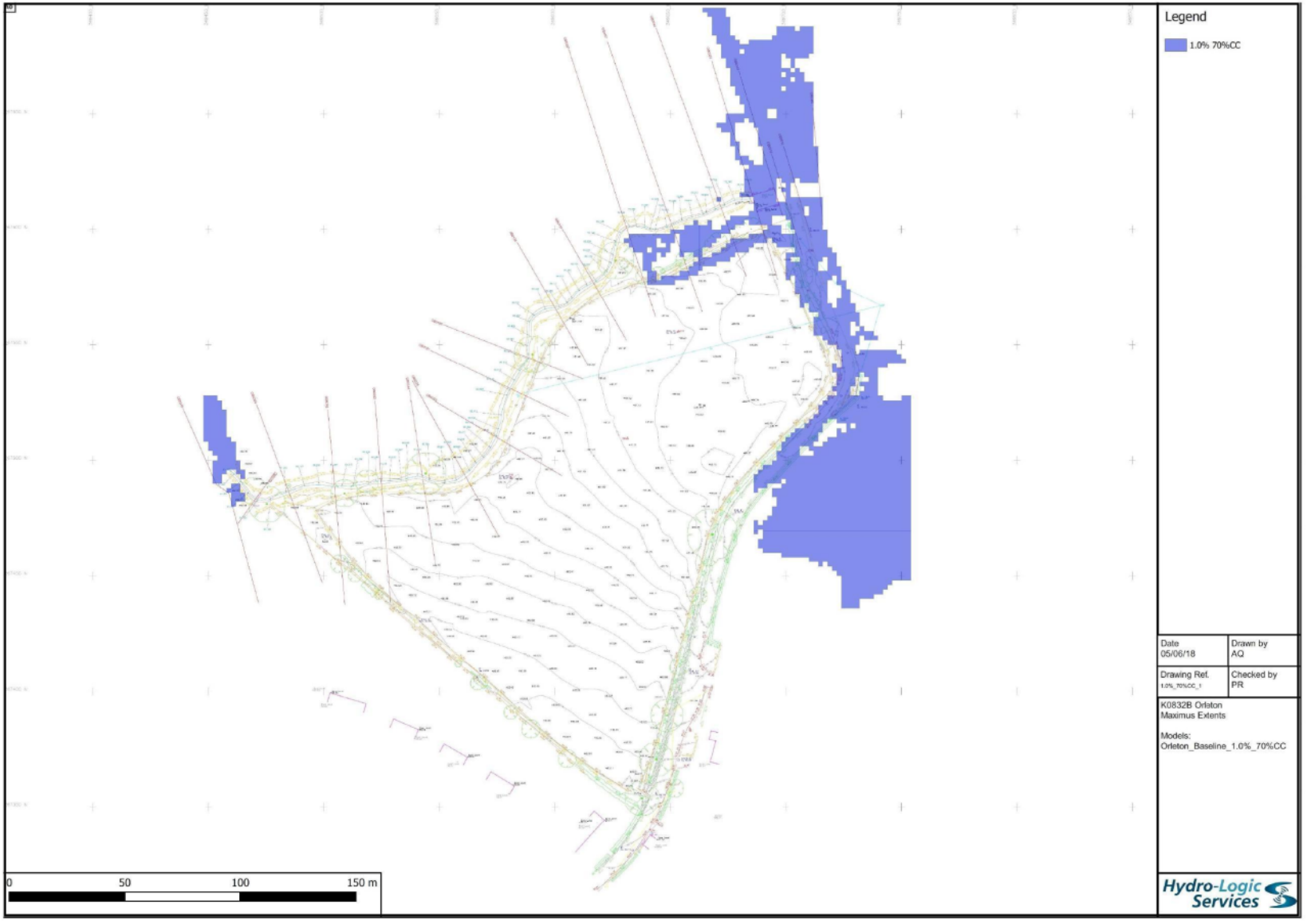


Figure 8 0.1% AEP plus 35% climate change maximum extent

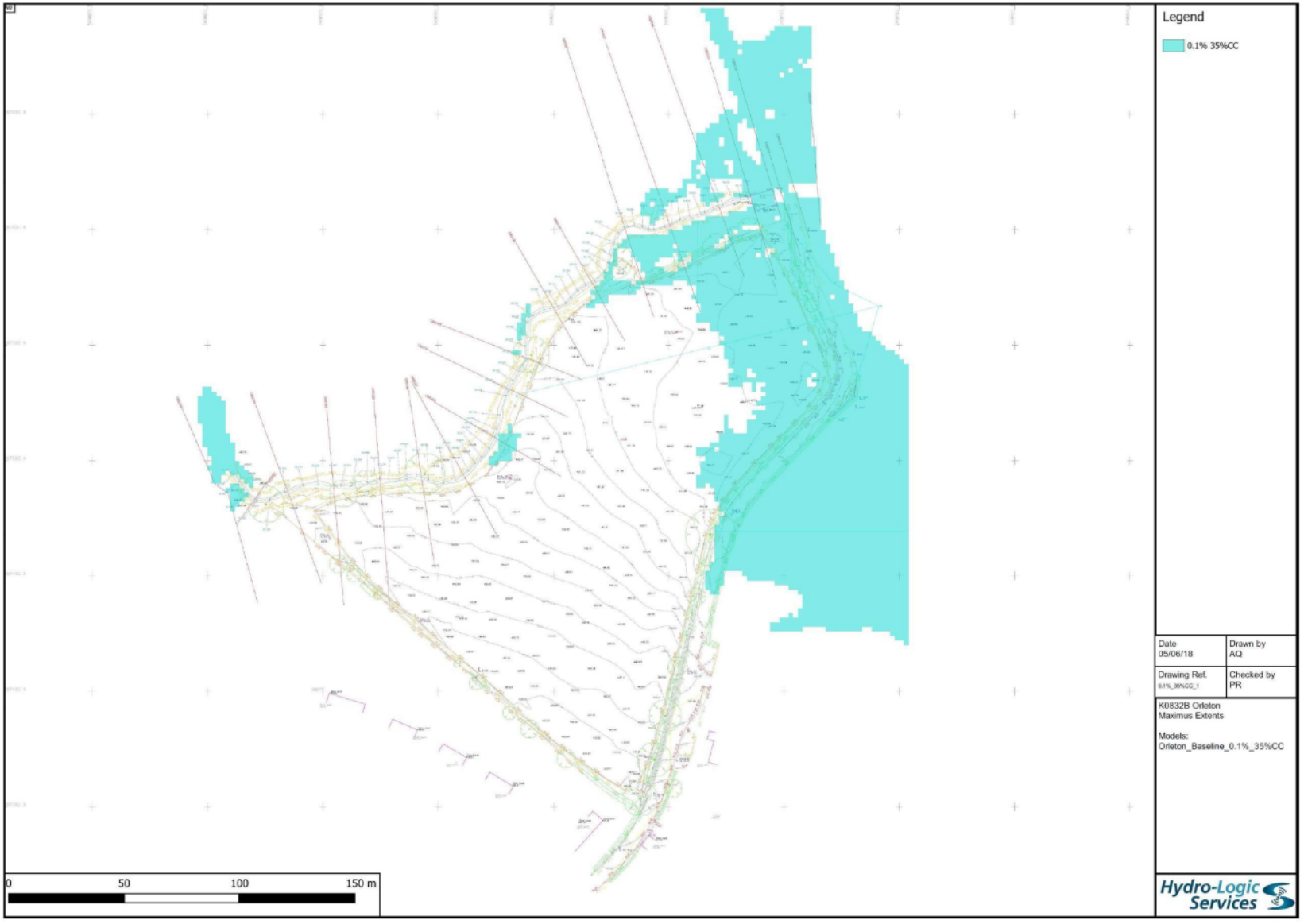


Figure 9 0.1% AEP plus 70% climate change maximum extent

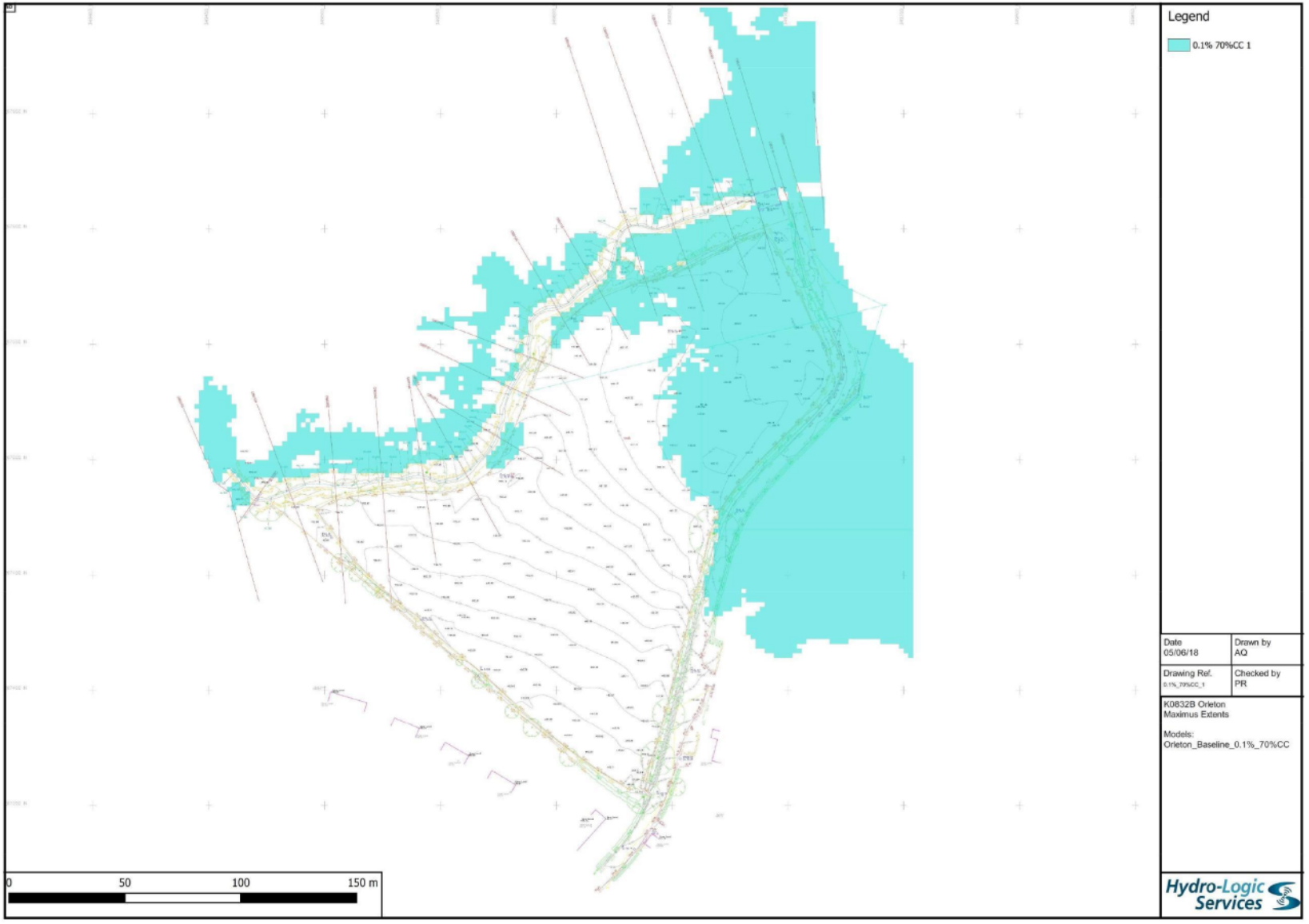


Figure 10 1.0% AEP plus 35% climate change maximum extent sensitivity test (n-20%)

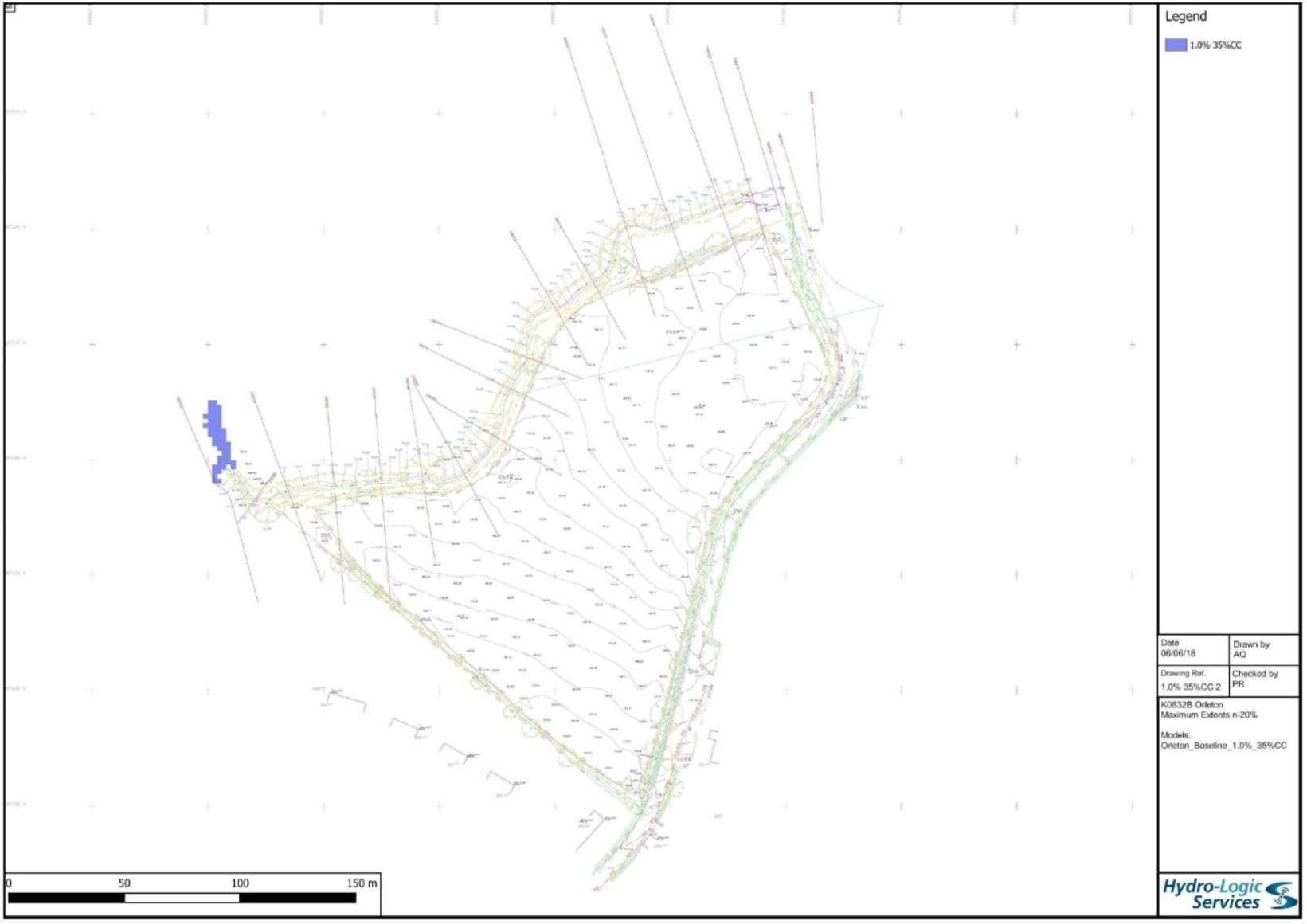


Figure 11 1.0% AEP plus 35% climate change maximum extent sensitivity test (n+20%)

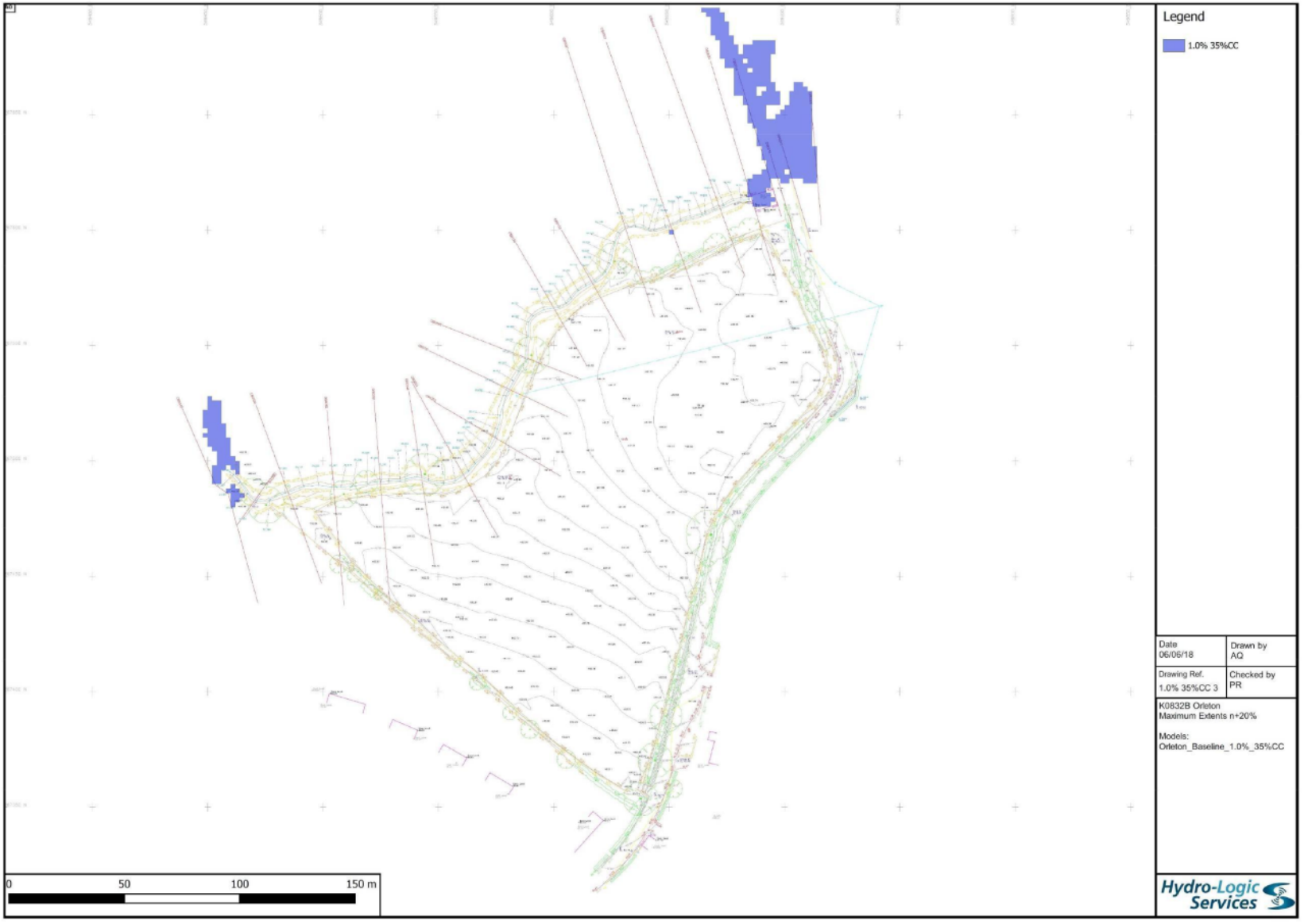


Figure 12 1.0% AEP plus 35% climate change maximum extent sensitivity test (NCDBDY-20%)

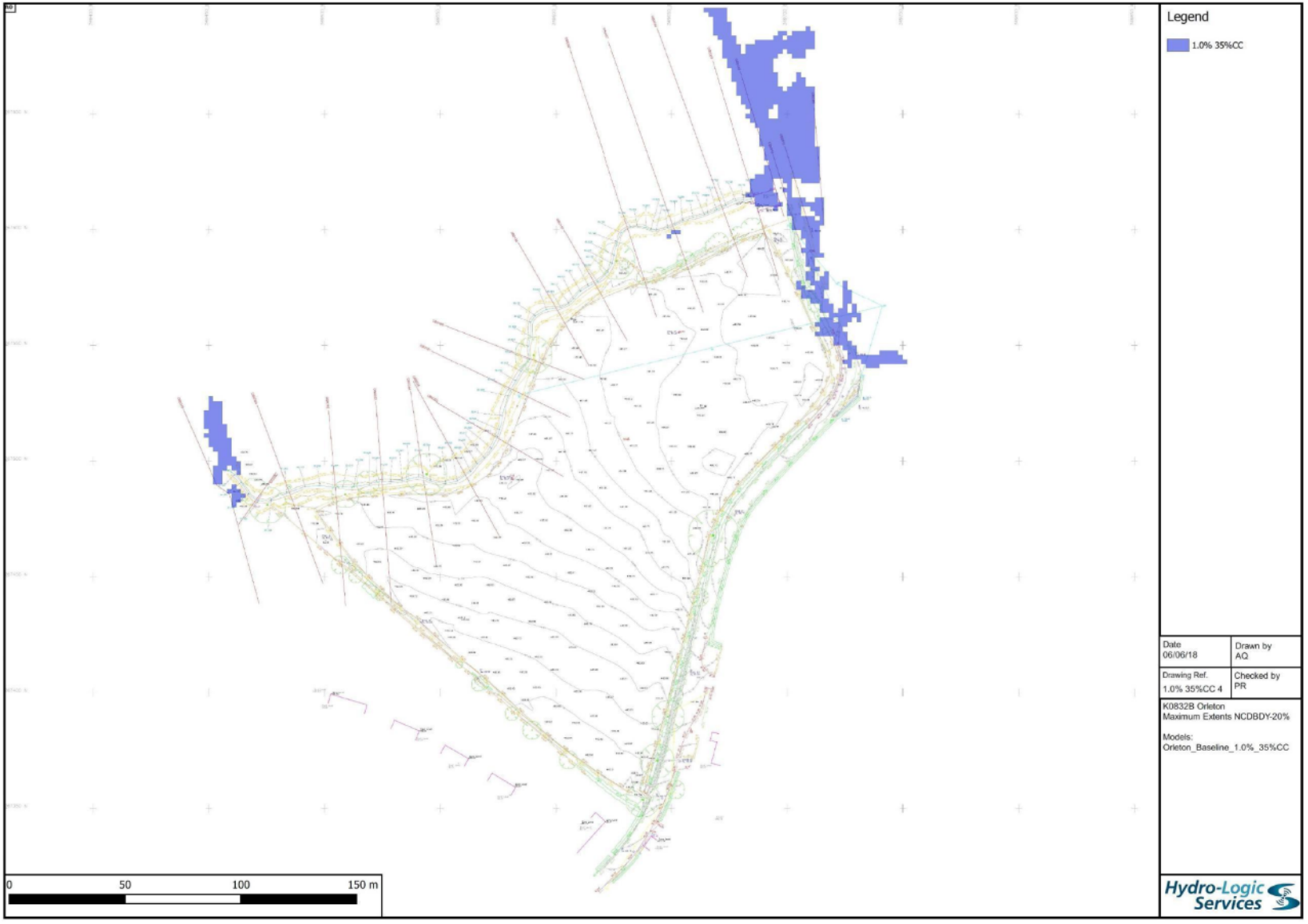
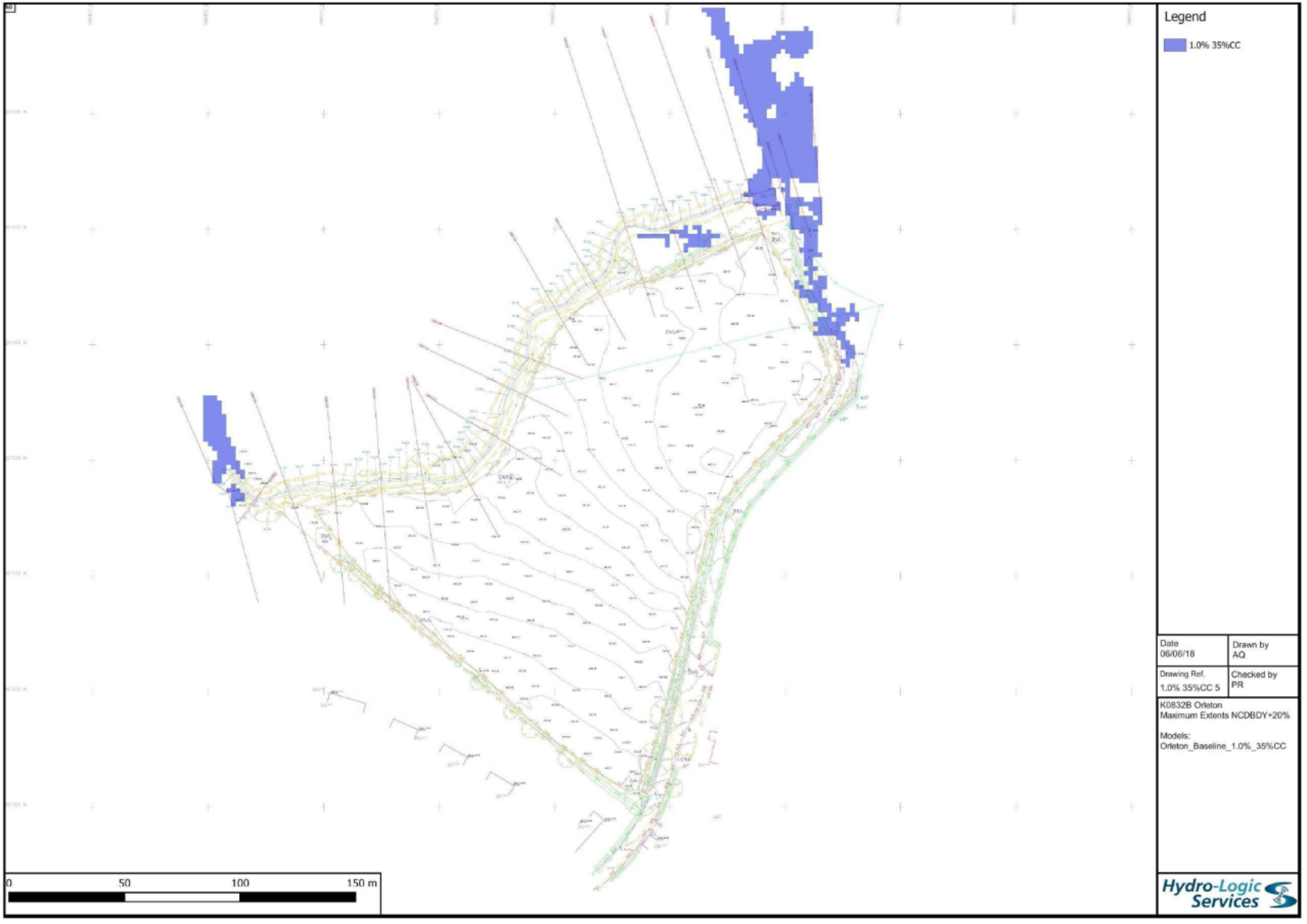


Figure 13 1.0% AEP plus 35% climate change maximum extent sensitivity test (NCDBDY+20%)



9. Model and Associated Data Provision

All model and simulation output data files can be provided for inspection and analysis. These comprise:

- All model related files, including all *Flood Modeller* 1D model data files, initial conditions files, event (flow simulation) files, event data (time-dependent) files, and results files; and all *TUFLOW* 2D control (text) files, model files as QGIS (.shp) layers, boundary conditions files, check files, and results files.
- The supporting QGIS project, map templates, style files, and illustrative files (aerial photos and maps as .jpg files).
- Simulation output images as .pdf and .jpg files.
- WINFEH4 datasets and analysis spreadsheet, spreadsheet showing development of flow-time hydrographs.

The folder structure used during the modelling project follows the standard structure for 1D-2D model development. The zipped project folder will be provided as an encrypted CD or DVD.

Appendix F – Extract from Soakaway Test Report

Ruddlesden geotechnical

Soakaway Test Report

Land off Kings Road, Orleton, Ludlow

Floreat Homes

November 2017

JM/JW/SR/17217/STR

REPORT CONTROL SHEET

Site Address	Land off Kings Road, Orleton, Ludlow
Client	Floreat Homes
Report Title	Soakaway Test Report
Issue Date	15 November 2017
Report No.	JM/JW/SR/17217/STR
Issue No.	1

Prepared by	James Myles
Signature	[redacted]
Position	Engineering Geologist
Qualifications	BSc (Hons). FGS.

Checked by	James Walker
Signature	[redacted]
Position	Senior Engineering Geologist
Qualifications	BSc (Hons). MSc. FGS.

Approved by	Simon Ruddlesden
Signature	[redacted]
Position	Director
Qualifications	BSc (Hons). MSc. DIC. CGeol. FGS. EurGeol.

Ruddlesden geotechnical
The Stables, 65 Langaton Lane,
Pinhoe, Exeter, EX1 3SP

01392 678082
mail@ruddlesden.co.uk
www.ruddlesden.co.uk

CONTENTS

APPENDICES

1 INTRODUCTION

1.1 General

In July 2017, a soakaway test investigation was undertaken by Ruddlesden geotechnical ltd on behalf of Floreat Homes at land off Kings Road, Orleton, Ludlow.

The investigation was undertaken to determine the permeability of the ground, to assess the suitability of the ground for soakaway drainage and to provide a soil infiltration rate for design. The investigation comprised the formation of four soakaway tests in accordance with BRE DG 365.

1.2 Development Proposals

It is understood that the southern area of the site is to be developed for residential purposes with the construction of thirty-nine houses with private gardens, access roads and associated infrastructure. The northern portion of the site is understood to include a car park and nature area for the nearby school, as well as allotments to the far north.

The proposed layout is presented in Appendix D of this report.

1.3 Scope of Investigation

The investigation covers aspects relating to soakaway drainage design. The brief was understood to comprise the following:

- Undertake in-situ soakaway testing in accordance with BRE DG 365.
- Use data to provide soil infiltration rates.
- Provide any other relevant comments relating to soakaway drainage design.

1.4 Scope of Report

The report is presented as a description of the procedures employed and the data obtained. This is followed by a description of the ground conditions and soakaway test results. The final part of the report comprises a discussion of results together with recommendations for soakaway design.

2 THE SITE

2.1 Site Location

The site is located at land off Kings Road, Orleton, Ludlow. The British National Grid Reference of the site is 349621, 267484, and the nearest postcode is SY8 4HQ.

The site is located within a mixed residential/ rural area, approximately 400m to the northeast of Orleton village centre and approximately 7km southwest of the town of Ludlow. The surrounding topography is relatively flat with gentle sloping ground to the northeast.

Access to the site is gained by a gateway off Kings Road, in the southern corner of the site.

2.2 Site Description

The site is irregular in shape, measuring approximately 225m x 160m (2.77 hectares), and slopes gently down to the northeast, falling from a level of approximately 86mAOD in the south of the site to a level of approximately 83mAOD in the northeast of the site.

The site comprises a previously cultivated undeveloped field containing overgrown vegetation, including weeds, thistles and maize shoots.

A narrow stream, approximately 1m wide and 1m below existing site levels, is present outside of the northwestern site boundary.

A pumping station is located off-site to the northeast.

Overhead power lines are present, broadly traversing northeast/ southwest, in the north of the site.

The site is bounded on all sides by a combination of hedgerows and mixed small to large (mainly deciduous) trees.

Land use surrounding the site includes residential housing and a primary school to the south, and agricultural fields to the north, west and east.

Photographs of the site are presented in Appendix B of this report, with additional photographs presented in Appendix A of the Phase 1: Preliminary Geotechnical and Contamination Assessment Report for the site (Ref: JM/JW/SR/17217/PGCAR, dated November 2017).

2.3 Site Geology

The British Geological Survey (BGS) map of the area indicates the site to be underlain by Quaternary Alluvium, underlain by the Silurian Raglan Mudstone Formation.

The Alluvium is described as 'normally soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel'.

The Raglan Mudstone Formation is described as 'red mudstones and silty mudstones with calcretes and sandstones'.

No published historical BGS borehole records are mapped within 250m of the site.

3 FIELDWORK

All fieldwork was undertaken on 17 July 2017.

Four soakaway tests were undertaken in accordance with BRE DG 365: Soakaway Design. The siting and setting out of the soakaway tests was determined by Ruddlesden geotechnical ltd.

Unless stated otherwise, the exploratory holes were located on-site using tape measurement and co-ordinates provided on logs were obtained using a hand-held GPS, typically accurate to 4m.

The trial pit was excavated to a depth deemed sufficient to represent a section of the design soakaway. The vertical sides were trimmed square. A 1500-gallon water bowser was used to supply the large volumes of water required at a quick rate.

The pit was filled with water and allowed to drain. The fall in water level was recorded with time.

Trial pit logs and photographs, showing the ground conditions encountered, are presented in Appendix A and Appendix B; the soakaway testing results with soil infiltration rate calculations are presented in Appendix C; and a plan showing the soakaway test locations is presented in Appendix D.

4 RESULTS OF THE INVESTIGATION

4.1 General

The following sections provide a summary of ground conditions encountered and soakaway testing results. Further details are provided in the appendices of this report.

4.2 Ground Conditions Encountered

4.2.1 Topsoil

Brown slightly gravelly clayey silt with fine rootlets was typically encountered to depths of between 0.20m and 0.40m below existing ground levels.

4.2.2 Natural Geology

Alluvium

Beneath the topsoil, typically firm to stiff reddish (yellow) brown slightly gravelly (slightly silty) clay/ silt was encountered to depths of between 1.00m and 2.45m.

At the location of SA03, (loose to medium dense) grey brown slightly silty slightly sandy clayey gravel was encountered to a depth of 2.10m.

Raglan Mudstone Formation

At the locations SA01 and SA04 only, (medium dense) reddish brown grey slightly sandy slightly clayey silty gravel was encountered to the base of the excavations, to depths of between 2.45m and 2.60m.

4.3 Groundwater

Groundwater was encountered at the following depths during the course of the investigation:

Table 1: Occurrence of Groundwater

TP No.	Water Level (mBGL)	Rate of Inflow
SA03	2.30	Moderate seepage

4.4 Soakaway Test Results

Full details of the soakaway testing results are provided in Appendix C of this report and are summarised in the table below:

Table 2: Summary of Soakaway Test Results

Test No.	Total Recorded Fall of Water Level (m)	Duration of Test (minutes)	Soil Infiltration Rate (m/s)
SA01	1.25	276	1.83×10^{-5} *1
SA02	0.16	221	n/a*2
SA03	0.01	170	n/a*2
SA04	1.13	105	3.80×10^{-5} *1

*1 Only one full trial completed – not in strict accordance with BRE DG 365.
*2 Test failed to reach 25% of the effective depth. No soil infiltration rate calculation possible.

5 DISCUSSION OF RESULTS AND RECOMMENDATIONS

It is understood that the southern area of the site is to be developed for residential purposes with the construction of thirty-nine houses with private gardens, access roads and associated infrastructure. The northern portion of the site is understood to include a car park and nature area for the nearby school, as well as allotments to the far north.

The proposed layout is presented in Appendix D of this report.

Water level falls of between 0.01m and 1.25m were recorded over the course of the day. Tests undertaken at locations SA02 and SA03 failed to reach 25% of the effective depth.

One full trial was carried out at the locations SA01 and SA04, producing soil infiltration rates of 1.83 x 10^{-5}m/s and 3.80 x 10^{-5}m/s, respectively, indicating that the ground may be suitably permeable for the use of soakaways as a means of surface water drainage at these locations and depths.

The soakaway tests were unable to be carried out three times at these locations, due to the relatively slow rates of infiltration recorded and time constraints. As these tests were not carried out three times, the soil infiltration rates obtained at these locations should not be used for detailed design. However, a rate of 1 x 10^{-5}m/s may be assumed for preliminary design purposes at these locations and depths.

The range of permeability values recorded are generally considered to be due to the variable geology on-site. The northern portion of the site uncovered deeper superficial deposits at depth (Alluvium), whilst the southern area of the site uncovered weathered bedrock (Raglan Mudstone Formation), which comprised predominantly granular soils of relatively higher permeability.

Given the variability of the soakaway test results, should the locations and/ or depths of any proposed soakaway drains significantly differ from those tested, additional soakaway testing should be undertaken to confirm the permeability of the ground.

All soakaways should be designed in accordance with the recommendations provided in BRE DG 365: Soakaway Design.

Ultimately, off-site discharge, possibly combined with on-site attenuation, may prove to be the most suitable drainage solution at this site.

The preferable drainage solution at this site would appear to be to discharge into the sewer or suitable outfall. If necessary, an underground storage tank with a throttled outflow valve may be able to be installed to allow water to be discharged at an agreed rate so that during storm periods discharge is not increased from the present situation.

BRE DG 365 states that when considering soakaways as a means of surface water drainage due consideration must be given to the ground conditions, i.e. for the potential of collapse due to wash-out of fines or slope instability, the seasonal high groundwater table and the potential for the soakaway to act as a preferential pathway for migrating contaminants.

No contamination testing or assessment has been undertaken as part of this investigation. However, a Phase 1 Preliminary Geotechnical and Contamination Assessment Report (ref: JM/JW/SR/17217/PGCAR, dated November 2017) has been undertaken at the site. In summary, the site has remained undeveloped;

therefore, no significant elevated levels of contamination would be expected on-site. It is therefore considered soakaway drainage will not likely cause any mobilisation of contaminants.

Assuming that the proposed site levels are to largely remain as existing, it is unlikely that the use of soakaways would lead to any significant slope instability.

Groundwater was encountered at the location of SA03, at a depth of 2.30m below existing ground levels. From an assessment of the site's geomorphological setting, it is considered that the seasonal high groundwater table may be above the base of any proposed soakaways (assuming that the base of any soakaway will be 2.50m below existing ground levels). If soakaway drainage is to be considered further, it is recommended that groundwater monitoring be undertaken to confirm the depth of the seasonal high groundwater table and hence whether there is sufficient freeboard for the use of soakaways as a means of surface water drainage. Monitoring should include worst-case conditions, i.e. January to May.

6 REFERENCES

- Building Research Establishment (2016): DG 365: Soakaway Design.

7 TERMS AND CONDITIONS

1. This report has been prepared for the sole use of the specified client in response to an agreed brief and for the stated purpose. The recommendations used in this report should not be used for any other schemes on or adjacent to this site without further reference to this company.

2. The copyright of this report is owned by Ruddlesden geotechnical ltd. With the exception of the named client, who may copy and distribute the report to deal with matters directly relating to its commission, this report may not be reproduced, published or adapted without written consent of the company.

3. New information, improved practices and legislation may necessitate an alteration to the report in whole or in part after its submission. Therefore, with any change in circumstances, this report should be referred to Ruddlesden geotechnical ltd for reassessment and, if necessary, reappraisal.

4. The comments given in this report assume that ground conditions do not vary beyond the range revealed by the investigation. There may, however, be conditions at or adjacent to the site that have not been disclosed by the investigation and which, therefore, have not been considered in this report. Accordingly, a careful watch should be maintained during any future groundworks and the recommendations of this report reviewed as necessary.

5. Whilst confident in the findings of the report, the recommendations may not necessarily be accepted by other authorities without question. It is advisable that, where appropriate, the report be submitted to the relevant statutory authorities and approval obtained before detailed design, site works or other irrevocable action is undertaken.

6. All comments and recommendations are based on groundwater conditions encountered at the time of investigation. It should be noted that groundwater levels might fluctuate according to the season and from year to year. This may have implications on other recommendations, including foundations and excavations.

7. All third party data referred to in the report, e.g. environmental searches and laboratory testing, has been obtained in good faith from bona fide sources. Ruddlesden geotechnical ltd cannot be held liable for any incorrect information supplied to us.

Appendix G – Greenfield Runoff Rates

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 800 Urban 0.000
Area (ha) 1.000 Soil 0.300 Region Number Region 4

Results l/s

QBAR Rural 2.1
QBAR Urban 2.1

Q100 years 5.5

Q1 year 1.8
Q30 years 4.2
Q100 years 5.5

Appendix H – Conceptual Drainage Strategy

MATERIALS FOR ADOPTABLE SEWERS

PIPES ≤ 150mm - 300mm DIA >

SURFACE AND FOUL WATER PIPES ARE TO BE EXTRA STRENGTH VITRIFIED CLAY WITH FLEXIBLE MECHANICAL JOINTS. PIPES MUST COMPLY WITH THE RELEVANT REQUIREMENTS OF BS EN 295-1:2013 AND BS 65:1991 (surface water pipes only).

PIPES > 300mm >

DIA SURFACE AND FOUL WATER PIPES ARE TO BE HIGH STRENGTH CONCRETE. CONCRETE PIPES AND FITTINGS WITH FLEXIBLE JOINTS SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS 5911-1:2002.

POLISHED STONE VALUES, AGGREGATE SIZES, AGGREGATE ABRASION VALUES AND PENETRATION VALUES OF ALL SURFACE COURSE MATERIALS MUST BE CHECKED WITH HIGHWAY AUTHORITY AND COMPLY WITH ALL CODES OF PRACTICE PRIOR TO ORDERING AND LAYING OF MATERIALS

FOUNDATIONS FOR PLOTS ADJACENT TO ADOPTABLE SEWERS LESS THAN 5m AWAY FROM PLOT WALL TO BE LOWER THAN THE INVERT LEVELS OF SEWER TO PREVENT ANY LOADING FORCES ON THE PIPEWORK

SURFACE WATER MANHOLE S11 IS TO BE FITTED WITH A HYDROBRAKE. FOR DETAILS REFER TO DRAWING NO AAC5672_RPS_XX_XX_DR_C_1004

LEVEL OF EXISTING ROAD AT POINT OF TIE IN WITH PROPOSED SITE ROAD MUST BE CHECKED BEFORE COMMENCEMENT OF WORKS AND ANY DISCREPANCIES REPORTED IMMEDIATELY.

A SCREEN AND SUMP IS TO BE FITTED OVER THE OUTGOING PIPE TO THE LAST NEW SURFACE AND FOUL MANHOLES BEFORE ENTERING THE EXISTING SEWERS IN ACCORDANCE WITH SEWERS FOR ADOPTION & THE SCREEN SHALL ONLY BE REMOVED ONCE ON SITE CONSTRUCTION WORKS HAVE BEEN COMPLETED

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT DESIGN DRAWINGS AND OTHER INFORMATION

ALL EXISTING SEWER LEVELS AND LOCATIONS TO BE CHECKED AND VERIFIED PRIOR TO ANY CONSTRUCTION WORKS AND ANY DISCREPANCIES REPORTED IMMEDIATELY.

MANHOLE RINGS SHALL NOT BE CUT

SURFACE WATER SEWER NETWORK DESIGNED IN ACCORDANCE WITH ROADS IDENTIFIED ON ORIGINAL DRAINAGE AND LEVELS CONCEPT LAYOUT AND POSITIONS ARE SUBJECT TO CHANGE

HEADWALLS TO BE PRE-CAST CONCRETE. REFER TO ALTHON DRAWINGS FOR DETAILS

MINIMUM DIMENSIONS FOR MANHOLES

Type	Size of largest pipe (DN)	Min internal dimensions¹ Rectangular length and width	Circular diameter	Min clear opening size² Rectangular length and width	Circular diameter
Manhole ≤ 1.5m deep to soffit	≤ 150 225 300 > 300	1000 x 675 1200 x 675 1200 x 750 1800 x (DN+775)	1000 1200 1200 ³ Polygonal 1800 or (DN+775)	750 x 675 1200 x 675	na⁴
> 1.5m deep to soffit	≤ 225 300 375-450 > 450	1200 x 1000 1200 x 1075 1350 x 1225 1800 x (DN+775)	1200 1200 1200 ³ Polygonal 1800 or (DN+775)	600 x 600	600
Manhole shaft > 3.0m deep to soffit	Steps⁵	1050 x 800	1050	600 x 600	600
	Ladder⁵	1200 x 800	1200		
	Winch⁶	900 x 800	900	600 x 600	600

NOTES:

1) LARGER SIZES MAY BE REQUIRED FOR MANHOLES ON BENDS OR WHERE THERE ARE JUNCTIONS.

2) MAY BE REDUCED TO 675 BY 675 WHERE REQUIRED BY HIGHWAY LOADING CONSIDERATIONS, SUBJECT TO A SAFE SYSTEM OF WORK BEING SPECIFIED.

3) NOT APPLICABLE DUE TO WORKING SPACE NEEDED.

4) MINIMUM HEIGHT OF CHAMBER IN SHAFTED MANHOLE 2M FROM BENCHING TO UNDERSIDE OF REDUCING SLAB.

5) MIN CLEAR SPACE BETWEEN LADDERS OR STEPS AND THE OPPOSITE FACE OF THE SHAFT SHOULD BE APPROXIMATELY 900MM.

6) WINCH ONLY - NO STEPS OR LADDERS, PERMANENT OR REMOVABLE

7) THE MINIMUM SIZE OF ANY MANHOLE SERVING A SEWER (I.E. ANY DRAIN SERVING MORE THAN ONE PROPERTY) SHOULD BE 1200 MM X 675 MM RECTANGULAR OR 1200 MM DIAMETER

SEVERN TRENT WATER MANHOLE REQUIREMENTS FOR DESIGN AND CONSTRUCTION GUIDANCE

GENERAL REQUIREMENTS

COPIES OF DELIVERY NOTES FOR CONCRETE AND PIPE BEDDING WILL BE REQUIRED INTERMITTENTLY AS THE JOB PROGRESSES. ALL OTHER COMPONENT UNITS MUST BE KITE-MARKED.

CHANNELS AND BENCHING

ALL CHAMBERS WITH PIPE SIZES 150MM, 225MM, 300MM MUST HAVE SWEPT BENDS AND CHANNELS. ALL BENCHING TO BE A MINIMUM 40MM THICK GRANOLITHIC CONCRETE TROWELLED TO A SMOOTH FINISH.

IRONWORK IN MANHOLES

IF THE CHAMBER IS LESS THAN 3M DEEP WE REQUIRE DOUBLE ENCAPSULATED STEP RUNGS UNLESS OTHERWISE APPROVED. IF THE CHAMBER IS OVER 3M DEEP WE REQUIRE MOTORWAY GALVANISED MILD STEEL LADDERS. THERE MUST BE 300MM BETWEEN LADDER AND BACK OF SHAFT. DEPTH IS MEASURED FROM FINISHED COVER LEVEL TO THE TOP OF THE BENCHING. THE MAXIMUM DISTANCE BETWEEN COVER LEVEL AND THE FIRST STEP MUST BE 675MM.

BRICKWORK

MIN 2 MAX 4 COURSES UNDER FRAME AND MUST BE SOLID CLASS B ENGINEERING BRICKS OR CONCRETE SPACING RINGS NEATLY POINTED UP. ENGLISH BOND TO BE USED ON ALL BRICKWORK. SULPHATE RESISTING CEMENT MUST BE USED IN ALL LOCATIONS.

COVER AND FRAMES

COVER SLAB OPENING, COVER AND FRAMES MUST BE 675 X 675 UNLESS OTHERWISE APPROVED. D400 SHALL BE USED AT ALL LOCATIONS. ON SPINE ROADS MUST BE 150MM DEEP. ON RESIDENTIAL CUL-DE-SACS 100MM MAY BE USED SUBJECT TO APPROVAL. FRAMES FOR MANHOLE COVERS SHOULD BE BEDDED IN A POLYESTER RESIN BEDDING MORTAR IN ALL SITUATIONS WHERE COVERS ARE SITED IN HIGHWAY ROAD CATEGORIES I, II OR III.

'INFILL' TYPE COVERS SHOULD NOT BE USED.

IN BLOCK PAVED AREAS 150MM DEEP FRAMES MUST BE USED IN ACCORDANCE WITH DESIGN AND CONSTRUCTION GUIDANCE P2.2

LATERALS

THEY SHOULD BE LAID TO THE SAME STANDARD AS PUBLIC SEWERS. THEY SHOULD HAVE NO CHANGES OF LINE OR GRADIENT BETWEEN THE SEWER AND THE DEMARCATION CHAMBER. THEY SHOULD HAVE AN ADOPTABLE MANHOLE AS THE DEMARCATION CHAMBER UNLESS THERE IS ONLY ON PROPERTY WHEN A PLASTIC CHAMBER TO BS EN 13598-2:2009 IS ALLOWED. LOCKABLE B125 AND A15 COVERS MAY BE ALLOWED IN CERTAIN LOCATIONS SUBJECT TO APPROVAL. THE DEMARCATION SHOULD BE INSIDE THE BOUNDARY OF THE PROPERTY, NO MORE THAN 1M INSIDE THE BOUNDARY, PREFERABLY IN THE DRIVEWAY AND NOT IN THE WHEEL TRACKS OF VEHICLES.

S106 APPLICATION.

A SECTION 106 APPLICATION TO SEVERN TRENT WATER MUST BE COMPLETED FOR THE REUSE OF ANY EXISTING CONNECTION INTO THE EXISTING PUBLIC SEWERAGE SYSTEM OR THE CONSTRUCTION OF A NEW CONNECTION.

AN APPLICATION WILL BE REQUIRED FOR THE FOUL AND SURFACE WATER DRAINAGE ARRANGEMENTS AND THIS SHOULD BE COMPLETED BY THE CONTRACTOR.

ALL SEWERS ARE TO COMPLY WITH THE DESIGN AND CONSTRUCTION GUIDE AND SEVERN TRENT WATER REQUIREMENTS

ANY POND BED LINING OR BANK STABILISATION METHODS REQUIRED FOR BALANCING POND TO BE ASSESSED BY STRUCTURAL ENGINEER

IMPORTANT: HEADWALLS WILL REQUIRE THE ENVIRONMENT AGENCY'S PRIOR WRITTEN CONSENT UNDER SECTION 109 OF THE WATER RESOURCES ACT 1991 BEFORE ANY CONSTRUCTION TAKES PLACE

WHERE PIPE CROSSING, PLASTIC MEMBRANE TO BE USED FOR PROTECTION TO ELIMINATE CHANCES OF CROSS CONTAMINATION

PIPES OF DIFFERENT DIAMETERS ENTERING MANHOLES SHOULD BE INSTALLED WITH SOFFITS AT THE SAME LEVEL

THE OUTSIDE OF THE SEWER SHOULD BE IN VEHICLE CARRIAGEWAY (NOT FOOTPATH) AND BE AT LEAST 1m FROM KERB LINE. THE OUTSIDE MANHOLES SHOULD BE AT LEAST 0.5m FROM THE KERB LINE.

THE MATERIALS TO BE USED ARE SUITABLE FOR THE GROUND CONDITIONS

TREES ON THE DRAWING ARE EXISTING OR PROPOSED AND ADHERE TO B.2.1 (PAGE 24) OF SFA6. THE TREES SPECIFIED WILL BE AS PER SEWERS FOR ADOPTION AND POSITIONED. WHERE CLEARANCES WITH VEGETATION IS NOT ACHIEVABLE, APPROPRIATE ROOT PROTECTION WILL BE PROVIDED

PRELIMINARY
SUBJECT TO SECTION 38 & 104
APPROVAL

Notes

1. This drawing has been prepared in accordance with the scope of RPS's appointment with its client and is subject to the terms and conditions of that appointment. RPS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
2. It is considered correctly that the recipients responsibility to print to correct scale. Only written dimensions should be used.
3. This drawing should be read in conjunction with all other relevant drawings and specifications.

For guidance only. Do not scale off this drawing

PUBLIC DRAINAGE

FOUL WATER
MANHOLE ●
PIPE LINE ━
DIRECTION ARROW ◁
RISING MAIN ━
DEMARCATION CHAMBER* Ⓓ

SURFACE WATER
MANHOLE ○
PIPE LINE ━
DIRECTION ARROW ◁
DEMARCATION CHAMBER* Ⓓ

HIGHWAY DRAINAGE
MANHOLE Ⓗ
GULLY
HIGHWAY DRAIN / GULLY CONNECTION ─

OTHER
EXISTING SEWERS TO BE ABANDONED GRUBBED UP IN ACCORDANCE WITH SEVERN TRENT WATER SPECIFICATION ━✕━✕━✕━

* DEMARCATION CHAMBERS TO BE CONSTRUCTED AS PER ADOPTABLE MANHOLE CONSTRUCTION DETAILS DEPENDING ON CHAMBER DEPTH. A 450 INSPECTION CHAMBER CAN BE USED PROVIDING LATERAL ONLY SERVES ONE PLOT.

Rev	Description	By	Chd	Date
P03	Drawing updated following comments from STW on S104.	FQ	ma	23.04.21
P02	Updated to match external levels layout plot 17-18 lowered	ma	AG	11.12.20
P01	First Issue	ma	AG	08.12.20

MAKING COMPLEX EASY

321 Bradford Street, Birmingham,
West Midlands B5 6ET
T +44 121 622 2520 E rpsbirmingham@rpsgroup.com

Client
SHROPSHIRE HOMES
Quality & Character

Project
Kings Road
Orleton

Title
Engineering Layout

Status	Scale @ A1	Date Created
Preliminary	1:500	02.12.2020
Task Team Manager	Information Author	Task Information Manager
AG	ma	x

Document Number
AAC5672-RPS-xx-xx-DR-C-100-01
Project Code - Originator - Zone - Level - Type - Role - Drawing Number

RPS Project Number	Suitability	Revision
AAC5672	S4	P03

rpsgroup.com

P:\Engineering\AAC5672 - Kings Road Orleton\CAD\00 Mod\AAC5672_RPS_XX_XX_DR_C_10001 Engineering Layout.dwg

Appendix I – MicroDrainage Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.386	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Surface Network 1

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.240	4-8	0.483	8-12	0.077

Total Area Contributing (ha) = 0.799

Total Pipe Volume (m³) = 48.345

Network Design Table for Surface Network 1

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	55.637	0.145	383.7	0.269	5.00	0.0	0.600	o	450	Pipe/Conduit	
1.001	15.660	0.041	381.9	0.021	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.002	29.231	0.076	384.6	0.117	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.003	25.826	0.067	385.5	0.032	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.004	42.991	0.147	292.5	0.130	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.005	6.446	0.013	495.8	0.102	0.00	0.0	0.600	o	525	Pipe/Conduit	
1.006	43.182	0.090	479.8	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
1.007	19.444	0.041	474.2	0.128	0.00	0.0	0.600	o	525	Pipe/Conduit	
1.008	21.656	0.039	555.3	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.90	81.084	0.269	0.0	0.0	0.0	1.03	164.1	36.4
1.001	50.00	6.15	80.939	0.290	0.0	0.0	0.0	1.03	164.5	39.3
1.002	50.00	6.62	80.898	0.407	0.0	0.0	0.0	1.03	163.9	55.1
1.003	50.00	7.04	80.822	0.439	0.0	0.0	0.0	1.03	163.7	59.4
1.004	50.00	7.65	80.755	0.569	0.0	0.0	0.0	1.18	188.3	77.0
1.005	50.00	7.75	80.533	0.671	0.0	0.0	0.0	1.00	216.3	90.9
1.006	50.00	8.46	80.520	0.671	0.0	0.0	0.0	1.02	219.9	90.9
1.007	50.00	8.78	80.430	0.799	0.0	0.0	0.0	1.02	221.2	108.2
1.008	49.25	9.16	80.389	0.799	0.0	0.0	0.0	0.94	204.2	108.2

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.009	4.529	0.009	503.2	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
1.010	11.189	0.046	243.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.009	49.04	9.24	80.350	0.799	0.0	0.0	0.0	0.99	214.7	108.2
1.010	48.53	9.42	80.341	0.799	0.0	0.0	0.0	1.00	70.9«	108.2

Manhole Schedules for Surface Network 1

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	82.931	1.847	Open Manhole	1800	1.000	81.084	450				
S2	83.290	2.351	Open Manhole	1350	1.001	80.939	450	1.000	80.939	450	
S3	83.113	2.215	Open Manhole	1350	1.002	80.898	450	1.001	80.898	450	
S4	82.831	2.009	Open Manhole	1350	1.003	80.822	450	1.002	80.822	450	
S5	82.558	1.803	Open Manhole	1350	1.004	80.755	450	1.003	80.755	450	
S6	82.415	1.882	Open Manhole	1350	1.005	80.533	525	1.004	80.608	450	
S7	82.402	1.882	Open Manhole	1350	1.006	80.520	525	1.005	80.520	525	
S8	82.283	1.853	Open Manhole	1350	1.007	80.430	525	1.006	80.430	525	
S9	81.614	1.225	Open Manhole	1500	1.008	80.389	525	1.007	80.389	525	
S10	81.575	1.225	Open Manhole	1500	1.009	80.350	525	1.008	80.350	525	
S11	82.146	1.805	Open Manhole	3000	1.010	80.341	300	1.009	80.341	525	
S12	81.045	0.750	Open Manhole	0		OUTFALL		1.010	80.295	300	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	349573.590	267450.297	349573.590	267450.297	Required	
S2	349611.130	267409.233	349611.130	267409.233	Required	
S3	349626.492	267412.274	349626.492	267412.274	Required	
S4	349630.456	267441.235	349630.456	267441.235	Required	
S5	349635.392	267466.584	349635.392	267466.584	Required	
S6	349661.278	267500.909	349661.278	267500.909	Required	
S7	349661.196	267507.355	349661.196	267507.355	Required	
S8	349621.718	267524.852	349621.718	267524.852	Required	
S9	349613.519	267542.483	349613.519	267542.483	Required	
S10	349622.708	267562.092	349622.708	267562.092	Required	
S11	349620.550	267566.074	349620.550	267566.074	Required	

Manhole Schedules for Surface Network 1

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S12	349619.923	267577.246			No Entry	

PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	450	S1	82.931	81.084	1.397	Open Manhole	1800
1.001	o	450	S2	83.290	80.939	1.901	Open Manhole	1350
1.002	o	450	S3	83.113	80.898	1.765	Open Manhole	1350
1.003	o	450	S4	82.831	80.822	1.559	Open Manhole	1350
1.004	o	450	S5	82.558	80.755	1.353	Open Manhole	1350
1.005	o	525	S6	82.415	80.533	1.357	Open Manhole	1350
1.006	o	525	S7	82.402	80.520	1.357	Open Manhole	1350
1.007	o	525	S8	82.283	80.430	1.328	Open Manhole	1350
1.008	o	525	S9	81.614	80.389	0.700	Open Manhole	1500
1.009	o	525	S10	81.575	80.350	0.700	Open Manhole	1500
1.010	o	300	S11	82.146	80.341	1.505	Open Manhole	3000

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	55.637	383.7	S2	83.290	80.939	1.901	Open Manhole	1350
1.001	15.660	381.9	S3	83.113	80.898	1.765	Open Manhole	1350
1.002	29.231	384.6	S4	82.831	80.822	1.559	Open Manhole	1350
1.003	25.826	385.5	S5	82.558	80.755	1.353	Open Manhole	1350
1.004	42.991	292.5	S6	82.415	80.608	1.357	Open Manhole	1350
1.005	6.446	495.8	S7	82.402	80.520	1.357	Open Manhole	1350
1.006	43.182	479.8	S8	82.283	80.430	1.328	Open Manhole	1350
1.007	19.444	474.2	S9	81.614	80.389	0.700	Open Manhole	1500
1.008	21.656	555.3	S10	81.575	80.350	0.700	Open Manhole	1500
1.009	4.529	503.2	S11	82.146	80.341	1.280	Open Manhole	3000
1.010	11.189	243.2	S12	81.045	80.295	0.450	Open Manhole	0

Surcharged Outfall Details for Surface Network 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.010	S12	81.045	80.295	0.000	0	0

Datum (m) 0.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1	81.446	12	81.446	23	81.446	34	81.446	45	81.446	56	81.446	67	81.446
2	81.446	13	81.446	24	81.446	35	81.446	46	81.446	57	81.446	68	81.446
3	81.446	14	81.446	25	81.446	36	81.446	47	81.446	58	81.446	69	81.446
4	81.446	15	81.446	26	81.446	37	81.446	48	81.446	59	81.446	70	81.446
5	81.446	16	81.446	27	81.446	38	81.446	49	81.446	60	81.446	71	81.446
6	81.446	17	81.446	28	81.446	39	81.446	50	81.446	61	81.446	72	81.446
7	81.446	18	81.446	29	81.446	40	81.446	51	81.446	62	81.446	73	81.446
8	81.446	19	81.446	30	81.446	41	81.446	52	81.446	63	81.446	74	81.446
9	81.446	20	81.446	31	81.446	42	81.446	53	81.446	64	81.446	75	81.446
10	81.446	21	81.446	32	81.446	43	81.446	54	81.446	65	81.446	76	81.446
11	81.446	22	81.446	33	81.446	44	81.446	55	81.446	66	81.446	77	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
78	81.446	135	81.446	192	81.446	249	81.446	306	81.446	363	81.446	420	81.446
79	81.446	136	81.446	193	81.446	250	81.446	307	81.446	364	81.446	421	81.446
80	81.446	137	81.446	194	81.446	251	81.446	308	81.446	365	81.446	422	81.446
81	81.446	138	81.446	195	81.446	252	81.446	309	81.446	366	81.446	423	81.446
82	81.446	139	81.446	196	81.446	253	81.446	310	81.446	367	81.446	424	81.446
83	81.446	140	81.446	197	81.446	254	81.446	311	81.446	368	81.446	425	81.446
84	81.446	141	81.446	198	81.446	255	81.446	312	81.446	369	81.446	426	81.446
85	81.446	142	81.446	199	81.446	256	81.446	313	81.446	370	81.446	427	81.446
86	81.446	143	81.446	200	81.446	257	81.446	314	81.446	371	81.446	428	81.446
87	81.446	144	81.446	201	81.446	258	81.446	315	81.446	372	81.446	429	81.446
88	81.446	145	81.446	202	81.446	259	81.446	316	81.446	373	81.446	430	81.446
89	81.446	146	81.446	203	81.446	260	81.446	317	81.446	374	81.446	431	81.446
90	81.446	147	81.446	204	81.446	261	81.446	318	81.446	375	81.446	432	81.446
91	81.446	148	81.446	205	81.446	262	81.446	319	81.446	376	81.446	433	81.446
92	81.446	149	81.446	206	81.446	263	81.446	320	81.446	377	81.446	434	81.446
93	81.446	150	81.446	207	81.446	264	81.446	321	81.446	378	81.446	435	81.446
94	81.446	151	81.446	208	81.446	265	81.446	322	81.446	379	81.446	436	81.446
95	81.446	152	81.446	209	81.446	266	81.446	323	81.446	380	81.446	437	81.446
96	81.446	153	81.446	210	81.446	267	81.446	324	81.446	381	81.446	438	81.446
97	81.446	154	81.446	211	81.446	268	81.446	325	81.446	382	81.446	439	81.446
98	81.446	155	81.446	212	81.446	269	81.446	326	81.446	383	81.446	440	81.446
99	81.446	156	81.446	213	81.446	270	81.446	327	81.446	384	81.446	441	81.446
100	81.446	157	81.446	214	81.446	271	81.446	328	81.446	385	81.446	442	81.446
101	81.446	158	81.446	215	81.446	272	81.446	329	81.446	386	81.446	443	81.446
102	81.446	159	81.446	216	81.446	273	81.446	330	81.446	387	81.446	444	81.446
103	81.446	160	81.446	217	81.446	274	81.446	331	81.446	388	81.446	445	81.446
104	81.446	161	81.446	218	81.446	275	81.446	332	81.446	389	81.446	446	81.446
105	81.446	162	81.446	219	81.446	276	81.446	333	81.446	390	81.446	447	81.446
106	81.446	163	81.446	220	81.446	277	81.446	334	81.446	391	81.446	448	81.446
107	81.446	164	81.446	221	81.446	278	81.446	335	81.446	392	81.446	449	81.446
108	81.446	165	81.446	222	81.446	279	81.446	336	81.446	393	81.446	450	81.446
109	81.446	166	81.446	223	81.446	280	81.446	337	81.446	394	81.446	451	81.446
110	81.446	167	81.446	224	81.446	281	81.446	338	81.446	395	81.446	452	81.446
111	81.446	168	81.446	225	81.446	282	81.446	339	81.446	396	81.446	453	81.446
112	81.446	169	81.446	226	81.446	283	81.446	340	81.446	397	81.446	454	81.446
113	81.446	170	81.446	227	81.446	284	81.446	341	81.446	398	81.446	455	81.446
114	81.446	171	81.446	228	81.446	285	81.446	342	81.446	399	81.446	456	81.446
115	81.446	172	81.446	229	81.446	286	81.446	343	81.446	400	81.446	457	81.446
116	81.446	173	81.446	230	81.446	287	81.446	344	81.446	401	81.446	458	81.446
117	81.446	174	81.446	231	81.446	288	81.446	345	81.446	402	81.446	459	81.446
118	81.446	175	81.446	232	81.446	289	81.446	346	81.446	403	81.446	460	81.446
119	81.446	176	81.446	233	81.446	290	81.446	347	81.446	404	81.446	461	81.446
120	81.446	177	81.446	234	81.446	291	81.446	348	81.446	405	81.446	462	81.446
121	81.446	178	81.446	235	81.446	292	81.446	349	81.446	406	81.446	463	81.446
122	81.446	179	81.446	236	81.446	293	81.446	350	81.446	407	81.446	464	81.446
123	81.446	180	81.446	237	81.446	294	81.446	351	81.446	408	81.446	465	81.446
124	81.446	181	81.446	238	81.446	295	81.446	352	81.446	409	81.446	466	81.446
125	81.446	182	81.446	239	81.446	296	81.446	353	81.446	410	81.446	467	81.446
126	81.446	183	81.446	240	81.446	297	81.446	354	81.446	411	81.446	468	81.446
127	81.446	184	81.446	241	81.446	298	81.446	355	81.446	412	81.446	469	81.446
128	81.446	185	81.446	242	81.446	299	81.446	356	81.446	413	81.446	470	81.446
129	81.446	186	81.446	243	81.446	300	81.446	357	81.446	414	81.446	471	81.446
130	81.446	187	81.446	244	81.446	301	81.446	358	81.446	415	81.446	472	81.446
131	81.446	188	81.446	245	81.446	302	81.446	359	81.446	416	81.446	473	81.446
132	81.446	189	81.446	246	81.446	303	81.446	360	81.446	417	81.446	474	81.446
133	81.446	190	81.446	247	81.446	304	81.446	361	81.446	418	81.446	475	81.446
134	81.446	191	81.446	248	81.446	305	81.446	362	81.446	419	81.446	476	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
477	81.446	534	81.446	591	81.446	648	81.446	705	81.446	762	81.446	819	81.446
478	81.446	535	81.446	592	81.446	649	81.446	706	81.446	763	81.446	820	81.446
479	81.446	536	81.446	593	81.446	650	81.446	707	81.446	764	81.446	821	81.446
480	81.446	537	81.446	594	81.446	651	81.446	708	81.446	765	81.446	822	81.446
481	81.446	538	81.446	595	81.446	652	81.446	709	81.446	766	81.446	823	81.446
482	81.446	539	81.446	596	81.446	653	81.446	710	81.446	767	81.446	824	81.446
483	81.446	540	81.446	597	81.446	654	81.446	711	81.446	768	81.446	825	81.446
484	81.446	541	81.446	598	81.446	655	81.446	712	81.446	769	81.446	826	81.446
485	81.446	542	81.446	599	81.446	656	81.446	713	81.446	770	81.446	827	81.446
486	81.446	543	81.446	600	81.446	657	81.446	714	81.446	771	81.446	828	81.446
487	81.446	544	81.446	601	81.446	658	81.446	715	81.446	772	81.446	829	81.446
488	81.446	545	81.446	602	81.446	659	81.446	716	81.446	773	81.446	830	81.446
489	81.446	546	81.446	603	81.446	660	81.446	717	81.446	774	81.446	831	81.446
490	81.446	547	81.446	604	81.446	661	81.446	718	81.446	775	81.446	832	81.446
491	81.446	548	81.446	605	81.446	662	81.446	719	81.446	776	81.446	833	81.446
492	81.446	549	81.446	606	81.446	663	81.446	720	81.446	777	81.446	834	81.446
493	81.446	550	81.446	607	81.446	664	81.446	721	81.446	778	81.446	835	81.446
494	81.446	551	81.446	608	81.446	665	81.446	722	81.446	779	81.446	836	81.446
495	81.446	552	81.446	609	81.446	666	81.446	723	81.446	780	81.446	837	81.446
496	81.446	553	81.446	610	81.446	667	81.446	724	81.446	781	81.446	838	81.446
497	81.446	554	81.446	611	81.446	668	81.446	725	81.446	782	81.446	839	81.446
498	81.446	555	81.446	612	81.446	669	81.446	726	81.446	783	81.446	840	81.446
499	81.446	556	81.446	613	81.446	670	81.446	727	81.446	784	81.446	841	81.446
500	81.446	557	81.446	614	81.446	671	81.446	728	81.446	785	81.446	842	81.446
501	81.446	558	81.446	615	81.446	672	81.446	729	81.446	786	81.446	843	81.446
502	81.446	559	81.446	616	81.446	673	81.446	730	81.446	787	81.446	844	81.446
503	81.446	560	81.446	617	81.446	674	81.446	731	81.446	788	81.446	845	81.446
504	81.446	561	81.446	618	81.446	675	81.446	732	81.446	789	81.446	846	81.446
505	81.446	562	81.446	619	81.446	676	81.446	733	81.446	790	81.446	847	81.446
506	81.446	563	81.446	620	81.446	677	81.446	734	81.446	791	81.446	848	81.446
507	81.446	564	81.446	621	81.446	678	81.446	735	81.446	792	81.446	849	81.446
508	81.446	565	81.446	622	81.446	679	81.446	736	81.446	793	81.446	850	81.446
509	81.446	566	81.446	623	81.446	680	81.446	737	81.446	794	81.446	851	81.446
510	81.446	567	81.446	624	81.446	681	81.446	738	81.446	795	81.446	852	81.446
511	81.446	568	81.446	625	81.446	682	81.446	739	81.446	796	81.446	853	81.446
512	81.446	569	81.446	626	81.446	683	81.446	740	81.446	797	81.446	854	81.446
513	81.446	570	81.446	627	81.446	684	81.446	741	81.446	798	81.446	855	81.446
514	81.446	571	81.446	628	81.446	685	81.446	742	81.446	799	81.446	856	81.446
515	81.446	572	81.446	629	81.446	686	81.446	743	81.446	800	81.446	857	81.446
516	81.446	573	81.446	630	81.446	687	81.446	744	81.446	801	81.446	858	81.446
517	81.446	574	81.446	631	81.446	688	81.446	745	81.446	802	81.446	859	81.446
518	81.446	575	81.446	632	81.446	689	81.446	746	81.446	803	81.446	860	81.446
519	81.446	576	81.446	633	81.446	690	81.446	747	81.446	804	81.446	861	81.446
520	81.446	577	81.446	634	81.446	691	81.446	748	81.446	805	81.446	862	81.446
521	81.446	578	81.446	635	81.446	692	81.446	749	81.446	806	81.446	863	81.446
522	81.446	579	81.446	636	81.446	693	81.446	750	81.446	807	81.446	864	81.446
523	81.446	580	81.446	637	81.446	694	81.446	751	81.446	808	81.446	865	81.446
524	81.446	581	81.446	638	81.446	695	81.446	752	81.446	809	81.446	866	81.446
525	81.446	582	81.446	639	81.446	696	81.446	753	81.446	810	81.446	867	81.446
526	81.446	583	81.446	640	81.446	697	81.446	754	81.446	811	81.446	868	81.446
527	81.446	584	81.446	641	81.446	698	81.446	755	81.446	812	81.446	869	81.446
528	81.446	585	81.446	642	81.446	699	81.446	756	81.446	813	81.446	870	81.446
529	81.446	586	81.446	643	81.446	700	81.446	757	81.446	814	81.446	871	81.446
530	81.446	587	81.446	644	81.446	701	81.446	758	81.446	815	81.446	872	81.446
531	81.446	588	81.446	645	81.446	702	81.446	759	81.446	816	81.446	873	81.446
532	81.446	589	81.446	646	81.446	703	81.446	760	81.446	817	81.446	874	81.446
533	81.446	590	81.446	647	81.446	704	81.446	761	81.446	818	81.446	875	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
876	81.446	933	81.446	990	81.446	1047	81.446	1104	81.446	1161	81.446	1218	81.446
877	81.446	934	81.446	991	81.446	1048	81.446	1105	81.446	1162	81.446	1219	81.446
878	81.446	935	81.446	992	81.446	1049	81.446	1106	81.446	1163	81.446	1220	81.446
879	81.446	936	81.446	993	81.446	1050	81.446	1107	81.446	1164	81.446	1221	81.446
880	81.446	937	81.446	994	81.446	1051	81.446	1108	81.446	1165	81.446	1222	81.446
881	81.446	938	81.446	995	81.446	1052	81.446	1109	81.446	1166	81.446	1223	81.446
882	81.446	939	81.446	996	81.446	1053	81.446	1110	81.446	1167	81.446	1224	81.446
883	81.446	940	81.446	997	81.446	1054	81.446	1111	81.446	1168	81.446	1225	81.446
884	81.446	941	81.446	998	81.446	1055	81.446	1112	81.446	1169	81.446	1226	81.446
885	81.446	942	81.446	999	81.446	1056	81.446	1113	81.446	1170	81.446	1227	81.446
886	81.446	943	81.446	1000	81.446	1057	81.446	1114	81.446	1171	81.446	1228	81.446
887	81.446	944	81.446	1001	81.446	1058	81.446	1115	81.446	1172	81.446	1229	81.446
888	81.446	945	81.446	1002	81.446	1059	81.446	1116	81.446	1173	81.446	1230	81.446
889	81.446	946	81.446	1003	81.446	1060	81.446	1117	81.446	1174	81.446	1231	81.446
890	81.446	947	81.446	1004	81.446	1061	81.446	1118	81.446	1175	81.446	1232	81.446
891	81.446	948	81.446	1005	81.446	1062	81.446	1119	81.446	1176	81.446	1233	81.446
892	81.446	949	81.446	1006	81.446	1063	81.446	1120	81.446	1177	81.446	1234	81.446
893	81.446	950	81.446	1007	81.446	1064	81.446	1121	81.446	1178	81.446	1235	81.446
894	81.446	951	81.446	1008	81.446	1065	81.446	1122	81.446	1179	81.446	1236	81.446
895	81.446	952	81.446	1009	81.446	1066	81.446	1123	81.446	1180	81.446	1237	81.446
896	81.446	953	81.446	1010	81.446	1067	81.446	1124	81.446	1181	81.446	1238	81.446
897	81.446	954	81.446	1011	81.446	1068	81.446	1125	81.446	1182	81.446	1239	81.446
898	81.446	955	81.446	1012	81.446	1069	81.446	1126	81.446	1183	81.446	1240	81.446
899	81.446	956	81.446	1013	81.446	1070	81.446	1127	81.446	1184	81.446	1241	81.446
900	81.446	957	81.446	1014	81.446	1071	81.446	1128	81.446	1185	81.446	1242	81.446
901	81.446	958	81.446	1015	81.446	1072	81.446	1129	81.446	1186	81.446	1243	81.446
902	81.446	959	81.446	1016	81.446	1073	81.446	1130	81.446	1187	81.446	1244	81.446
903	81.446	960	81.446	1017	81.446	1074	81.446	1131	81.446	1188	81.446	1245	81.446
904	81.446	961	81.446	1018	81.446	1075	81.446	1132	81.446	1189	81.446	1246	81.446
905	81.446	962	81.446	1019	81.446	1076	81.446	1133	81.446	1190	81.446	1247	81.446
906	81.446	963	81.446	1020	81.446	1077	81.446	1134	81.446	1191	81.446	1248	81.446
907	81.446	964	81.446	1021	81.446	1078	81.446	1135	81.446	1192	81.446	1249	81.446
908	81.446	965	81.446	1022	81.446	1079	81.446	1136	81.446	1193	81.446	1250	81.446
909	81.446	966	81.446	1023	81.446	1080	81.446	1137	81.446	1194	81.446	1251	81.446
910	81.446	967	81.446	1024	81.446	1081	81.446	1138	81.446	1195	81.446	1252	81.446
911	81.446	968	81.446	1025	81.446	1082	81.446	1139	81.446	1196	81.446	1253	81.446
912	81.446	969	81.446	1026	81.446	1083	81.446	1140	81.446	1197	81.446	1254	81.446
913	81.446	970	81.446	1027	81.446	1084	81.446	1141	81.446	1198	81.446	1255	81.446
914	81.446	971	81.446	1028	81.446	1085	81.446	1142	81.446	1199	81.446	1256	81.446
915	81.446	972	81.446	1029	81.446	1086	81.446	1143	81.446	1200	81.446	1257	81.446
916	81.446	973	81.446	1030	81.446	1087	81.446	1144	81.446	1201	81.446	1258	81.446
917	81.446	974	81.446	1031	81.446	1088	81.446	1145	81.446	1202	81.446	1259	81.446
918	81.446	975	81.446	1032	81.446	1089	81.446	1146	81.446	1203	81.446	1260	81.446
919	81.446	976	81.446	1033	81.446	1090	81.446	1147	81.446	1204	81.446	1261	81.446
920	81.446	977	81.446	1034	81.446	1091	81.446	1148	81.446	1205	81.446	1262	81.446
921	81.446	978	81.446	1035	81.446	1092	81.446	1149	81.446	1206	81.446	1263	81.446
922	81.446	979	81.446	1036	81.446	1093	81.446	1150	81.446	1207	81.446	1264	81.446
923	81.446	980	81.446	1037	81.446	1094	81.446	1151	81.446	1208	81.446	1265	81.446
924	81.446	981	81.446	1038	81.446	1095	81.446	1152	81.446	1209	81.446	1266	81.446
925	81.446	982	81.446	1039	81.446	1096	81.446	1153	81.446	1210	81.446	1267	81.446
926	81.446	983	81.446	1040	81.446	1097	81.446	1154	81.446	1211	81.446	1268	81.446
927	81.446	984	81.446	1041	81.446	1098	81.446	1155	81.446	1212	81.446	1269	81.446
928	81.446	985	81.446	1042	81.446	1099	81.446	1156	81.446	1213	81.446	1270	81.446
929	81.446	986	81.446	1043	81.446	1100	81.446	1157	81.446	1214	81.446	1271	81.446
930	81.446	987	81.446	1044	81.446	1101	81.446	1158	81.446	1215	81.446	1272	81.446
931	81.446	988	81.446	1045	81.446	1102	81.446	1159	81.446	1216	81.446	1273	81.446
932	81.446	989	81.446	1046	81.446	1103	81.446	1160	81.446	1217	81.446	1274	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1275	81.446	1332	81.446	1389	81.446	1446	81.446	1503	81.446	1560	81.446	1617	81.446
1276	81.446	1333	81.446	1390	81.446	1447	81.446	1504	81.446	1561	81.446	1618	81.446
1277	81.446	1334	81.446	1391	81.446	1448	81.446	1505	81.446	1562	81.446	1619	81.446
1278	81.446	1335	81.446	1392	81.446	1449	81.446	1506	81.446	1563	81.446	1620	81.446
1279	81.446	1336	81.446	1393	81.446	1450	81.446	1507	81.446	1564	81.446	1621	81.446
1280	81.446	1337	81.446	1394	81.446	1451	81.446	1508	81.446	1565	81.446	1622	81.446
1281	81.446	1338	81.446	1395	81.446	1452	81.446	1509	81.446	1566	81.446	1623	81.446
1282	81.446	1339	81.446	1396	81.446	1453	81.446	1510	81.446	1567	81.446	1624	81.446
1283	81.446	1340	81.446	1397	81.446	1454	81.446	1511	81.446	1568	81.446	1625	81.446
1284	81.446	1341	81.446	1398	81.446	1455	81.446	1512	81.446	1569	81.446	1626	81.446
1285	81.446	1342	81.446	1399	81.446	1456	81.446	1513	81.446	1570	81.446	1627	81.446
1286	81.446	1343	81.446	1400	81.446	1457	81.446	1514	81.446	1571	81.446	1628	81.446
1287	81.446	1344	81.446	1401	81.446	1458	81.446	1515	81.446	1572	81.446	1629	81.446
1288	81.446	1345	81.446	1402	81.446	1459	81.446	1516	81.446	1573	81.446	1630	81.446
1289	81.446	1346	81.446	1403	81.446	1460	81.446	1517	81.446	1574	81.446	1631	81.446
1290	81.446	1347	81.446	1404	81.446	1461	81.446	1518	81.446	1575	81.446	1632	81.446
1291	81.446	1348	81.446	1405	81.446	1462	81.446	1519	81.446	1576	81.446	1633	81.446
1292	81.446	1349	81.446	1406	81.446	1463	81.446	1520	81.446	1577	81.446	1634	81.446
1293	81.446	1350	81.446	1407	81.446	1464	81.446	1521	81.446	1578	81.446	1635	81.446
1294	81.446	1351	81.446	1408	81.446	1465	81.446	1522	81.446	1579	81.446	1636	81.446
1295	81.446	1352	81.446	1409	81.446	1466	81.446	1523	81.446	1580	81.446	1637	81.446
1296	81.446	1353	81.446	1410	81.446	1467	81.446	1524	81.446	1581	81.446	1638	81.446
1297	81.446	1354	81.446	1411	81.446	1468	81.446	1525	81.446	1582	81.446	1639	81.446
1298	81.446	1355	81.446	1412	81.446	1469	81.446	1526	81.446	1583	81.446	1640	81.446
1299	81.446	1356	81.446	1413	81.446	1470	81.446	1527	81.446	1584	81.446	1641	81.446
1300	81.446	1357	81.446	1414	81.446	1471	81.446	1528	81.446	1585	81.446	1642	81.446
1301	81.446	1358	81.446	1415	81.446	1472	81.446	1529	81.446	1586	81.446	1643	81.446
1302	81.446	1359	81.446	1416	81.446	1473	81.446	1530	81.446	1587	81.446	1644	81.446
1303	81.446	1360	81.446	1417	81.446	1474	81.446	1531	81.446	1588	81.446	1645	81.446
1304	81.446	1361	81.446	1418	81.446	1475	81.446	1532	81.446	1589	81.446	1646	81.446
1305	81.446	1362	81.446	1419	81.446	1476	81.446	1533	81.446	1590	81.446	1647	81.446
1306	81.446	1363	81.446	1420	81.446	1477	81.446	1534	81.446	1591	81.446	1648	81.446
1307	81.446	1364	81.446	1421	81.446	1478	81.446	1535	81.446	1592	81.446	1649	81.446
1308	81.446	1365	81.446	1422	81.446	1479	81.446	1536	81.446	1593	81.446	1650	81.446
1309	81.446	1366	81.446	1423	81.446	1480	81.446	1537	81.446	1594	81.446	1651	81.446
1310	81.446	1367	81.446	1424	81.446	1481	81.446	1538	81.446	1595	81.446	1652	81.446
1311	81.446	1368	81.446	1425	81.446	1482	81.446	1539	81.446	1596	81.446	1653	81.446
1312	81.446	1369	81.446	1426	81.446	1483	81.446	1540	81.446	1597	81.446	1654	81.446
1313	81.446	1370	81.446	1427	81.446	1484	81.446	1541	81.446	1598	81.446	1655	81.446
1314	81.446	1371	81.446	1428	81.446	1485	81.446	1542	81.446	1599	81.446	1656	81.446
1315	81.446	1372	81.446	1429	81.446	1486	81.446	1543	81.446	1600	81.446	1657	81.446
1316	81.446	1373	81.446	1430	81.446	1487	81.446	1544	81.446	1601	81.446	1658	81.446
1317	81.446	1374	81.446	1431	81.446	1488	81.446	1545	81.446	1602	81.446	1659	81.446
1318	81.446	1375	81.446	1432	81.446	1489	81.446	1546	81.446	1603	81.446	1660	81.446
1319	81.446	1376	81.446	1433	81.446	1490	81.446	1547	81.446	1604	81.446	1661	81.446
1320	81.446	1377	81.446	1434	81.446	1491	81.446	1548	81.446	1605	81.446	1662	81.446
1321	81.446	1378	81.446	1435	81.446	1492	81.446	1549	81.446	1606	81.446	1663	81.446
1322	81.446	1379	81.446	1436	81.446	1493	81.446	1550	81.446	1607	81.446	1664	81.446
1323	81.446	1380	81.446	1437	81.446	1494	81.446	1551	81.446	1608	81.446	1665	81.446
1324	81.446	1381	81.446	1438	81.446	1495	81.446	1552	81.446	1609	81.446	1666	81.446
1325	81.446	1382	81.446	1439	81.446	1496	81.446	1553	81.446	1610	81.446	1667	81.446
1326	81.446	1383	81.446	1440	81.446	1497	81.446	1554	81.446	1611	81.446	1668	81.446
1327	81.446	1384	81.446	1441	81.446	1498	81.446	1555	81.446	1612	81.446	1669	81.446
1328	81.446	1385	81.446	1442	81.446	1499	81.446	1556	81.446	1613	81.446	1670	81.446
1329	81.446	1386	81.446	1443	81.446	1500	81.446	1557	81.446	1614	81.446	1671	81.446
1330	81.446	1387	81.446	1444	81.446	1501	81.446	1558	81.446	1615	81.446	1672	81.446
1331	81.446	1388	81.446	1445	81.446	1502	81.446	1559	81.446	1616	81.446	1673	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1674	81.446	1731	81.446	1788	81.446	1845	81.446	1902	81.446	1959	81.446	2016	81.446
1675	81.446	1732	81.446	1789	81.446	1846	81.446	1903	81.446	1960	81.446	2017	81.446
1676	81.446	1733	81.446	1790	81.446	1847	81.446	1904	81.446	1961	81.446	2018	81.446
1677	81.446	1734	81.446	1791	81.446	1848	81.446	1905	81.446	1962	81.446	2019	81.446
1678	81.446	1735	81.446	1792	81.446	1849	81.446	1906	81.446	1963	81.446	2020	81.446
1679	81.446	1736	81.446	1793	81.446	1850	81.446	1907	81.446	1964	81.446	2021	81.446
1680	81.446	1737	81.446	1794	81.446	1851	81.446	1908	81.446	1965	81.446	2022	81.446
1681	81.446	1738	81.446	1795	81.446	1852	81.446	1909	81.446	1966	81.446	2023	81.446
1682	81.446	1739	81.446	1796	81.446	1853	81.446	1910	81.446	1967	81.446	2024	81.446
1683	81.446	1740	81.446	1797	81.446	1854	81.446	1911	81.446	1968	81.446	2025	81.446
1684	81.446	1741	81.446	1798	81.446	1855	81.446	1912	81.446	1969	81.446	2026	81.446
1685	81.446	1742	81.446	1799	81.446	1856	81.446	1913	81.446	1970	81.446	2027	81.446
1686	81.446	1743	81.446	1800	81.446	1857	81.446	1914	81.446	1971	81.446	2028	81.446
1687	81.446	1744	81.446	1801	81.446	1858	81.446	1915	81.446	1972	81.446	2029	81.446
1688	81.446	1745	81.446	1802	81.446	1859	81.446	1916	81.446	1973	81.446	2030	81.446
1689	81.446	1746	81.446	1803	81.446	1860	81.446	1917	81.446	1974	81.446	2031	81.446
1690	81.446	1747	81.446	1804	81.446	1861	81.446	1918	81.446	1975	81.446	2032	81.446
1691	81.446	1748	81.446	1805	81.446	1862	81.446	1919	81.446	1976	81.446	2033	81.446
1692	81.446	1749	81.446	1806	81.446	1863	81.446	1920	81.446	1977	81.446	2034	81.446
1693	81.446	1750	81.446	1807	81.446	1864	81.446	1921	81.446	1978	81.446	2035	81.446
1694	81.446	1751	81.446	1808	81.446	1865	81.446	1922	81.446	1979	81.446	2036	81.446
1695	81.446	1752	81.446	1809	81.446	1866	81.446	1923	81.446	1980	81.446	2037	81.446
1696	81.446	1753	81.446	1810	81.446	1867	81.446	1924	81.446	1981	81.446	2038	81.446
1697	81.446	1754	81.446	1811	81.446	1868	81.446	1925	81.446	1982	81.446	2039	81.446
1698	81.446	1755	81.446	1812	81.446	1869	81.446	1926	81.446	1983	81.446	2040	81.446
1699	81.446	1756	81.446	1813	81.446	1870	81.446	1927	81.446	1984	81.446	2041	81.446
1700	81.446	1757	81.446	1814	81.446	1871	81.446	1928	81.446	1985	81.446	2042	81.446
1701	81.446	1758	81.446	1815	81.446	1872	81.446	1929	81.446	1986	81.446	2043	81.446
1702	81.446	1759	81.446	1816	81.446	1873	81.446	1930	81.446	1987	81.446	2044	81.446
1703	81.446	1760	81.446	1817	81.446	1874	81.446	1931	81.446	1988	81.446	2045	81.446
1704	81.446	1761	81.446	1818	81.446	1875	81.446	1932	81.446	1989	81.446	2046	81.446
1705	81.446	1762	81.446	1819	81.446	1876	81.446	1933	81.446	1990	81.446	2047	81.446
1706	81.446	1763	81.446	1820	81.446	1877	81.446	1934	81.446	1991	81.446	2048	81.446
1707	81.446	1764	81.446	1821	81.446	1878	81.446	1935	81.446	1992	81.446	2049	81.446
1708	81.446	1765	81.446	1822	81.446	1879	81.446	1936	81.446	1993	81.446	2050	81.446
1709	81.446	1766	81.446	1823	81.446	1880	81.446	1937	81.446	1994	81.446	2051	81.446
1710	81.446	1767	81.446	1824	81.446	1881	81.446	1938	81.446	1995	81.446	2052	81.446
1711	81.446	1768	81.446	1825	81.446	1882	81.446	1939	81.446	1996	81.446	2053	81.446
1712	81.446	1769	81.446	1826	81.446	1883	81.446	1940	81.446	1997	81.446	2054	81.446
1713	81.446	1770	81.446	1827	81.446	1884	81.446	1941	81.446	1998	81.446	2055	81.446
1714	81.446	1771	81.446	1828	81.446	1885	81.446	1942	81.446	1999	81.446	2056	81.446
1715	81.446	1772	81.446	1829	81.446	1886	81.446	1943	81.446	2000	81.446	2057	81.446
1716	81.446	1773	81.446	1830	81.446	1887	81.446	1944	81.446	2001	81.446	2058	81.446
1717	81.446	1774	81.446	1831	81.446	1888	81.446	1945	81.446	2002	81.446	2059	81.446
1718	81.446	1775	81.446	1832	81.446	1889	81.446	1946	81.446	2003	81.446	2060	81.446
1719	81.446	1776	81.446	1833	81.446	1890	81.446	1947	81.446	2004	81.446	2061	81.446
1720	81.446	1777	81.446	1834	81.446	1891	81.446	1948	81.446	2005	81.446	2062	81.446
1721	81.446	1778	81.446	1835	81.446	1892	81.446	1949	81.446	2006	81.446	2063	81.446
1722	81.446	1779	81.446	1836	81.446	1893	81.446	1950	81.446	2007	81.446	2064	81.446
1723	81.446	1780	81.446	1837	81.446	1894	81.446	1951	81.446	2008	81.446	2065	81.446
1724	81.446	1781	81.446	1838	81.446	1895	81.446	1952	81.446	2009	81.446	2066	81.446
1725	81.446	1782	81.446	1839	81.446	1896	81.446	1953	81.446	2010	81.446	2067	81.446
1726	81.446	1783	81.446	1840	81.446	1897	81.446	1954	81.446	2011	81.446	2068	81.446
1727	81.446	1784	81.446	1841	81.446	1898	81.446	1955	81.446	2012	81.446	2069	81.446
1728	81.446	1785	81.446	1842	81.446	1899	81.446	1956	81.446	2013	81.446	2070	81.446
1729	81.446	1786	81.446	1843	81.446	1900	81.446	1957	81.446	2014	81.446	2071	81.446
1730	81.446	1787	81.446	1844	81.446	1901	81.446	1958	81.446	2015	81.446	2072	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
2073	81.446	2130	81.446	2187	81.446	2244	81.446	2301	81.446	2358	81.446	2415	81.446
2074	81.446	2131	81.446	2188	81.446	2245	81.446	2302	81.446	2359	81.446	2416	81.446
2075	81.446	2132	81.446	2189	81.446	2246	81.446	2303	81.446	2360	81.446	2417	81.446
2076	81.446	2133	81.446	2190	81.446	2247	81.446	2304	81.446	2361	81.446	2418	81.446
2077	81.446	2134	81.446	2191	81.446	2248	81.446	2305	81.446	2362	81.446	2419	81.446
2078	81.446	2135	81.446	2192	81.446	2249	81.446	2306	81.446	2363	81.446	2420	81.446
2079	81.446	2136	81.446	2193	81.446	2250	81.446	2307	81.446	2364	81.446	2421	81.446
2080	81.446	2137	81.446	2194	81.446	2251	81.446	2308	81.446	2365	81.446	2422	81.446
2081	81.446	2138	81.446	2195	81.446	2252	81.446	2309	81.446	2366	81.446	2423	81.446
2082	81.446	2139	81.446	2196	81.446	2253	81.446	2310	81.446	2367	81.446	2424	81.446
2083	81.446	2140	81.446	2197	81.446	2254	81.446	2311	81.446	2368	81.446	2425	81.446
2084	81.446	2141	81.446	2198	81.446	2255	81.446	2312	81.446	2369	81.446	2426	81.446
2085	81.446	2142	81.446	2199	81.446	2256	81.446	2313	81.446	2370	81.446	2427	81.446
2086	81.446	2143	81.446	2200	81.446	2257	81.446	2314	81.446	2371	81.446	2428	81.446
2087	81.446	2144	81.446	2201	81.446	2258	81.446	2315	81.446	2372	81.446	2429	81.446
2088	81.446	2145	81.446	2202	81.446	2259	81.446	2316	81.446	2373	81.446	2430	81.446
2089	81.446	2146	81.446	2203	81.446	2260	81.446	2317	81.446	2374	81.446	2431	81.446
2090	81.446	2147	81.446	2204	81.446	2261	81.446	2318	81.446	2375	81.446	2432	81.446
2091	81.446	2148	81.446	2205	81.446	2262	81.446	2319	81.446	2376	81.446	2433	81.446
2092	81.446	2149	81.446	2206	81.446	2263	81.446	2320	81.446	2377	81.446	2434	81.446
2093	81.446	2150	81.446	2207	81.446	2264	81.446	2321	81.446	2378	81.446	2435	81.446
2094	81.446	2151	81.446	2208	81.446	2265	81.446	2322	81.446	2379	81.446	2436	81.446
2095	81.446	2152	81.446	2209	81.446	2266	81.446	2323	81.446	2380	81.446	2437	81.446
2096	81.446	2153	81.446	2210	81.446	2267	81.446	2324	81.446	2381	81.446	2438	81.446
2097	81.446	2154	81.446	2211	81.446	2268	81.446	2325	81.446	2382	81.446	2439	81.446
2098	81.446	2155	81.446	2212	81.446	2269	81.446	2326	81.446	2383	81.446	2440	81.446
2099	81.446	2156	81.446	2213	81.446	2270	81.446	2327	81.446	2384	81.446	2441	81.446
2100	81.446	2157	81.446	2214	81.446	2271	81.446	2328	81.446	2385	81.446	2442	81.446
2101	81.446	2158	81.446	2215	81.446	2272	81.446	2329	81.446	2386	81.446	2443	81.446
2102	81.446	2159	81.446	2216	81.446	2273	81.446	2330	81.446	2387	81.446	2444	81.446
2103	81.446	2160	81.446	2217	81.446	2274	81.446	2331	81.446	2388	81.446	2445	81.446
2104	81.446	2161	81.446	2218	81.446	2275	81.446	2332	81.446	2389	81.446	2446	81.446
2105	81.446	2162	81.446	2219	81.446	2276	81.446	2333	81.446	2390	81.446	2447	81.446
2106	81.446	2163	81.446	2220	81.446	2277	81.446	2334	81.446	2391	81.446	2448	81.446
2107	81.446	2164	81.446	2221	81.446	2278	81.446	2335	81.446	2392	81.446	2449	81.446
2108	81.446	2165	81.446	2222	81.446	2279	81.446	2336	81.446	2393	81.446	2450	81.446
2109	81.446	2166	81.446	2223	81.446	2280	81.446	2337	81.446	2394	81.446	2451	81.446
2110	81.446	2167	81.446	2224	81.446	2281	81.446	2338	81.446	2395	81.446	2452	81.446
2111	81.446	2168	81.446	2225	81.446	2282	81.446	2339	81.446	2396	81.446	2453	81.446
2112	81.446	2169	81.446	2226	81.446	2283	81.446	2340	81.446	2397	81.446	2454	81.446
2113	81.446	2170	81.446	2227	81.446	2284	81.446	2341	81.446	2398	81.446	2455	81.446
2114	81.446	2171	81.446	2228	81.446	2285	81.446	2342	81.446	2399	81.446	2456	81.446
2115	81.446	2172	81.446	2229	81.446	2286	81.446	2343	81.446	2400	81.446	2457	81.446
2116	81.446	2173	81.446	2230	81.446	2287	81.446	2344	81.446	2401	81.446	2458	81.446
2117	81.446	2174	81.446	2231	81.446	2288	81.446	2345	81.446	2402	81.446	2459	81.446
2118	81.446	2175	81.446	2232	81.446	2289	81.446	2346	81.446	2403	81.446	2460	81.446
2119	81.446	2176	81.446	2233	81.446	2290	81.446	2347	81.446	2404	81.446	2461	81.446
2120	81.446	2177	81.446	2234	81.446	2291	81.446	2348	81.446	2405	81.446	2462	81.446
2121	81.446	2178	81.446	2235	81.446	2292	81.446	2349	81.446	2406	81.446	2463	81.446
2122	81.446	2179	81.446	2236	81.446	2293	81.446	2350	81.446	2407	81.446	2464	81.446
2123	81.446	2180	81.446	2237	81.446	2294	81.446	2351	81.446	2408	81.446	2465	81.446
2124	81.446	2181	81.446	2238	81.446	2295	81.446	2352	81.446	2409	81.446	2466	81.446
2125	81.446	2182	81.446	2239	81.446	2296	81.446	2353	81.446	2410	81.446	2467	81.446
2126	81.446	2183	81.446	2240	81.446	2297	81.446	2354	81.446	2411	81.446	2468	81.446
2127	81.446	2184	81.446	2241	81.446	2298	81.446	2355	81.446	2412	81.446	2469	81.446
2128	81.446	2185	81.446	2242	81.446	2299	81.446	2356	81.446	2413	81.446	2470	81.446
2129	81.446	2186	81.446	2243	81.446	2300	81.446	2357	81.446	2414	81.446	2471	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
2472	81.446	2529	81.446	2586	81.446	2643	81.446	2700	81.446	2757	81.446	2814	81.446
2473	81.446	2530	81.446	2587	81.446	2644	81.446	2701	81.446	2758	81.446	2815	81.446
2474	81.446	2531	81.446	2588	81.446	2645	81.446	2702	81.446	2759	81.446	2816	81.446
2475	81.446	2532	81.446	2589	81.446	2646	81.446	2703	81.446	2760	81.446	2817	81.446
2476	81.446	2533	81.446	2590	81.446	2647	81.446	2704	81.446	2761	81.446	2818	81.446
2477	81.446	2534	81.446	2591	81.446	2648	81.446	2705	81.446	2762	81.446	2819	81.446
2478	81.446	2535	81.446	2592	81.446	2649	81.446	2706	81.446	2763	81.446	2820	81.446
2479	81.446	2536	81.446	2593	81.446	2650	81.446	2707	81.446	2764	81.446	2821	81.446
2480	81.446	2537	81.446	2594	81.446	2651	81.446	2708	81.446	2765	81.446	2822	81.446
2481	81.446	2538	81.446	2595	81.446	2652	81.446	2709	81.446	2766	81.446	2823	81.446
2482	81.446	2539	81.446	2596	81.446	2653	81.446	2710	81.446	2767	81.446	2824	81.446
2483	81.446	2540	81.446	2597	81.446	2654	81.446	2711	81.446	2768	81.446	2825	81.446
2484	81.446	2541	81.446	2598	81.446	2655	81.446	2712	81.446	2769	81.446	2826	81.446
2485	81.446	2542	81.446	2599	81.446	2656	81.446	2713	81.446	2770	81.446	2827	81.446
2486	81.446	2543	81.446	2600	81.446	2657	81.446	2714	81.446	2771	81.446	2828	81.446
2487	81.446	2544	81.446	2601	81.446	2658	81.446	2715	81.446	2772	81.446	2829	81.446
2488	81.446	2545	81.446	2602	81.446	2659	81.446	2716	81.446	2773	81.446	2830	81.446
2489	81.446	2546	81.446	2603	81.446	2660	81.446	2717	81.446	2774	81.446	2831	81.446
2490	81.446	2547	81.446	2604	81.446	2661	81.446	2718	81.446	2775	81.446	2832	81.446
2491	81.446	2548	81.446	2605	81.446	2662	81.446	2719	81.446	2776	81.446	2833	81.446
2492	81.446	2549	81.446	2606	81.446	2663	81.446	2720	81.446	2777	81.446	2834	81.446
2493	81.446	2550	81.446	2607	81.446	2664	81.446	2721	81.446	2778	81.446	2835	81.446
2494	81.446	2551	81.446	2608	81.446	2665	81.446	2722	81.446	2779	81.446	2836	81.446
2495	81.446	2552	81.446	2609	81.446	2666	81.446	2723	81.446	2780	81.446	2837	81.446
2496	81.446	2553	81.446	2610	81.446	2667	81.446	2724	81.446	2781	81.446	2838	81.446
2497	81.446	2554	81.446	2611	81.446	2668	81.446	2725	81.446	2782	81.446	2839	81.446
2498	81.446	2555	81.446	2612	81.446	2669	81.446	2726	81.446	2783	81.446	2840	81.446
2499	81.446	2556	81.446	2613	81.446	2670	81.446	2727	81.446	2784	81.446	2841	81.446
2500	81.446	2557	81.446	2614	81.446	2671	81.446	2728	81.446	2785	81.446	2842	81.446
2501	81.446	2558	81.446	2615	81.446	2672	81.446	2729	81.446	2786	81.446	2843	81.446
2502	81.446	2559	81.446	2616	81.446	2673	81.446	2730	81.446	2787	81.446	2844	81.446
2503	81.446	2560	81.446	2617	81.446	2674	81.446	2731	81.446	2788	81.446	2845	81.446
2504	81.446	2561	81.446	2618	81.446	2675	81.446	2732	81.446	2789	81.446	2846	81.446
2505	81.446	2562	81.446	2619	81.446	2676	81.446	2733	81.446	2790	81.446	2847	81.446
2506	81.446	2563	81.446	2620	81.446	2677	81.446	2734	81.446	2791	81.446	2848	81.446
2507	81.446	2564	81.446	2621	81.446	2678	81.446	2735	81.446	2792	81.446	2849	81.446
2508	81.446	2565	81.446	2622	81.446	2679	81.446	2736	81.446	2793	81.446	2850	81.446
2509	81.446	2566	81.446	2623	81.446	2680	81.446	2737	81.446	2794	81.446	2851	81.446
2510	81.446	2567	81.446	2624	81.446	2681	81.446	2738	81.446	2795	81.446	2852	81.446
2511	81.446	2568	81.446	2625	81.446	2682	81.446	2739	81.446	2796	81.446	2853	81.446
2512	81.446	2569	81.446	2626	81.446	2683	81.446	2740	81.446	2797	81.446	2854	81.446
2513	81.446	2570	81.446	2627	81.446	2684	81.446	2741	81.446	2798	81.446	2855	81.446
2514	81.446	2571	81.446	2628	81.446	2685	81.446	2742	81.446	2799	81.446	2856	81.446
2515	81.446	2572	81.446	2629	81.446	2686	81.446	2743	81.446	2800	81.446	2857	81.446
2516	81.446	2573	81.446	2630	81.446	2687	81.446	2744	81.446	2801	81.446	2858	81.446
2517	81.446	2574	81.446	2631	81.446	2688	81.446	2745	81.446	2802	81.446	2859	81.446
2518	81.446	2575	81.446	2632	81.446	2689	81.446	2746	81.446	2803	81.446	2860	81.446
2519	81.446	2576	81.446	2633	81.446	2690	81.446	2747	81.446	2804	81.446	2861	81.446
2520	81.446	2577	81.446	2634	81.446	2691	81.446	2748	81.446	2805	81.446	2862	81.446
2521	81.446	2578	81.446	2635	81.446	2692	81.446	2749	81.446	2806	81.446	2863	81.446
2522	81.446	2579	81.446	2636	81.446	2693	81.446	2750	81.446	2807	81.446	2864	81.446
2523	81.446	2580	81.446	2637	81.446	2694	81.446	2751	81.446	2808	81.446	2865	81.446
2524	81.446	2581	81.446	2638	81.446	2695	81.446	2752	81.446	2809	81.446	2866	81.446
2525	81.446	2582	81.446	2639	81.446	2696	81.446	2753	81.446	2810	81.446	2867	81.446
2526	81.446	2583	81.446	2640	81.446	2697	81.446	2754	81.446	2811	81.446	2868	81.446
2527	81.446	2584	81.446	2641	81.446	2698	81.446	2755	81.446	2812	81.446	2869	81.446
2528	81.446	2585	81.446	2642	81.446	2699	81.446	2756	81.446	2813	81.446	2870	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
2871	81.446	2928	81.446	2985	81.446	3042	81.446	3099	81.446	3156	81.446	3213	81.446
2872	81.446	2929	81.446	2986	81.446	3043	81.446	3100	81.446	3157	81.446	3214	81.446
2873	81.446	2930	81.446	2987	81.446	3044	81.446	3101	81.446	3158	81.446	3215	81.446
2874	81.446	2931	81.446	2988	81.446	3045	81.446	3102	81.446	3159	81.446	3216	81.446
2875	81.446	2932	81.446	2989	81.446	3046	81.446	3103	81.446	3160	81.446	3217	81.446
2876	81.446	2933	81.446	2990	81.446	3047	81.446	3104	81.446	3161	81.446	3218	81.446
2877	81.446	2934	81.446	2991	81.446	3048	81.446	3105	81.446	3162	81.446	3219	81.446
2878	81.446	2935	81.446	2992	81.446	3049	81.446	3106	81.446	3163	81.446	3220	81.446
2879	81.446	2936	81.446	2993	81.446	3050	81.446	3107	81.446	3164	81.446	3221	81.446
2880	81.446	2937	81.446	2994	81.446	3051	81.446	3108	81.446	3165	81.446	3222	81.446
2881	81.446	2938	81.446	2995	81.446	3052	81.446	3109	81.446	3166	81.446	3223	81.446
2882	81.446	2939	81.446	2996	81.446	3053	81.446	3110	81.446	3167	81.446	3224	81.446
2883	81.446	2940	81.446	2997	81.446	3054	81.446	3111	81.446	3168	81.446	3225	81.446
2884	81.446	2941	81.446	2998	81.446	3055	81.446	3112	81.446	3169	81.446	3226	81.446
2885	81.446	2942	81.446	2999	81.446	3056	81.446	3113	81.446	3170	81.446	3227	81.446
2886	81.446	2943	81.446	3000	81.446	3057	81.446	3114	81.446	3171	81.446	3228	81.446
2887	81.446	2944	81.446	3001	81.446	3058	81.446	3115	81.446	3172	81.446	3229	81.446
2888	81.446	2945	81.446	3002	81.446	3059	81.446	3116	81.446	3173	81.446	3230	81.446
2889	81.446	2946	81.446	3003	81.446	3060	81.446	3117	81.446	3174	81.446	3231	81.446
2890	81.446	2947	81.446	3004	81.446	3061	81.446	3118	81.446	3175	81.446	3232	81.446
2891	81.446	2948	81.446	3005	81.446	3062	81.446	3119	81.446	3176	81.446	3233	81.446
2892	81.446	2949	81.446	3006	81.446	3063	81.446	3120	81.446	3177	81.446	3234	81.446
2893	81.446	2950	81.446	3007	81.446	3064	81.446	3121	81.446	3178	81.446	3235	81.446
2894	81.446	2951	81.446	3008	81.446	3065	81.446	3122	81.446	3179	81.446	3236	81.446
2895	81.446	2952	81.446	3009	81.446	3066	81.446	3123	81.446	3180	81.446	3237	81.446
2896	81.446	2953	81.446	3010	81.446	3067	81.446	3124	81.446	3181	81.446	3238	81.446
2897	81.446	2954	81.446	3011	81.446	3068	81.446	3125	81.446	3182	81.446	3239	81.446
2898	81.446	2955	81.446	3012	81.446	3069	81.446	3126	81.446	3183	81.446	3240	81.446
2899	81.446	2956	81.446	3013	81.446	3070	81.446	3127	81.446	3184	81.446	3241	81.446
2900	81.446	2957	81.446	3014	81.446	3071	81.446	3128	81.446	3185	81.446	3242	81.446
2901	81.446	2958	81.446	3015	81.446	3072	81.446	3129	81.446	3186	81.446	3243	81.446
2902	81.446	2959	81.446	3016	81.446	3073	81.446	3130	81.446	3187	81.446	3244	81.446
2903	81.446	2960	81.446	3017	81.446	3074	81.446	3131	81.446	3188	81.446	3245	81.446
2904	81.446	2961	81.446	3018	81.446	3075	81.446	3132	81.446	3189	81.446	3246	81.446
2905	81.446	2962	81.446	3019	81.446	3076	81.446	3133	81.446	3190	81.446	3247	81.446
2906	81.446	2963	81.446	3020	81.446	3077	81.446	3134	81.446	3191	81.446	3248	81.446
2907	81.446	2964	81.446	3021	81.446	3078	81.446	3135	81.446	3192	81.446	3249	81.446
2908	81.446	2965	81.446	3022	81.446	3079	81.446	3136	81.446	3193	81.446	3250	81.446
2909	81.446	2966	81.446	3023	81.446	3080	81.446	3137	81.446	3194	81.446	3251	81.446
2910	81.446	2967	81.446	3024	81.446	3081	81.446	3138	81.446	3195	81.446	3252	81.446
2911	81.446	2968	81.446	3025	81.446	3082	81.446	3139	81.446	3196	81.446	3253	81.446
2912	81.446	2969	81.446	3026	81.446	3083	81.446	3140	81.446	3197	81.446	3254	81.446
2913	81.446	2970	81.446	3027	81.446	3084	81.446	3141	81.446	3198	81.446	3255	81.446
2914	81.446	2971	81.446	3028	81.446	3085	81.446	3142	81.446	3199	81.446	3256	81.446
2915	81.446	2972	81.446	3029	81.446	3086	81.446	3143	81.446	3200	81.446	3257	81.446
2916	81.446	2973	81.446	3030	81.446	3087	81.446	3144	81.446	3201	81.446	3258	81.446
2917	81.446	2974	81.446	3031	81.446	3088	81.446	3145	81.446	3202	81.446	3259	81.446
2918	81.446	2975	81.446	3032	81.446	3089	81.446	3146	81.446	3203	81.446	3260	81.446
2919	81.446	2976	81.446	3033	81.446	3090	81.446	3147	81.446	3204	81.446	3261	81.446
2920	81.446	2977	81.446	3034	81.446	3091	81.446	3148	81.446	3205	81.446	3262	81.446
2921	81.446	2978	81.446	3035	81.446	3092	81.446	3149	81.446	3206	81.446	3263	81.446
2922	81.446	2979	81.446	3036	81.446	3093	81.446	3150	81.446	3207	81.446	3264	81.446
2923	81.446	2980	81.446	3037	81.446	3094	81.446	3151	81.446	3208	81.446	3265	81.446
2924	81.446	2981	81.446	3038	81.446	3095	81.446	3152	81.446	3209	81.446	3266	81.446
2925	81.446	2982	81.446	3039	81.446	3096	81.446	3153	81.446	3210	81.446	3267	81.446
2926	81.446	2983	81.446	3040	81.446	3097	81.446	3154	81.446	3211	81.446	3268	81.446
2927	81.446	2984	81.446	3041	81.446	3098	81.446	3155	81.446	3212	81.446	3269	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
3270	81.446	3327	81.446	3384	81.446	3441	81.446	3498	81.446	3555	81.446	3612	81.446
3271	81.446	3328	81.446	3385	81.446	3442	81.446	3499	81.446	3556	81.446	3613	81.446
3272	81.446	3329	81.446	3386	81.446	3443	81.446	3500	81.446	3557	81.446	3614	81.446
3273	81.446	3330	81.446	3387	81.446	3444	81.446	3501	81.446	3558	81.446	3615	81.446
3274	81.446	3331	81.446	3388	81.446	3445	81.446	3502	81.446	3559	81.446	3616	81.446
3275	81.446	3332	81.446	3389	81.446	3446	81.446	3503	81.446	3560	81.446	3617	81.446
3276	81.446	3333	81.446	3390	81.446	3447	81.446	3504	81.446	3561	81.446	3618	81.446
3277	81.446	3334	81.446	3391	81.446	3448	81.446	3505	81.446	3562	81.446	3619	81.446
3278	81.446	3335	81.446	3392	81.446	3449	81.446	3506	81.446	3563	81.446	3620	81.446
3279	81.446	3336	81.446	3393	81.446	3450	81.446	3507	81.446	3564	81.446	3621	81.446
3280	81.446	3337	81.446	3394	81.446	3451	81.446	3508	81.446	3565	81.446	3622	81.446
3281	81.446	3338	81.446	3395	81.446	3452	81.446	3509	81.446	3566	81.446	3623	81.446
3282	81.446	3339	81.446	3396	81.446	3453	81.446	3510	81.446	3567	81.446	3624	81.446
3283	81.446	3340	81.446	3397	81.446	3454	81.446	3511	81.446	3568	81.446	3625	81.446
3284	81.446	3341	81.446	3398	81.446	3455	81.446	3512	81.446	3569	81.446	3626	81.446
3285	81.446	3342	81.446	3399	81.446	3456	81.446	3513	81.446	3570	81.446	3627	81.446
3286	81.446	3343	81.446	3400	81.446	3457	81.446	3514	81.446	3571	81.446	3628	81.446
3287	81.446	3344	81.446	3401	81.446	3458	81.446	3515	81.446	3572	81.446	3629	81.446
3288	81.446	3345	81.446	3402	81.446	3459	81.446	3516	81.446	3573	81.446	3630	81.446
3289	81.446	3346	81.446	3403	81.446	3460	81.446	3517	81.446	3574	81.446	3631	81.446
3290	81.446	3347	81.446	3404	81.446	3461	81.446	3518	81.446	3575	81.446	3632	81.446
3291	81.446	3348	81.446	3405	81.446	3462	81.446	3519	81.446	3576	81.446	3633	81.446
3292	81.446	3349	81.446	3406	81.446	3463	81.446	3520	81.446	3577	81.446	3634	81.446
3293	81.446	3350	81.446	3407	81.446	3464	81.446	3521	81.446	3578	81.446	3635	81.446
3294	81.446	3351	81.446	3408	81.446	3465	81.446	3522	81.446	3579	81.446	3636	81.446
3295	81.446	3352	81.446	3409	81.446	3466	81.446	3523	81.446	3580	81.446	3637	81.446
3296	81.446	3353	81.446	3410	81.446	3467	81.446	3524	81.446	3581	81.446	3638	81.446
3297	81.446	3354	81.446	3411	81.446	3468	81.446	3525	81.446	3582	81.446	3639	81.446
3298	81.446	3355	81.446	3412	81.446	3469	81.446	3526	81.446	3583	81.446	3640	81.446
3299	81.446	3356	81.446	3413	81.446	3470	81.446	3527	81.446	3584	81.446	3641	81.446
3300	81.446	3357	81.446	3414	81.446	3471	81.446	3528	81.446	3585	81.446	3642	81.446
3301	81.446	3358	81.446	3415	81.446	3472	81.446	3529	81.446	3586	81.446	3643	81.446
3302	81.446	3359	81.446	3416	81.446	3473	81.446	3530	81.446	3587	81.446	3644	81.446
3303	81.446	3360	81.446	3417	81.446	3474	81.446	3531	81.446	3588	81.446	3645	81.446
3304	81.446	3361	81.446	3418	81.446	3475	81.446	3532	81.446	3589	81.446	3646	81.446
3305	81.446	3362	81.446	3419	81.446	3476	81.446	3533	81.446	3590	81.446	3647	81.446
3306	81.446	3363	81.446	3420	81.446	3477	81.446	3534	81.446	3591	81.446	3648	81.446
3307	81.446	3364	81.446	3421	81.446	3478	81.446	3535	81.446	3592	81.446	3649	81.446
3308	81.446	3365	81.446	3422	81.446	3479	81.446	3536	81.446	3593	81.446	3650	81.446
3309	81.446	3366	81.446	3423	81.446	3480	81.446	3537	81.446	3594	81.446	3651	81.446
3310	81.446	3367	81.446	3424	81.446	3481	81.446	3538	81.446	3595	81.446	3652	81.446
3311	81.446	3368	81.446	3425	81.446	3482	81.446	3539	81.446	3596	81.446	3653	81.446
3312	81.446	3369	81.446	3426	81.446	3483	81.446	3540	81.446	3597	81.446	3654	81.446
3313	81.446	3370	81.446	3427	81.446	3484	81.446	3541	81.446	3598	81.446	3655	81.446
3314	81.446	3371	81.446	3428	81.446	3485	81.446	3542	81.446	3599	81.446	3656	81.446
3315	81.446	3372	81.446	3429	81.446	3486	81.446	3543	81.446	3600	81.446	3657	81.446
3316	81.446	3373	81.446	3430	81.446	3487	81.446	3544	81.446	3601	81.446	3658	81.446
3317	81.446	3374	81.446	3431	81.446	3488	81.446	3545	81.446	3602	81.446	3659	81.446
3318	81.446	3375	81.446	3432	81.446	3489	81.446	3546	81.446	3603	81.446	3660	81.446
3319	81.446	3376	81.446	3433	81.446	3490	81.446	3547	81.446	3604	81.446	3661	81.446
3320	81.446	3377	81.446	3434	81.446	3491	81.446	3548	81.446	3605	81.446	3662	81.446
3321	81.446	3378	81.446	3435	81.446	3492	81.446	3549	81.446	3606	81.446	3663	81.446
3322	81.446	3379	81.446	3436	81.446	3493	81.446	3550	81.446	3607	81.446	3664	81.446
3323	81.446	3380	81.446	3437	81.446	3494	81.446	3551	81.446	3608	81.446	3665	81.446
3324	81.446	3381	81.446	3438	81.446	3495	81.446	3552	81.446	3609	81.446	3666	81.446
3325	81.446	3382	81.446	3439	81.446	3496	81.446	3553	81.446	3610	81.446	3667	81.446
3326	81.446	3383	81.446	3440	81.446	3497	81.446	3554	81.446	3611	81.446	3668	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
3669	81.446	3726	81.446	3783	81.446	3840	81.446	3897	81.446	3954	81.446	4011	81.446
3670	81.446	3727	81.446	3784	81.446	3841	81.446	3898	81.446	3955	81.446	4012	81.446
3671	81.446	3728	81.446	3785	81.446	3842	81.446	3899	81.446	3956	81.446	4013	81.446
3672	81.446	3729	81.446	3786	81.446	3843	81.446	3900	81.446	3957	81.446	4014	81.446
3673	81.446	3730	81.446	3787	81.446	3844	81.446	3901	81.446	3958	81.446	4015	81.446
3674	81.446	3731	81.446	3788	81.446	3845	81.446	3902	81.446	3959	81.446	4016	81.446
3675	81.446	3732	81.446	3789	81.446	3846	81.446	3903	81.446	3960	81.446	4017	81.446
3676	81.446	3733	81.446	3790	81.446	3847	81.446	3904	81.446	3961	81.446	4018	81.446
3677	81.446	3734	81.446	3791	81.446	3848	81.446	3905	81.446	3962	81.446	4019	81.446
3678	81.446	3735	81.446	3792	81.446	3849	81.446	3906	81.446	3963	81.446	4020	81.446
3679	81.446	3736	81.446	3793	81.446	3850	81.446	3907	81.446	3964	81.446	4021	81.446
3680	81.446	3737	81.446	3794	81.446	3851	81.446	3908	81.446	3965	81.446	4022	81.446
3681	81.446	3738	81.446	3795	81.446	3852	81.446	3909	81.446	3966	81.446	4023	81.446
3682	81.446	3739	81.446	3796	81.446	3853	81.446	3910	81.446	3967	81.446	4024	81.446
3683	81.446	3740	81.446	3797	81.446	3854	81.446	3911	81.446	3968	81.446	4025	81.446
3684	81.446	3741	81.446	3798	81.446	3855	81.446	3912	81.446	3969	81.446	4026	81.446
3685	81.446	3742	81.446	3799	81.446	3856	81.446	3913	81.446	3970	81.446	4027	81.446
3686	81.446	3743	81.446	3800	81.446	3857	81.446	3914	81.446	3971	81.446	4028	81.446
3687	81.446	3744	81.446	3801	81.446	3858	81.446	3915	81.446	3972	81.446	4029	81.446
3688	81.446	3745	81.446	3802	81.446	3859	81.446	3916	81.446	3973	81.446	4030	81.446
3689	81.446	3746	81.446	3803	81.446	3860	81.446	3917	81.446	3974	81.446	4031	81.446
3690	81.446	3747	81.446	3804	81.446	3861	81.446	3918	81.446	3975	81.446	4032	81.446
3691	81.446	3748	81.446	3805	81.446	3862	81.446	3919	81.446	3976	81.446	4033	81.446
3692	81.446	3749	81.446	3806	81.446	3863	81.446	3920	81.446	3977	81.446	4034	81.446
3693	81.446	3750	81.446	3807	81.446	3864	81.446	3921	81.446	3978	81.446	4035	81.446
3694	81.446	3751	81.446	3808	81.446	3865	81.446	3922	81.446	3979	81.446	4036	81.446
3695	81.446	3752	81.446	3809	81.446	3866	81.446	3923	81.446	3980	81.446	4037	81.446
3696	81.446	3753	81.446	3810	81.446	3867	81.446	3924	81.446	3981	81.446	4038	81.446
3697	81.446	3754	81.446	3811	81.446	3868	81.446	3925	81.446	3982	81.446	4039	81.446
3698	81.446	3755	81.446	3812	81.446	3869	81.446	3926	81.446	3983	81.446	4040	81.446
3699	81.446	3756	81.446	3813	81.446	3870	81.446	3927	81.446	3984	81.446	4041	81.446
3700	81.446	3757	81.446	3814	81.446	3871	81.446	3928	81.446	3985	81.446	4042	81.446
3701	81.446	3758	81.446	3815	81.446	3872	81.446	3929	81.446	3986	81.446	4043	81.446
3702	81.446	3759	81.446	3816	81.446	3873	81.446	3930	81.446	3987	81.446	4044	81.446
3703	81.446	3760	81.446	3817	81.446	3874	81.446	3931	81.446	3988	81.446	4045	81.446
3704	81.446	3761	81.446	3818	81.446	3875	81.446	3932	81.446	3989	81.446	4046	81.446
3705	81.446	3762	81.446	3819	81.446	3876	81.446	3933	81.446	3990	81.446	4047	81.446
3706	81.446	3763	81.446	3820	81.446	3877	81.446	3934	81.446	3991	81.446	4048	81.446
3707	81.446	3764	81.446	3821	81.446	3878	81.446	3935	81.446	3992	81.446	4049	81.446
3708	81.446	3765	81.446	3822	81.446	3879	81.446	3936	81.446	3993	81.446	4050	81.446
3709	81.446	3766	81.446	3823	81.446	3880	81.446	3937	81.446	3994	81.446	4051	81.446
3710	81.446	3767	81.446	3824	81.446	3881	81.446	3938	81.446	3995	81.446	4052	81.446
3711	81.446	3768	81.446	3825	81.446	3882	81.446	3939	81.446	3996	81.446	4053	81.446
3712	81.446	3769	81.446	3826	81.446	3883	81.446	3940	81.446	3997	81.446	4054	81.446
3713	81.446	3770	81.446	3827	81.446	3884	81.446	3941	81.446	3998	81.446	4055	81.446
3714	81.446	3771	81.446	3828	81.446	3885	81.446	3942	81.446	3999	81.446	4056	81.446
3715	81.446	3772	81.446	3829	81.446	3886	81.446	3943	81.446	4000	81.446	4057	81.446
3716	81.446	3773	81.446	3830	81.446	3887	81.446	3944	81.446	4001	81.446	4058	81.446
3717	81.446	3774	81.446	3831	81.446	3888	81.446	3945	81.446	4002	81.446	4059	81.446
3718	81.446	3775	81.446	3832	81.446	3889	81.446	3946	81.446	4003	81.446	4060	81.446
3719	81.446	3776	81.446	3833	81.446	3890	81.446	3947	81.446	4004	81.446	4061	81.446
3720	81.446	3777	81.446	3834	81.446	3891	81.446	3948	81.446	4005	81.446	4062	81.446
3721	81.446	3778	81.446	3835	81.446	3892	81.446	3949	81.446	4006	81.446	4063	81.446
3722	81.446	3779	81.446	3836	81.446	3893	81.446	3950	81.446	4007	81.446	4064	81.446
3723	81.446	3780	81.446	3837	81.446	3894	81.446	3951	81.446	4008	81.446	4065	81.446
3724	81.446	3781	81.446	3838	81.446	3895	81.446	3952	81.446	4009	81.446	4066	81.446
3725	81.446	3782	81.446	3839	81.446	3896	81.446	3953	81.446	4010	81.446	4067	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
4068	81.446	4125	81.446	4182	81.446	4239	81.446	4296	81.446	4353	81.446	4410	81.446
4069	81.446	4126	81.446	4183	81.446	4240	81.446	4297	81.446	4354	81.446	4411	81.446
4070	81.446	4127	81.446	4184	81.446	4241	81.446	4298	81.446	4355	81.446	4412	81.446
4071	81.446	4128	81.446	4185	81.446	4242	81.446	4299	81.446	4356	81.446	4413	81.446
4072	81.446	4129	81.446	4186	81.446	4243	81.446	4300	81.446	4357	81.446	4414	81.446
4073	81.446	4130	81.446	4187	81.446	4244	81.446	4301	81.446	4358	81.446	4415	81.446
4074	81.446	4131	81.446	4188	81.446	4245	81.446	4302	81.446	4359	81.446	4416	81.446
4075	81.446	4132	81.446	4189	81.446	4246	81.446	4303	81.446	4360	81.446	4417	81.446
4076	81.446	4133	81.446	4190	81.446	4247	81.446	4304	81.446	4361	81.446	4418	81.446
4077	81.446	4134	81.446	4191	81.446	4248	81.446	4305	81.446	4362	81.446	4419	81.446
4078	81.446	4135	81.446	4192	81.446	4249	81.446	4306	81.446	4363	81.446	4420	81.446
4079	81.446	4136	81.446	4193	81.446	4250	81.446	4307	81.446	4364	81.446	4421	81.446
4080	81.446	4137	81.446	4194	81.446	4251	81.446	4308	81.446	4365	81.446	4422	81.446
4081	81.446	4138	81.446	4195	81.446	4252	81.446	4309	81.446	4366	81.446	4423	81.446
4082	81.446	4139	81.446	4196	81.446	4253	81.446	4310	81.446	4367	81.446	4424	81.446
4083	81.446	4140	81.446	4197	81.446	4254	81.446	4311	81.446	4368	81.446	4425	81.446
4084	81.446	4141	81.446	4198	81.446	4255	81.446	4312	81.446	4369	81.446	4426	81.446
4085	81.446	4142	81.446	4199	81.446	4256	81.446	4313	81.446	4370	81.446	4427	81.446
4086	81.446	4143	81.446	4200	81.446	4257	81.446	4314	81.446	4371	81.446	4428	81.446
4087	81.446	4144	81.446	4201	81.446	4258	81.446	4315	81.446	4372	81.446	4429	81.446
4088	81.446	4145	81.446	4202	81.446	4259	81.446	4316	81.446	4373	81.446	4430	81.446
4089	81.446	4146	81.446	4203	81.446	4260	81.446	4317	81.446	4374	81.446	4431	81.446
4090	81.446	4147	81.446	4204	81.446	4261	81.446	4318	81.446	4375	81.446	4432	81.446
4091	81.446	4148	81.446	4205	81.446	4262	81.446	4319	81.446	4376	81.446	4433	81.446
4092	81.446	4149	81.446	4206	81.446	4263	81.446	4320	81.446	4377	81.446	4434	81.446
4093	81.446	4150	81.446	4207	81.446	4264	81.446	4321	81.446	4378	81.446	4435	81.446
4094	81.446	4151	81.446	4208	81.446	4265	81.446	4322	81.446	4379	81.446	4436	81.446
4095	81.446	4152	81.446	4209	81.446	4266	81.446	4323	81.446	4380	81.446	4437	81.446
4096	81.446	4153	81.446	4210	81.446	4267	81.446	4324	81.446	4381	81.446	4438	81.446
4097	81.446	4154	81.446	4211	81.446	4268	81.446	4325	81.446	4382	81.446	4439	81.446
4098	81.446	4155	81.446	4212	81.446	4269	81.446	4326	81.446	4383	81.446	4440	81.446
4099	81.446	4156	81.446	4213	81.446	4270	81.446	4327	81.446	4384	81.446	4441	81.446
4100	81.446	4157	81.446	4214	81.446	4271	81.446	4328	81.446	4385	81.446	4442	81.446
4101	81.446	4158	81.446	4215	81.446	4272	81.446	4329	81.446	4386	81.446	4443	81.446
4102	81.446	4159	81.446	4216	81.446	4273	81.446	4330	81.446	4387	81.446	4444	81.446
4103	81.446	4160	81.446	4217	81.446	4274	81.446	4331	81.446	4388	81.446	4445	81.446
4104	81.446	4161	81.446	4218	81.446	4275	81.446	4332	81.446	4389	81.446	4446	81.446
4105	81.446	4162	81.446	4219	81.446	4276	81.446	4333	81.446	4390	81.446	4447	81.446
4106	81.446	4163	81.446	4220	81.446	4277	81.446	4334	81.446	4391	81.446	4448	81.446
4107	81.446	4164	81.446	4221	81.446	4278	81.446	4335	81.446	4392	81.446	4449	81.446
4108	81.446	4165	81.446	4222	81.446	4279	81.446	4336	81.446	4393	81.446	4450	81.446
4109	81.446	4166	81.446	4223	81.446	4280	81.446	4337	81.446	4394	81.446	4451	81.446
4110	81.446	4167	81.446	4224	81.446	4281	81.446	4338	81.446	4395	81.446	4452	81.446
4111	81.446	4168	81.446	4225	81.446	4282	81.446	4339	81.446	4396	81.446	4453	81.446
4112	81.446	4169	81.446	4226	81.446	4283	81.446	4340	81.446	4397	81.446	4454	81.446
4113	81.446	4170	81.446	4227	81.446	4284	81.446	4341	81.446	4398	81.446	4455	81.446
4114	81.446	4171	81.446	4228	81.446	4285	81.446	4342	81.446	4399	81.446	4456	81.446
4115	81.446	4172	81.446	4229	81.446	4286	81.446	4343	81.446	4400	81.446	4457	81.446
4116	81.446	4173	81.446	4230	81.446	4287	81.446	4344	81.446	4401	81.446	4458	81.446
4117	81.446	4174	81.446	4231	81.446	4288	81.446	4345	81.446	4402	81.446	4459	81.446
4118	81.446	4175	81.446	4232	81.446	4289	81.446	4346	81.446	4403	81.446	4460	81.446
4119	81.446	4176	81.446	4233	81.446	4290	81.446	4347	81.446	4404	81.446	4461	81.446
4120	81.446	4177	81.446	4234	81.446	4291	81.446	4348	81.446	4405	81.446	4462	81.446
4121	81.446	4178	81.446	4235	81.446	4292	81.446	4349	81.446	4406	81.446	4463	81.446
4122	81.446	4179	81.446	4236	81.446	4293	81.446	4350	81.446	4407	81.446	4464	81.446
4123	81.446	4180	81.446	4237	81.446	4294	81.446	4351	81.446	4408	81.446	4465	81.446
4124	81.446	4181	81.446	4238	81.446	4295	81.446	4352	81.446	4409	81.446	4466	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
4467	81.446	4524	81.446	4581	81.446	4638	81.446	4695	81.446	4752	81.446	4809	81.446
4468	81.446	4525	81.446	4582	81.446	4639	81.446	4696	81.446	4753	81.446	4810	81.446
4469	81.446	4526	81.446	4583	81.446	4640	81.446	4697	81.446	4754	81.446	4811	81.446
4470	81.446	4527	81.446	4584	81.446	4641	81.446	4698	81.446	4755	81.446	4812	81.446
4471	81.446	4528	81.446	4585	81.446	4642	81.446	4699	81.446	4756	81.446	4813	81.446
4472	81.446	4529	81.446	4586	81.446	4643	81.446	4700	81.446	4757	81.446	4814	81.446
4473	81.446	4530	81.446	4587	81.446	4644	81.446	4701	81.446	4758	81.446	4815	81.446
4474	81.446	4531	81.446	4588	81.446	4645	81.446	4702	81.446	4759	81.446	4816	81.446
4475	81.446	4532	81.446	4589	81.446	4646	81.446	4703	81.446	4760	81.446	4817	81.446
4476	81.446	4533	81.446	4590	81.446	4647	81.446	4704	81.446	4761	81.446	4818	81.446
4477	81.446	4534	81.446	4591	81.446	4648	81.446	4705	81.446	4762	81.446	4819	81.446
4478	81.446	4535	81.446	4592	81.446	4649	81.446	4706	81.446	4763	81.446	4820	81.446
4479	81.446	4536	81.446	4593	81.446	4650	81.446	4707	81.446	4764	81.446	4821	81.446
4480	81.446	4537	81.446	4594	81.446	4651	81.446	4708	81.446	4765	81.446	4822	81.446
4481	81.446	4538	81.446	4595	81.446	4652	81.446	4709	81.446	4766	81.446	4823	81.446
4482	81.446	4539	81.446	4596	81.446	4653	81.446	4710	81.446	4767	81.446	4824	81.446
4483	81.446	4540	81.446	4597	81.446	4654	81.446	4711	81.446	4768	81.446	4825	81.446
4484	81.446	4541	81.446	4598	81.446	4655	81.446	4712	81.446	4769	81.446	4826	81.446
4485	81.446	4542	81.446	4599	81.446	4656	81.446	4713	81.446	4770	81.446	4827	81.446
4486	81.446	4543	81.446	4600	81.446	4657	81.446	4714	81.446	4771	81.446	4828	81.446
4487	81.446	4544	81.446	4601	81.446	4658	81.446	4715	81.446	4772	81.446	4829	81.446
4488	81.446	4545	81.446	4602	81.446	4659	81.446	4716	81.446	4773	81.446	4830	81.446
4489	81.446	4546	81.446	4603	81.446	4660	81.446	4717	81.446	4774	81.446	4831	81.446
4490	81.446	4547	81.446	4604	81.446	4661	81.446	4718	81.446	4775	81.446	4832	81.446
4491	81.446	4548	81.446	4605	81.446	4662	81.446	4719	81.446	4776	81.446	4833	81.446
4492	81.446	4549	81.446	4606	81.446	4663	81.446	4720	81.446	4777	81.446	4834	81.446
4493	81.446	4550	81.446	4607	81.446	4664	81.446	4721	81.446	4778	81.446	4835	81.446
4494	81.446	4551	81.446	4608	81.446	4665	81.446	4722	81.446	4779	81.446	4836	81.446
4495	81.446	4552	81.446	4609	81.446	4666	81.446	4723	81.446	4780	81.446	4837	81.446
4496	81.446	4553	81.446	4610	81.446	4667	81.446	4724	81.446	4781	81.446	4838	81.446
4497	81.446	4554	81.446	4611	81.446	4668	81.446	4725	81.446	4782	81.446	4839	81.446
4498	81.446	4555	81.446	4612	81.446	4669	81.446	4726	81.446	4783	81.446	4840	81.446
4499	81.446	4556	81.446	4613	81.446	4670	81.446	4727	81.446	4784	81.446	4841	81.446
4500	81.446	4557	81.446	4614	81.446	4671	81.446	4728	81.446	4785	81.446	4842	81.446
4501	81.446	4558	81.446	4615	81.446	4672	81.446	4729	81.446	4786	81.446	4843	81.446
4502	81.446	4559	81.446	4616	81.446	4673	81.446	4730	81.446	4787	81.446	4844	81.446
4503	81.446	4560	81.446	4617	81.446	4674	81.446	4731	81.446	4788	81.446	4845	81.446
4504	81.446	4561	81.446	4618	81.446	4675	81.446	4732	81.446	4789	81.446	4846	81.446
4505	81.446	4562	81.446	4619	81.446	4676	81.446	4733	81.446	4790	81.446	4847	81.446
4506	81.446	4563	81.446	4620	81.446	4677	81.446	4734	81.446	4791	81.446	4848	81.446
4507	81.446	4564	81.446	4621	81.446	4678	81.446	4735	81.446	4792	81.446	4849	81.446
4508	81.446	4565	81.446	4622	81.446	4679	81.446	4736	81.446	4793	81.446	4850	81.446
4509	81.446	4566	81.446	4623	81.446	4680	81.446	4737	81.446	4794	81.446	4851	81.446
4510	81.446	4567	81.446	4624	81.446	4681	81.446	4738	81.446	4795	81.446	4852	81.446
4511	81.446	4568	81.446	4625	81.446	4682	81.446	4739	81.446	4796	81.446	4853	81.446
4512	81.446	4569	81.446	4626	81.446	4683	81.446	4740	81.446	4797	81.446	4854	81.446
4513	81.446	4570	81.446	4627	81.446	4684	81.446	4741	81.446	4798	81.446	4855	81.446
4514	81.446	4571	81.446	4628	81.446	4685	81.446	4742	81.446	4799	81.446	4856	81.446
4515	81.446	4572	81.446	4629	81.446	4686	81.446	4743	81.446	4800	81.446	4857	81.446
4516	81.446	4573	81.446	4630	81.446	4687	81.446	4744	81.446	4801	81.446	4858	81.446
4517	81.446	4574	81.446	4631	81.446	4688	81.446	4745	81.446	4802	81.446	4859	81.446
4518	81.446	4575	81.446	4632	81.446	4689	81.446	4746	81.446	4803	81.446	4860	81.446
4519	81.446	4576	81.446	4633	81.446	4690	81.446	4747	81.446	4804	81.446	4861	81.446
4520	81.446	4577	81.446	4634	81.446	4691	81.446	4748	81.446	4805	81.446	4862	81.446
4521	81.446	4578	81.446	4635	81.446	4692	81.446	4749	81.446	4806	81.446	4863	81.446
4522	81.446	4579	81.446	4636	81.446	4693	81.446	4750	81.446	4807	81.446	4864	81.446
4523	81.446	4580	81.446	4637	81.446	4694	81.446	4751	81.446	4808	81.446	4865	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
4866	81.446	4923	81.446	4980	81.446	5037	81.446	5094	81.446	5151	81.446	5208	81.446
4867	81.446	4924	81.446	4981	81.446	5038	81.446	5095	81.446	5152	81.446	5209	81.446
4868	81.446	4925	81.446	4982	81.446	5039	81.446	5096	81.446	5153	81.446	5210	81.446
4869	81.446	4926	81.446	4983	81.446	5040	81.446	5097	81.446	5154	81.446	5211	81.446
4870	81.446	4927	81.446	4984	81.446	5041	81.446	5098	81.446	5155	81.446	5212	81.446
4871	81.446	4928	81.446	4985	81.446	5042	81.446	5099	81.446	5156	81.446	5213	81.446
4872	81.446	4929	81.446	4986	81.446	5043	81.446	5100	81.446	5157	81.446	5214	81.446
4873	81.446	4930	81.446	4987	81.446	5044	81.446	5101	81.446	5158	81.446	5215	81.446
4874	81.446	4931	81.446	4988	81.446	5045	81.446	5102	81.446	5159	81.446	5216	81.446
4875	81.446	4932	81.446	4989	81.446	5046	81.446	5103	81.446	5160	81.446	5217	81.446
4876	81.446	4933	81.446	4990	81.446	5047	81.446	5104	81.446	5161	81.446	5218	81.446
4877	81.446	4934	81.446	4991	81.446	5048	81.446	5105	81.446	5162	81.446	5219	81.446
4878	81.446	4935	81.446	4992	81.446	5049	81.446	5106	81.446	5163	81.446	5220	81.446
4879	81.446	4936	81.446	4993	81.446	5050	81.446	5107	81.446	5164	81.446	5221	81.446
4880	81.446	4937	81.446	4994	81.446	5051	81.446	5108	81.446	5165	81.446	5222	81.446
4881	81.446	4938	81.446	4995	81.446	5052	81.446	5109	81.446	5166	81.446	5223	81.446
4882	81.446	4939	81.446	4996	81.446	5053	81.446	5110	81.446	5167	81.446	5224	81.446
4883	81.446	4940	81.446	4997	81.446	5054	81.446	5111	81.446	5168	81.446	5225	81.446
4884	81.446	4941	81.446	4998	81.446	5055	81.446	5112	81.446	5169	81.446	5226	81.446
4885	81.446	4942	81.446	4999	81.446	5056	81.446	5113	81.446	5170	81.446	5227	81.446
4886	81.446	4943	81.446	5000	81.446	5057	81.446	5114	81.446	5171	81.446	5228	81.446
4887	81.446	4944	81.446	5001	81.446	5058	81.446	5115	81.446	5172	81.446	5229	81.446
4888	81.446	4945	81.446	5002	81.446	5059	81.446	5116	81.446	5173	81.446	5230	81.446
4889	81.446	4946	81.446	5003	81.446	5060	81.446	5117	81.446	5174	81.446	5231	81.446
4890	81.446	4947	81.446	5004	81.446	5061	81.446	5118	81.446	5175	81.446	5232	81.446
4891	81.446	4948	81.446	5005	81.446	5062	81.446	5119	81.446	5176	81.446	5233	81.446
4892	81.446	4949	81.446	5006	81.446	5063	81.446	5120	81.446	5177	81.446	5234	81.446
4893	81.446	4950	81.446	5007	81.446	5064	81.446	5121	81.446	5178	81.446	5235	81.446
4894	81.446	4951	81.446	5008	81.446	5065	81.446	5122	81.446	5179	81.446	5236	81.446
4895	81.446	4952	81.446	5009	81.446	5066	81.446	5123	81.446	5180	81.446	5237	81.446
4896	81.446	4953	81.446	5010	81.446	5067	81.446	5124	81.446	5181	81.446	5238	81.446
4897	81.446	4954	81.446	5011	81.446	5068	81.446	5125	81.446	5182	81.446	5239	81.446
4898	81.446	4955	81.446	5012	81.446	5069	81.446	5126	81.446	5183	81.446	5240	81.446
4899	81.446	4956	81.446	5013	81.446	5070	81.446	5127	81.446	5184	81.446	5241	81.446
4900	81.446	4957	81.446	5014	81.446	5071	81.446	5128	81.446	5185	81.446	5242	81.446
4901	81.446	4958	81.446	5015	81.446	5072	81.446	5129	81.446	5186	81.446	5243	81.446
4902	81.446	4959	81.446	5016	81.446	5073	81.446	5130	81.446	5187	81.446	5244	81.446
4903	81.446	4960	81.446	5017	81.446	5074	81.446	5131	81.446	5188	81.446	5245	81.446
4904	81.446	4961	81.446	5018	81.446	5075	81.446	5132	81.446	5189	81.446	5246	81.446
4905	81.446	4962	81.446	5019	81.446	5076	81.446	5133	81.446	5190	81.446	5247	81.446
4906	81.446	4963	81.446	5020	81.446	5077	81.446	5134	81.446	5191	81.446	5248	81.446
4907	81.446	4964	81.446	5021	81.446	5078	81.446	5135	81.446	5192	81.446	5249	81.446
4908	81.446	4965	81.446	5022	81.446	5079	81.446	5136	81.446	5193	81.446	5250	81.446
4909	81.446	4966	81.446	5023	81.446	5080	81.446	5137	81.446	5194	81.446	5251	81.446
4910	81.446	4967	81.446	5024	81.446	5081	81.446	5138	81.446	5195	81.446	5252	81.446
4911	81.446	4968	81.446	5025	81.446	5082	81.446	5139	81.446	5196	81.446	5253	81.446
4912	81.446	4969	81.446	5026	81.446	5083	81.446	5140	81.446	5197	81.446	5254	81.446
4913	81.446	4970	81.446	5027	81.446	5084	81.446	5141	81.446	5198	81.446	5255	81.446
4914	81.446	4971	81.446	5028	81.446	5085	81.446	5142	81.446	5199	81.446	5256	81.446
4915	81.446	4972	81.446	5029	81.446	5086	81.446	5143	81.446	5200	81.446	5257	81.446
4916	81.446	4973	81.446	5030	81.446	5087	81.446	5144	81.446	5201	81.446	5258	81.446
4917	81.446	4974	81.446	5031	81.446	5088	81.446	5145	81.446	5202	81.446	5259	81.446
4918	81.446	4975	81.446	5032	81.446	5089	81.446	5146	81.446	5203	81.446	5260	81.446
4919	81.446	4976	81.446	5033	81.446	5090	81.446	5147	81.446	5204	81.446	5261	81.446
4920	81.446	4977	81.446	5034	81.446	5091	81.446	5148	81.446	5205	81.446	5262	81.446
4921	81.446	4978	81.446	5035	81.446	5092	81.446	5149	81.446	5206	81.446	5263	81.446
4922	81.446	4979	81.446	5036	81.446	5093	81.446	5150	81.446	5207	81.446	5264	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
5265	81.446	5322	81.446	5379	81.446	5436	81.446	5493	81.446	5550	81.446	5607	81.446
5266	81.446	5323	81.446	5380	81.446	5437	81.446	5494	81.446	5551	81.446	5608	81.446
5267	81.446	5324	81.446	5381	81.446	5438	81.446	5495	81.446	5552	81.446	5609	81.446
5268	81.446	5325	81.446	5382	81.446	5439	81.446	5496	81.446	5553	81.446	5610	81.446
5269	81.446	5326	81.446	5383	81.446	5440	81.446	5497	81.446	5554	81.446	5611	81.446
5270	81.446	5327	81.446	5384	81.446	5441	81.446	5498	81.446	5555	81.446	5612	81.446
5271	81.446	5328	81.446	5385	81.446	5442	81.446	5499	81.446	5556	81.446	5613	81.446
5272	81.446	5329	81.446	5386	81.446	5443	81.446	5500	81.446	5557	81.446	5614	81.446
5273	81.446	5330	81.446	5387	81.446	5444	81.446	5501	81.446	5558	81.446	5615	81.446
5274	81.446	5331	81.446	5388	81.446	5445	81.446	5502	81.446	5559	81.446	5616	81.446
5275	81.446	5332	81.446	5389	81.446	5446	81.446	5503	81.446	5560	81.446	5617	81.446
5276	81.446	5333	81.446	5390	81.446	5447	81.446	5504	81.446	5561	81.446	5618	81.446
5277	81.446	5334	81.446	5391	81.446	5448	81.446	5505	81.446	5562	81.446	5619	81.446
5278	81.446	5335	81.446	5392	81.446	5449	81.446	5506	81.446	5563	81.446	5620	81.446
5279	81.446	5336	81.446	5393	81.446	5450	81.446	5507	81.446	5564	81.446	5621	81.446
5280	81.446	5337	81.446	5394	81.446	5451	81.446	5508	81.446	5565	81.446	5622	81.446
5281	81.446	5338	81.446	5395	81.446	5452	81.446	5509	81.446	5566	81.446	5623	81.446
5282	81.446	5339	81.446	5396	81.446	5453	81.446	5510	81.446	5567	81.446	5624	81.446
5283	81.446	5340	81.446	5397	81.446	5454	81.446	5511	81.446	5568	81.446	5625	81.446
5284	81.446	5341	81.446	5398	81.446	5455	81.446	5512	81.446	5569	81.446	5626	81.446
5285	81.446	5342	81.446	5399	81.446	5456	81.446	5513	81.446	5570	81.446	5627	81.446
5286	81.446	5343	81.446	5400	81.446	5457	81.446	5514	81.446	5571	81.446	5628	81.446
5287	81.446	5344	81.446	5401	81.446	5458	81.446	5515	81.446	5572	81.446	5629	81.446
5288	81.446	5345	81.446	5402	81.446	5459	81.446	5516	81.446	5573	81.446	5630	81.446
5289	81.446	5346	81.446	5403	81.446	5460	81.446	5517	81.446	5574	81.446	5631	81.446
5290	81.446	5347	81.446	5404	81.446	5461	81.446	5518	81.446	5575	81.446	5632	81.446
5291	81.446	5348	81.446	5405	81.446	5462	81.446	5519	81.446	5576	81.446	5633	81.446
5292	81.446	5349	81.446	5406	81.446	5463	81.446	5520	81.446	5577	81.446	5634	81.446
5293	81.446	5350	81.446	5407	81.446	5464	81.446	5521	81.446	5578	81.446	5635	81.446
5294	81.446	5351	81.446	5408	81.446	5465	81.446	5522	81.446	5579	81.446	5636	81.446
5295	81.446	5352	81.446	5409	81.446	5466	81.446	5523	81.446	5580	81.446	5637	81.446
5296	81.446	5353	81.446	5410	81.446	5467	81.446	5524	81.446	5581	81.446	5638	81.446
5297	81.446	5354	81.446	5411	81.446	5468	81.446	5525	81.446	5582	81.446	5639	81.446
5298	81.446	5355	81.446	5412	81.446	5469	81.446	5526	81.446	5583	81.446	5640	81.446
5299	81.446	5356	81.446	5413	81.446	5470	81.446	5527	81.446	5584	81.446	5641	81.446
5300	81.446	5357	81.446	5414	81.446	5471	81.446	5528	81.446	5585	81.446	5642	81.446
5301	81.446	5358	81.446	5415	81.446	5472	81.446	5529	81.446	5586	81.446	5643	81.446
5302	81.446	5359	81.446	5416	81.446	5473	81.446	5530	81.446	5587	81.446	5644	81.446
5303	81.446	5360	81.446	5417	81.446	5474	81.446	5531	81.446	5588	81.446	5645	81.446
5304	81.446	5361	81.446	5418	81.446	5475	81.446	5532	81.446	5589	81.446	5646	81.446
5305	81.446	5362	81.446	5419	81.446	5476	81.446	5533	81.446	5590	81.446	5647	81.446
5306	81.446	5363	81.446	5420	81.446	5477	81.446	5534	81.446	5591	81.446	5648	81.446
5307	81.446	5364	81.446	5421	81.446	5478	81.446	5535	81.446	5592	81.446	5649	81.446
5308	81.446	5365	81.446	5422	81.446	5479	81.446	5536	81.446	5593	81.446	5650	81.446
5309	81.446	5366	81.446	5423	81.446	5480	81.446	5537	81.446	5594	81.446	5651	81.446
5310	81.446	5367	81.446	5424	81.446	5481	81.446	5538	81.446	5595	81.446	5652	81.446
5311	81.446	5368	81.446	5425	81.446	5482	81.446	5539	81.446	5596	81.446	5653	81.446
5312	81.446	5369	81.446	5426	81.446	5483	81.446	5540	81.446	5597	81.446	5654	81.446
5313	81.446	5370	81.446	5427	81.446	5484	81.446	5541	81.446	5598	81.446	5655	81.446
5314	81.446	5371	81.446	5428	81.446	5485	81.446	5542	81.446	5599	81.446	5656	81.446
5315	81.446	5372	81.446	5429	81.446	5486	81.446	5543	81.446	5600	81.446	5657	81.446
5316	81.446	5373	81.446	5430	81.446	5487	81.446	5544	81.446	5601	81.446	5658	81.446
5317	81.446	5374	81.446	5431	81.446	5488	81.446	5545	81.446	5602	81.446	5659	81.446
5318	81.446	5375	81.446	5432	81.446	5489	81.446	5546	81.446	5603	81.446	5660	81.446
5319	81.446	5376	81.446	5433	81.446	5490	81.446	5547	81.446	5604	81.446	5661	81.446
5320	81.446	5377	81.446	5434	81.446	5491	81.446	5548	81.446	5605	81.446	5662	81.446
5321	81.446	5378	81.446	5435	81.446	5492	81.446	5549	81.446	5606	81.446	5663	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
5664	81.446	5721	81.446	5778	81.446	5835	81.446	5892	81.446	5949	81.446	6006	81.446
5665	81.446	5722	81.446	5779	81.446	5836	81.446	5893	81.446	5950	81.446	6007	81.446
5666	81.446	5723	81.446	5780	81.446	5837	81.446	5894	81.446	5951	81.446	6008	81.446
5667	81.446	5724	81.446	5781	81.446	5838	81.446	5895	81.446	5952	81.446	6009	81.446
5668	81.446	5725	81.446	5782	81.446	5839	81.446	5896	81.446	5953	81.446	6010	81.446
5669	81.446	5726	81.446	5783	81.446	5840	81.446	5897	81.446	5954	81.446	6011	81.446
5670	81.446	5727	81.446	5784	81.446	5841	81.446	5898	81.446	5955	81.446	6012	81.446
5671	81.446	5728	81.446	5785	81.446	5842	81.446	5899	81.446	5956	81.446	6013	81.446
5672	81.446	5729	81.446	5786	81.446	5843	81.446	5900	81.446	5957	81.446	6014	81.446
5673	81.446	5730	81.446	5787	81.446	5844	81.446	5901	81.446	5958	81.446	6015	81.446
5674	81.446	5731	81.446	5788	81.446	5845	81.446	5902	81.446	5959	81.446	6016	81.446
5675	81.446	5732	81.446	5789	81.446	5846	81.446	5903	81.446	5960	81.446	6017	81.446
5676	81.446	5733	81.446	5790	81.446	5847	81.446	5904	81.446	5961	81.446	6018	81.446
5677	81.446	5734	81.446	5791	81.446	5848	81.446	5905	81.446	5962	81.446	6019	81.446
5678	81.446	5735	81.446	5792	81.446	5849	81.446	5906	81.446	5963	81.446	6020	81.446
5679	81.446	5736	81.446	5793	81.446	5850	81.446	5907	81.446	5964	81.446	6021	81.446
5680	81.446	5737	81.446	5794	81.446	5851	81.446	5908	81.446	5965	81.446	6022	81.446
5681	81.446	5738	81.446	5795	81.446	5852	81.446	5909	81.446	5966	81.446	6023	81.446
5682	81.446	5739	81.446	5796	81.446	5853	81.446	5910	81.446	5967	81.446	6024	81.446
5683	81.446	5740	81.446	5797	81.446	5854	81.446	5911	81.446	5968	81.446	6025	81.446
5684	81.446	5741	81.446	5798	81.446	5855	81.446	5912	81.446	5969	81.446	6026	81.446
5685	81.446	5742	81.446	5799	81.446	5856	81.446	5913	81.446	5970	81.446	6027	81.446
5686	81.446	5743	81.446	5800	81.446	5857	81.446	5914	81.446	5971	81.446	6028	81.446
5687	81.446	5744	81.446	5801	81.446	5858	81.446	5915	81.446	5972	81.446	6029	81.446
5688	81.446	5745	81.446	5802	81.446	5859	81.446	5916	81.446	5973	81.446	6030	81.446
5689	81.446	5746	81.446	5803	81.446	5860	81.446	5917	81.446	5974	81.446	6031	81.446
5690	81.446	5747	81.446	5804	81.446	5861	81.446	5918	81.446	5975	81.446	6032	81.446
5691	81.446	5748	81.446	5805	81.446	5862	81.446	5919	81.446	5976	81.446	6033	81.446
5692	81.446	5749	81.446	5806	81.446	5863	81.446	5920	81.446	5977	81.446	6034	81.446
5693	81.446	5750	81.446	5807	81.446	5864	81.446	5921	81.446	5978	81.446	6035	81.446
5694	81.446	5751	81.446	5808	81.446	5865	81.446	5922	81.446	5979	81.446	6036	81.446
5695	81.446	5752	81.446	5809	81.446	5866	81.446	5923	81.446	5980	81.446	6037	81.446
5696	81.446	5753	81.446	5810	81.446	5867	81.446	5924	81.446	5981	81.446	6038	81.446
5697	81.446	5754	81.446	5811	81.446	5868	81.446	5925	81.446	5982	81.446	6039	81.446
5698	81.446	5755	81.446	5812	81.446	5869	81.446	5926	81.446	5983	81.446	6040	81.446
5699	81.446	5756	81.446	5813	81.446	5870	81.446	5927	81.446	5984	81.446	6041	81.446
5700	81.446	5757	81.446	5814	81.446	5871	81.446	5928	81.446	5985	81.446	6042	81.446
5701	81.446	5758	81.446	5815	81.446	5872	81.446	5929	81.446	5986	81.446	6043	81.446
5702	81.446	5759	81.446	5816	81.446	5873	81.446	5930	81.446	5987	81.446	6044	81.446
5703	81.446	5760	81.446	5817	81.446	5874	81.446	5931	81.446	5988	81.446	6045	81.446
5704	81.446	5761	81.446	5818	81.446	5875	81.446	5932	81.446	5989	81.446	6046	81.446
5705	81.446	5762	81.446	5819	81.446	5876	81.446	5933	81.446	5990	81.446	6047	81.446
5706	81.446	5763	81.446	5820	81.446	5877	81.446	5934	81.446	5991	81.446	6048	81.446
5707	81.446	5764	81.446	5821	81.446	5878	81.446	5935	81.446	5992	81.446	6049	81.446
5708	81.446	5765	81.446	5822	81.446	5879	81.446	5936	81.446	5993	81.446	6050	81.446
5709	81.446	5766	81.446	5823	81.446	5880	81.446	5937	81.446	5994	81.446	6051	81.446
5710	81.446	5767	81.446	5824	81.446	5881	81.446	5938	81.446	5995	81.446	6052	81.446
5711	81.446	5768	81.446	5825	81.446	5882	81.446	5939	81.446	5996	81.446	6053	81.446
5712	81.446	5769	81.446	5826	81.446	5883	81.446	5940	81.446	5997	81.446	6054	81.446
5713	81.446	5770	81.446	5827	81.446	5884	81.446	5941	81.446	5998	81.446	6055	81.446
5714	81.446	5771	81.446	5828	81.446	5885	81.446	5942	81.446	5999	81.446	6056	81.446
5715	81.446	5772	81.446	5829	81.446	5886	81.446	5943	81.446	6000	81.446	6057	81.446
5716	81.446	5773	81.446	5830	81.446	5887	81.446	5944	81.446	6001	81.446	6058	81.446
5717	81.446	5774	81.446	5831	81.446	5888	81.446	5945	81.446	6002	81.446	6059	81.446
5718	81.446	5775	81.446	5832	81.446	5889	81.446	5946	81.446	6003	81.446	6060	81.446
5719	81.446	5776	81.446	5833	81.446	5890	81.446	5947	81.446	6004	81.446	6061	81.446
5720	81.446	5777	81.446	5834	81.446	5891	81.446	5948	81.446	6005	81.446	6062	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
6063	81.446	6120	81.446	6177	81.446	6234	81.446	6291	81.446	6348	81.446	6405	81.446
6064	81.446	6121	81.446	6178	81.446	6235	81.446	6292	81.446	6349	81.446	6406	81.446
6065	81.446	6122	81.446	6179	81.446	6236	81.446	6293	81.446	6350	81.446	6407	81.446
6066	81.446	6123	81.446	6180	81.446	6237	81.446	6294	81.446	6351	81.446	6408	81.446
6067	81.446	6124	81.446	6181	81.446	6238	81.446	6295	81.446	6352	81.446	6409	81.446
6068	81.446	6125	81.446	6182	81.446	6239	81.446	6296	81.446	6353	81.446	6410	81.446
6069	81.446	6126	81.446	6183	81.446	6240	81.446	6297	81.446	6354	81.446	6411	81.446
6070	81.446	6127	81.446	6184	81.446	6241	81.446	6298	81.446	6355	81.446	6412	81.446
6071	81.446	6128	81.446	6185	81.446	6242	81.446	6299	81.446	6356	81.446	6413	81.446
6072	81.446	6129	81.446	6186	81.446	6243	81.446	6300	81.446	6357	81.446	6414	81.446
6073	81.446	6130	81.446	6187	81.446	6244	81.446	6301	81.446	6358	81.446	6415	81.446
6074	81.446	6131	81.446	6188	81.446	6245	81.446	6302	81.446	6359	81.446	6416	81.446
6075	81.446	6132	81.446	6189	81.446	6246	81.446	6303	81.446	6360	81.446	6417	81.446
6076	81.446	6133	81.446	6190	81.446	6247	81.446	6304	81.446	6361	81.446	6418	81.446
6077	81.446	6134	81.446	6191	81.446	6248	81.446	6305	81.446	6362	81.446	6419	81.446
6078	81.446	6135	81.446	6192	81.446	6249	81.446	6306	81.446	6363	81.446	6420	81.446
6079	81.446	6136	81.446	6193	81.446	6250	81.446	6307	81.446	6364	81.446	6421	81.446
6080	81.446	6137	81.446	6194	81.446	6251	81.446	6308	81.446	6365	81.446	6422	81.446
6081	81.446	6138	81.446	6195	81.446	6252	81.446	6309	81.446	6366	81.446	6423	81.446
6082	81.446	6139	81.446	6196	81.446	6253	81.446	6310	81.446	6367	81.446	6424	81.446
6083	81.446	6140	81.446	6197	81.446	6254	81.446	6311	81.446	6368	81.446	6425	81.446
6084	81.446	6141	81.446	6198	81.446	6255	81.446	6312	81.446	6369	81.446	6426	81.446
6085	81.446	6142	81.446	6199	81.446	6256	81.446	6313	81.446	6370	81.446	6427	81.446
6086	81.446	6143	81.446	6200	81.446	6257	81.446	6314	81.446	6371	81.446	6428	81.446
6087	81.446	6144	81.446	6201	81.446	6258	81.446	6315	81.446	6372	81.446	6429	81.446
6088	81.446	6145	81.446	6202	81.446	6259	81.446	6316	81.446	6373	81.446	6430	81.446
6089	81.446	6146	81.446	6203	81.446	6260	81.446	6317	81.446	6374	81.446	6431	81.446
6090	81.446	6147	81.446	6204	81.446	6261	81.446	6318	81.446	6375	81.446	6432	81.446
6091	81.446	6148	81.446	6205	81.446	6262	81.446	6319	81.446	6376	81.446	6433	81.446
6092	81.446	6149	81.446	6206	81.446	6263	81.446	6320	81.446	6377	81.446	6434	81.446
6093	81.446	6150	81.446	6207	81.446	6264	81.446	6321	81.446	6378	81.446	6435	81.446
6094	81.446	6151	81.446	6208	81.446	6265	81.446	6322	81.446	6379	81.446	6436	81.446
6095	81.446	6152	81.446	6209	81.446	6266	81.446	6323	81.446	6380	81.446	6437	81.446
6096	81.446	6153	81.446	6210	81.446	6267	81.446	6324	81.446	6381	81.446	6438	81.446
6097	81.446	6154	81.446	6211	81.446	6268	81.446	6325	81.446	6382	81.446	6439	81.446
6098	81.446	6155	81.446	6212	81.446	6269	81.446	6326	81.446	6383	81.446	6440	81.446
6099	81.446	6156	81.446	6213	81.446	6270	81.446	6327	81.446	6384	81.446	6441	81.446
6100	81.446	6157	81.446	6214	81.446	6271	81.446	6328	81.446	6385	81.446	6442	81.446
6101	81.446	6158	81.446	6215	81.446	6272	81.446	6329	81.446	6386	81.446	6443	81.446
6102	81.446	6159	81.446	6216	81.446	6273	81.446	6330	81.446	6387	81.446	6444	81.446
6103	81.446	6160	81.446	6217	81.446	6274	81.446	6331	81.446	6388	81.446	6445	81.446
6104	81.446	6161	81.446	6218	81.446	6275	81.446	6332	81.446	6389	81.446	6446	81.446
6105	81.446	6162	81.446	6219	81.446	6276	81.446	6333	81.446	6390	81.446	6447	81.446
6106	81.446	6163	81.446	6220	81.446	6277	81.446	6334	81.446	6391	81.446	6448	81.446
6107	81.446	6164	81.446	6221	81.446	6278	81.446	6335	81.446	6392	81.446	6449	81.446
6108	81.446	6165	81.446	6222	81.446	6279	81.446	6336	81.446	6393	81.446	6450	81.446
6109	81.446	6166	81.446	6223	81.446	6280	81.446	6337	81.446	6394	81.446	6451	81.446
6110	81.446	6167	81.446	6224	81.446	6281	81.446	6338	81.446	6395	81.446	6452	81.446
6111	81.446	6168	81.446	6225	81.446	6282	81.446	6339	81.446	6396	81.446	6453	81.446
6112	81.446	6169	81.446	6226	81.446	6283	81.446	6340	81.446	6397	81.446	6454	81.446
6113	81.446	6170	81.446	6227	81.446	6284	81.446	6341	81.446	6398	81.446	6455	81.446
6114	81.446	6171	81.446	6228	81.446	6285	81.446	6342	81.446	6399	81.446	6456	81.446
6115	81.446	6172	81.446	6229	81.446	6286	81.446	6343	81.446	6400	81.446	6457	81.446
6116	81.446	6173	81.446	6230	81.446	6287	81.446	6344	81.446	6401	81.446	6458	81.446
6117	81.446	6174	81.446	6231	81.446	6288	81.446	6345	81.446	6402	81.446	6459	81.446
6118	81.446	6175	81.446	6232	81.446	6289	81.446	6346	81.446	6403	81.446	6460	81.446
6119	81.446	6176	81.446	6233	81.446	6290	81.446	6347	81.446	6404	81.446	6461	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
6462	81.446	6519	81.446	6576	81.446	6633	81.446	6690	81.446	6747	81.446	6804	81.446
6463	81.446	6520	81.446	6577	81.446	6634	81.446	6691	81.446	6748	81.446	6805	81.446
6464	81.446	6521	81.446	6578	81.446	6635	81.446	6692	81.446	6749	81.446	6806	81.446
6465	81.446	6522	81.446	6579	81.446	6636	81.446	6693	81.446	6750	81.446	6807	81.446
6466	81.446	6523	81.446	6580	81.446	6637	81.446	6694	81.446	6751	81.446	6808	81.446
6467	81.446	6524	81.446	6581	81.446	6638	81.446	6695	81.446	6752	81.446	6809	81.446
6468	81.446	6525	81.446	6582	81.446	6639	81.446	6696	81.446	6753	81.446	6810	81.446
6469	81.446	6526	81.446	6583	81.446	6640	81.446	6697	81.446	6754	81.446	6811	81.446
6470	81.446	6527	81.446	6584	81.446	6641	81.446	6698	81.446	6755	81.446	6812	81.446
6471	81.446	6528	81.446	6585	81.446	6642	81.446	6699	81.446	6756	81.446	6813	81.446
6472	81.446	6529	81.446	6586	81.446	6643	81.446	6700	81.446	6757	81.446	6814	81.446
6473	81.446	6530	81.446	6587	81.446	6644	81.446	6701	81.446	6758	81.446	6815	81.446
6474	81.446	6531	81.446	6588	81.446	6645	81.446	6702	81.446	6759	81.446	6816	81.446
6475	81.446	6532	81.446	6589	81.446	6646	81.446	6703	81.446	6760	81.446	6817	81.446
6476	81.446	6533	81.446	6590	81.446	6647	81.446	6704	81.446	6761	81.446	6818	81.446
6477	81.446	6534	81.446	6591	81.446	6648	81.446	6705	81.446	6762	81.446	6819	81.446
6478	81.446	6535	81.446	6592	81.446	6649	81.446	6706	81.446	6763	81.446	6820	81.446
6479	81.446	6536	81.446	6593	81.446	6650	81.446	6707	81.446	6764	81.446	6821	81.446
6480	81.446	6537	81.446	6594	81.446	6651	81.446	6708	81.446	6765	81.446	6822	81.446
6481	81.446	6538	81.446	6595	81.446	6652	81.446	6709	81.446	6766	81.446	6823	81.446
6482	81.446	6539	81.446	6596	81.446	6653	81.446	6710	81.446	6767	81.446	6824	81.446
6483	81.446	6540	81.446	6597	81.446	6654	81.446	6711	81.446	6768	81.446	6825	81.446
6484	81.446	6541	81.446	6598	81.446	6655	81.446	6712	81.446	6769	81.446	6826	81.446
6485	81.446	6542	81.446	6599	81.446	6656	81.446	6713	81.446	6770	81.446	6827	81.446
6486	81.446	6543	81.446	6600	81.446	6657	81.446	6714	81.446	6771	81.446	6828	81.446
6487	81.446	6544	81.446	6601	81.446	6658	81.446	6715	81.446	6772	81.446	6829	81.446
6488	81.446	6545	81.446	6602	81.446	6659	81.446	6716	81.446	6773	81.446	6830	81.446
6489	81.446	6546	81.446	6603	81.446	6660	81.446	6717	81.446	6774	81.446	6831	81.446
6490	81.446	6547	81.446	6604	81.446	6661	81.446	6718	81.446	6775	81.446	6832	81.446
6491	81.446	6548	81.446	6605	81.446	6662	81.446	6719	81.446	6776	81.446	6833	81.446
6492	81.446	6549	81.446	6606	81.446	6663	81.446	6720	81.446	6777	81.446	6834	81.446
6493	81.446	6550	81.446	6607	81.446	6664	81.446	6721	81.446	6778	81.446	6835	81.446
6494	81.446	6551	81.446	6608	81.446	6665	81.446	6722	81.446	6779	81.446	6836	81.446
6495	81.446	6552	81.446	6609	81.446	6666	81.446	6723	81.446	6780	81.446	6837	81.446
6496	81.446	6553	81.446	6610	81.446	6667	81.446	6724	81.446	6781	81.446	6838	81.446
6497	81.446	6554	81.446	6611	81.446	6668	81.446	6725	81.446	6782	81.446	6839	81.446
6498	81.446	6555	81.446	6612	81.446	6669	81.446	6726	81.446	6783	81.446	6840	81.446
6499	81.446	6556	81.446	6613	81.446	6670	81.446	6727	81.446	6784	81.446	6841	81.446
6500	81.446	6557	81.446	6614	81.446	6671	81.446	6728	81.446	6785	81.446	6842	81.446
6501	81.446	6558	81.446	6615	81.446	6672	81.446	6729	81.446	6786	81.446	6843	81.446
6502	81.446	6559	81.446	6616	81.446	6673	81.446	6730	81.446	6787	81.446	6844	81.446
6503	81.446	6560	81.446	6617	81.446	6674	81.446	6731	81.446	6788	81.446	6845	81.446
6504	81.446	6561	81.446	6618	81.446	6675	81.446	6732	81.446	6789	81.446	6846	81.446
6505	81.446	6562	81.446	6619	81.446	6676	81.446	6733	81.446	6790	81.446	6847	81.446
6506	81.446	6563	81.446	6620	81.446	6677	81.446	6734	81.446	6791	81.446	6848	81.446
6507	81.446	6564	81.446	6621	81.446	6678	81.446	6735	81.446	6792	81.446	6849	81.446
6508	81.446	6565	81.446	6622	81.446	6679	81.446	6736	81.446	6793	81.446	6850	81.446
6509	81.446	6566	81.446	6623	81.446	6680	81.446	6737	81.446	6794	81.446	6851	81.446
6510	81.446	6567	81.446	6624	81.446	6681	81.446	6738	81.446	6795	81.446	6852	81.446
6511	81.446	6568	81.446	6625	81.446	6682	81.446	6739	81.446	6796	81.446	6853	81.446
6512	81.446	6569	81.446	6626	81.446	6683	81.446	6740	81.446	6797	81.446	6854	81.446
6513	81.446	6570	81.446	6627	81.446	6684	81.446	6741	81.446	6798	81.446	6855	81.446
6514	81.446	6571	81.446	6628	81.446	6685	81.446	6742	81.446	6799	81.446	6856	81.446
6515	81.446	6572	81.446	6629	81.446	6686	81.446	6743	81.446	6800	81.446	6857	81.446
6516	81.446	6573	81.446	6630	81.446	6687	81.446	6744	81.446	6801	81.446	6858	81.446
6517	81.446	6574	81.446	6631	81.446	6688	81.446	6745	81.446	6802	81.446	6859	81.446
6518	81.446	6575	81.446	6632	81.446	6689	81.446	6746	81.446	6803	81.446	6860	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
6861	81.446	6918	81.446	6975	81.446	7032	81.446	7089	81.446	7146	81.446	7203	81.446
6862	81.446	6919	81.446	6976	81.446	7033	81.446	7090	81.446	7147	81.446	7204	81.446
6863	81.446	6920	81.446	6977	81.446	7034	81.446	7091	81.446	7148	81.446	7205	81.446
6864	81.446	6921	81.446	6978	81.446	7035	81.446	7092	81.446	7149	81.446	7206	81.446
6865	81.446	6922	81.446	6979	81.446	7036	81.446	7093	81.446	7150	81.446	7207	81.446
6866	81.446	6923	81.446	6980	81.446	7037	81.446	7094	81.446	7151	81.446	7208	81.446
6867	81.446	6924	81.446	6981	81.446	7038	81.446	7095	81.446	7152	81.446	7209	81.446
6868	81.446	6925	81.446	6982	81.446	7039	81.446	7096	81.446	7153	81.446	7210	81.446
6869	81.446	6926	81.446	6983	81.446	7040	81.446	7097	81.446	7154	81.446	7211	81.446
6870	81.446	6927	81.446	6984	81.446	7041	81.446	7098	81.446	7155	81.446	7212	81.446
6871	81.446	6928	81.446	6985	81.446	7042	81.446	7099	81.446	7156	81.446	7213	81.446
6872	81.446	6929	81.446	6986	81.446	7043	81.446	7100	81.446	7157	81.446	7214	81.446
6873	81.446	6930	81.446	6987	81.446	7044	81.446	7101	81.446	7158	81.446	7215	81.446
6874	81.446	6931	81.446	6988	81.446	7045	81.446	7102	81.446	7159	81.446	7216	81.446
6875	81.446	6932	81.446	6989	81.446	7046	81.446	7103	81.446	7160	81.446	7217	81.446
6876	81.446	6933	81.446	6990	81.446	7047	81.446	7104	81.446	7161	81.446	7218	81.446
6877	81.446	6934	81.446	6991	81.446	7048	81.446	7105	81.446	7162	81.446	7219	81.446
6878	81.446	6935	81.446	6992	81.446	7049	81.446	7106	81.446	7163	81.446	7220	81.446
6879	81.446	6936	81.446	6993	81.446	7050	81.446	7107	81.446	7164	81.446	7221	81.446
6880	81.446	6937	81.446	6994	81.446	7051	81.446	7108	81.446	7165	81.446	7222	81.446
6881	81.446	6938	81.446	6995	81.446	7052	81.446	7109	81.446	7166	81.446	7223	81.446
6882	81.446	6939	81.446	6996	81.446	7053	81.446	7110	81.446	7167	81.446	7224	81.446
6883	81.446	6940	81.446	6997	81.446	7054	81.446	7111	81.446	7168	81.446	7225	81.446
6884	81.446	6941	81.446	6998	81.446	7055	81.446	7112	81.446	7169	81.446	7226	81.446
6885	81.446	6942	81.446	6999	81.446	7056	81.446	7113	81.446	7170	81.446	7227	81.446
6886	81.446	6943	81.446	7000	81.446	7057	81.446	7114	81.446	7171	81.446	7228	81.446
6887	81.446	6944	81.446	7001	81.446	7058	81.446	7115	81.446	7172	81.446	7229	81.446
6888	81.446	6945	81.446	7002	81.446	7059	81.446	7116	81.446	7173	81.446	7230	81.446
6889	81.446	6946	81.446	7003	81.446	7060	81.446	7117	81.446	7174	81.446	7231	81.446
6890	81.446	6947	81.446	7004	81.446	7061	81.446	7118	81.446	7175	81.446	7232	81.446
6891	81.446	6948	81.446	7005	81.446	7062	81.446	7119	81.446	7176	81.446	7233	81.446
6892	81.446	6949	81.446	7006	81.446	7063	81.446	7120	81.446	7177	81.446	7234	81.446
6893	81.446	6950	81.446	7007	81.446	7064	81.446	7121	81.446	7178	81.446	7235	81.446
6894	81.446	6951	81.446	7008	81.446	7065	81.446	7122	81.446	7179	81.446	7236	81.446
6895	81.446	6952	81.446	7009	81.446	7066	81.446	7123	81.446	7180	81.446	7237	81.446
6896	81.446	6953	81.446	7010	81.446	7067	81.446	7124	81.446	7181	81.446	7238	81.446
6897	81.446	6954	81.446	7011	81.446	7068	81.446	7125	81.446	7182	81.446	7239	81.446
6898	81.446	6955	81.446	7012	81.446	7069	81.446	7126	81.446	7183	81.446	7240	81.446
6899	81.446	6956	81.446	7013	81.446	7070	81.446	7127	81.446	7184	81.446	7241	81.446
6900	81.446	6957	81.446	7014	81.446	7071	81.446	7128	81.446	7185	81.446	7242	81.446
6901	81.446	6958	81.446	7015	81.446	7072	81.446	7129	81.446	7186	81.446	7243	81.446
6902	81.446	6959	81.446	7016	81.446	7073	81.446	7130	81.446	7187	81.446	7244	81.446
6903	81.446	6960	81.446	7017	81.446	7074	81.446	7131	81.446	7188	81.446	7245	81.446
6904	81.446	6961	81.446	7018	81.446	7075	81.446	7132	81.446	7189	81.446	7246	81.446
6905	81.446	6962	81.446	7019	81.446	7076	81.446	7133	81.446	7190	81.446	7247	81.446
6906	81.446	6963	81.446	7020	81.446	7077	81.446	7134	81.446	7191	81.446	7248	81.446
6907	81.446	6964	81.446	7021	81.446	7078	81.446	7135	81.446	7192	81.446	7249	81.446
6908	81.446	6965	81.446	7022	81.446	7079	81.446	7136	81.446	7193	81.446	7250	81.446
6909	81.446	6966	81.446	7023	81.446	7080	81.446	7137	81.446	7194	81.446	7251	81.446
6910	81.446	6967	81.446	7024	81.446	7081	81.446	7138	81.446	7195	81.446	7252	81.446
6911	81.446	6968	81.446	7025	81.446	7082	81.446	7139	81.446	7196	81.446	7253	81.446
6912	81.446	6969	81.446	7026	81.446	7083	81.446	7140	81.446	7197	81.446	7254	81.446
6913	81.446	6970	81.446	7027	81.446	7084	81.446	7141	81.446	7198	81.446	7255	81.446
6914	81.446	6971	81.446	7028	81.446	7085	81.446	7142	81.446	7199	81.446	7256	81.446
6915	81.446	6972	81.446	7029	81.446	7086	81.446	7143	81.446	7200	81.446	7257	81.446
6916	81.446	6973	81.446	7030	81.446	7087	81.446	7144	81.446	7201	81.446	7258	81.446
6917	81.446	6974	81.446	7031	81.446	7088	81.446	7145	81.446	7202	81.446	7259	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
7260	81.446	7317	81.446	7374	81.446	7431	81.446	7488	81.446	7545	81.446	7602	81.446
7261	81.446	7318	81.446	7375	81.446	7432	81.446	7489	81.446	7546	81.446	7603	81.446
7262	81.446	7319	81.446	7376	81.446	7433	81.446	7490	81.446	7547	81.446	7604	81.446
7263	81.446	7320	81.446	7377	81.446	7434	81.446	7491	81.446	7548	81.446	7605	81.446
7264	81.446	7321	81.446	7378	81.446	7435	81.446	7492	81.446	7549	81.446	7606	81.446
7265	81.446	7322	81.446	7379	81.446	7436	81.446	7493	81.446	7550	81.446	7607	81.446
7266	81.446	7323	81.446	7380	81.446	7437	81.446	7494	81.446	7551	81.446	7608	81.446
7267	81.446	7324	81.446	7381	81.446	7438	81.446	7495	81.446	7552	81.446	7609	81.446
7268	81.446	7325	81.446	7382	81.446	7439	81.446	7496	81.446	7553	81.446	7610	81.446
7269	81.446	7326	81.446	7383	81.446	7440	81.446	7497	81.446	7554	81.446	7611	81.446
7270	81.446	7327	81.446	7384	81.446	7441	81.446	7498	81.446	7555	81.446	7612	81.446
7271	81.446	7328	81.446	7385	81.446	7442	81.446	7499	81.446	7556	81.446	7613	81.446
7272	81.446	7329	81.446	7386	81.446	7443	81.446	7500	81.446	7557	81.446	7614	81.446
7273	81.446	7330	81.446	7387	81.446	7444	81.446	7501	81.446	7558	81.446	7615	81.446
7274	81.446	7331	81.446	7388	81.446	7445	81.446	7502	81.446	7559	81.446	7616	81.446
7275	81.446	7332	81.446	7389	81.446	7446	81.446	7503	81.446	7560	81.446	7617	81.446
7276	81.446	7333	81.446	7390	81.446	7447	81.446	7504	81.446	7561	81.446	7618	81.446
7277	81.446	7334	81.446	7391	81.446	7448	81.446	7505	81.446	7562	81.446	7619	81.446
7278	81.446	7335	81.446	7392	81.446	7449	81.446	7506	81.446	7563	81.446	7620	81.446
7279	81.446	7336	81.446	7393	81.446	7450	81.446	7507	81.446	7564	81.446	7621	81.446
7280	81.446	7337	81.446	7394	81.446	7451	81.446	7508	81.446	7565	81.446	7622	81.446
7281	81.446	7338	81.446	7395	81.446	7452	81.446	7509	81.446	7566	81.446	7623	81.446
7282	81.446	7339	81.446	7396	81.446	7453	81.446	7510	81.446	7567	81.446	7624	81.446
7283	81.446	7340	81.446	7397	81.446	7454	81.446	7511	81.446	7568	81.446	7625	81.446
7284	81.446	7341	81.446	7398	81.446	7455	81.446	7512	81.446	7569	81.446	7626	81.446
7285	81.446	7342	81.446	7399	81.446	7456	81.446	7513	81.446	7570	81.446	7627	81.446
7286	81.446	7343	81.446	7400	81.446	7457	81.446	7514	81.446	7571	81.446	7628	81.446
7287	81.446	7344	81.446	7401	81.446	7458	81.446	7515	81.446	7572	81.446	7629	81.446
7288	81.446	7345	81.446	7402	81.446	7459	81.446	7516	81.446	7573	81.446	7630	81.446
7289	81.446	7346	81.446	7403	81.446	7460	81.446	7517	81.446	7574	81.446	7631	81.446
7290	81.446	7347	81.446	7404	81.446	7461	81.446	7518	81.446	7575	81.446	7632	81.446
7291	81.446	7348	81.446	7405	81.446	7462	81.446	7519	81.446	7576	81.446	7633	81.446
7292	81.446	7349	81.446	7406	81.446	7463	81.446	7520	81.446	7577	81.446	7634	81.446
7293	81.446	7350	81.446	7407	81.446	7464	81.446	7521	81.446	7578	81.446	7635	81.446
7294	81.446	7351	81.446	7408	81.446	7465	81.446	7522	81.446	7579	81.446	7636	81.446
7295	81.446	7352	81.446	7409	81.446	7466	81.446	7523	81.446	7580	81.446	7637	81.446
7296	81.446	7353	81.446	7410	81.446	7467	81.446	7524	81.446	7581	81.446	7638	81.446
7297	81.446	7354	81.446	7411	81.446	7468	81.446	7525	81.446	7582	81.446	7639	81.446
7298	81.446	7355	81.446	7412	81.446	7469	81.446	7526	81.446	7583	81.446	7640	81.446
7299	81.446	7356	81.446	7413	81.446	7470	81.446	7527	81.446	7584	81.446	7641	81.446
7300	81.446	7357	81.446	7414	81.446	7471	81.446	7528	81.446	7585	81.446	7642	81.446
7301	81.446	7358	81.446	7415	81.446	7472	81.446	7529	81.446	7586	81.446	7643	81.446
7302	81.446	7359	81.446	7416	81.446	7473	81.446	7530	81.446	7587	81.446	7644	81.446
7303	81.446	7360	81.446	7417	81.446	7474	81.446	7531	81.446	7588	81.446	7645	81.446
7304	81.446	7361	81.446	7418	81.446	7475	81.446	7532	81.446	7589	81.446	7646	81.446
7305	81.446	7362	81.446	7419	81.446	7476	81.446	7533	81.446	7590	81.446	7647	81.446
7306	81.446	7363	81.446	7420	81.446	7477	81.446	7534	81.446	7591	81.446	7648	81.446
7307	81.446	7364	81.446	7421	81.446	7478	81.446	7535	81.446	7592	81.446	7649	81.446
7308	81.446	7365	81.446	7422	81.446	7479	81.446	7536	81.446	7593	81.446	7650	81.446
7309	81.446	7366	81.446	7423	81.446	7480	81.446	7537	81.446	7594	81.446	7651	81.446
7310	81.446	7367	81.446	7424	81.446	7481	81.446	7538	81.446	7595	81.446	7652	81.446
7311	81.446	7368	81.446	7425	81.446	7482	81.446	7539	81.446	7596	81.446	7653	81.446
7312	81.446	7369	81.446	7426	81.446	7483	81.446	7540	81.446	7597	81.446	7654	81.446
7313	81.446	7370	81.446	7427	81.446	7484	81.446	7541	81.446	7598	81.446	7655	81.446
7314	81.446	7371	81.446	7428	81.446	7485	81.446	7542	81.446	7599	81.446	7656	81.446
7315	81.446	7372	81.446	7429	81.446	7486	81.446	7543	81.446	7600	81.446	7657	81.446
7316	81.446	7373	81.446	7430	81.446	7487	81.446	7544	81.446	7601	81.446	7658	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
7659	81.446	7716	81.446	7773	81.446	7830	81.446	7887	81.446	7944	81.446	8001	81.446
7660	81.446	7717	81.446	7774	81.446	7831	81.446	7888	81.446	7945	81.446	8002	81.446
7661	81.446	7718	81.446	7775	81.446	7832	81.446	7889	81.446	7946	81.446	8003	81.446
7662	81.446	7719	81.446	7776	81.446	7833	81.446	7890	81.446	7947	81.446	8004	81.446
7663	81.446	7720	81.446	7777	81.446	7834	81.446	7891	81.446	7948	81.446	8005	81.446
7664	81.446	7721	81.446	7778	81.446	7835	81.446	7892	81.446	7949	81.446	8006	81.446
7665	81.446	7722	81.446	7779	81.446	7836	81.446	7893	81.446	7950	81.446	8007	81.446
7666	81.446	7723	81.446	7780	81.446	7837	81.446	7894	81.446	7951	81.446	8008	81.446
7667	81.446	7724	81.446	7781	81.446	7838	81.446	7895	81.446	7952	81.446	8009	81.446
7668	81.446	7725	81.446	7782	81.446	7839	81.446	7896	81.446	7953	81.446	8010	81.446
7669	81.446	7726	81.446	7783	81.446	7840	81.446	7897	81.446	7954	81.446	8011	81.446
7670	81.446	7727	81.446	7784	81.446	7841	81.446	7898	81.446	7955	81.446	8012	81.446
7671	81.446	7728	81.446	7785	81.446	7842	81.446	7899	81.446	7956	81.446	8013	81.446
7672	81.446	7729	81.446	7786	81.446	7843	81.446	7900	81.446	7957	81.446	8014	81.446
7673	81.446	7730	81.446	7787	81.446	7844	81.446	7901	81.446	7958	81.446	8015	81.446
7674	81.446	7731	81.446	7788	81.446	7845	81.446	7902	81.446	7959	81.446	8016	81.446
7675	81.446	7732	81.446	7789	81.446	7846	81.446	7903	81.446	7960	81.446	8017	81.446
7676	81.446	7733	81.446	7790	81.446	7847	81.446	7904	81.446	7961	81.446	8018	81.446
7677	81.446	7734	81.446	7791	81.446	7848	81.446	7905	81.446	7962	81.446	8019	81.446
7678	81.446	7735	81.446	7792	81.446	7849	81.446	7906	81.446	7963	81.446	8020	81.446
7679	81.446	7736	81.446	7793	81.446	7850	81.446	7907	81.446	7964	81.446	8021	81.446
7680	81.446	7737	81.446	7794	81.446	7851	81.446	7908	81.446	7965	81.446	8022	81.446
7681	81.446	7738	81.446	7795	81.446	7852	81.446	7909	81.446	7966	81.446	8023	81.446
7682	81.446	7739	81.446	7796	81.446	7853	81.446	7910	81.446	7967	81.446	8024	81.446
7683	81.446	7740	81.446	7797	81.446	7854	81.446	7911	81.446	7968	81.446	8025	81.446
7684	81.446	7741	81.446	7798	81.446	7855	81.446	7912	81.446	7969	81.446	8026	81.446
7685	81.446	7742	81.446	7799	81.446	7856	81.446	7913	81.446	7970	81.446	8027	81.446
7686	81.446	7743	81.446	7800	81.446	7857	81.446	7914	81.446	7971	81.446	8028	81.446
7687	81.446	7744	81.446	7801	81.446	7858	81.446	7915	81.446	7972	81.446	8029	81.446
7688	81.446	7745	81.446	7802	81.446	7859	81.446	7916	81.446	7973	81.446	8030	81.446
7689	81.446	7746	81.446	7803	81.446	7860	81.446	7917	81.446	7974	81.446	8031	81.446
7690	81.446	7747	81.446	7804	81.446	7861	81.446	7918	81.446	7975	81.446	8032	81.446
7691	81.446	7748	81.446	7805	81.446	7862	81.446	7919	81.446	7976	81.446	8033	81.446
7692	81.446	7749	81.446	7806	81.446	7863	81.446	7920	81.446	7977	81.446	8034	81.446
7693	81.446	7750	81.446	7807	81.446	7864	81.446	7921	81.446	7978	81.446	8035	81.446
7694	81.446	7751	81.446	7808	81.446	7865	81.446	7922	81.446	7979	81.446	8036	81.446
7695	81.446	7752	81.446	7809	81.446	7866	81.446	7923	81.446	7980	81.446	8037	81.446
7696	81.446	7753	81.446	7810	81.446	7867	81.446	7924	81.446	7981	81.446	8038	81.446
7697	81.446	7754	81.446	7811	81.446	7868	81.446	7925	81.446	7982	81.446	8039	81.446
7698	81.446	7755	81.446	7812	81.446	7869	81.446	7926	81.446	7983	81.446	8040	81.446
7699	81.446	7756	81.446	7813	81.446	7870	81.446	7927	81.446	7984	81.446	8041	81.446
7700	81.446	7757	81.446	7814	81.446	7871	81.446	7928	81.446	7985	81.446	8042	81.446
7701	81.446	7758	81.446	7815	81.446	7872	81.446	7929	81.446	7986	81.446	8043	81.446
7702	81.446	7759	81.446	7816	81.446	7873	81.446	7930	81.446	7987	81.446	8044	81.446
7703	81.446	7760	81.446	7817	81.446	7874	81.446	7931	81.446	7988	81.446	8045	81.446
7704	81.446	7761	81.446	7818	81.446	7875	81.446	7932	81.446	7989	81.446	8046	81.446
7705	81.446	7762	81.446	7819	81.446	7876	81.446	7933	81.446	7990	81.446	8047	81.446
7706	81.446	7763	81.446	7820	81.446	7877	81.446	7934	81.446	7991	81.446	8048	81.446
7707	81.446	7764	81.446	7821	81.446	7878	81.446	7935	81.446	7992	81.446	8049	81.446
7708	81.446	7765	81.446	7822	81.446	7879	81.446	7936	81.446	7993	81.446	8050	81.446
7709	81.446	7766	81.446	7823	81.446	7880	81.446	7937	81.446	7994	81.446	8051	81.446
7710	81.446	7767	81.446	7824	81.446	7881	81.446	7938	81.446	7995	81.446	8052	81.446
7711	81.446	7768	81.446	7825	81.446	7882	81.446	7939	81.446	7996	81.446	8053	81.446
7712	81.446	7769	81.446	7826	81.446	7883	81.446	7940	81.446	7997	81.446	8054	81.446
7713	81.446	7770	81.446	7827	81.446	7884	81.446	7941	81.446	7998	81.446	8055	81.446
7714	81.446	7771	81.446	7828	81.446	7885	81.446	7942	81.446	7999	81.446	8056	81.446
7715	81.446	7772	81.446	7829	81.446	7886	81.446	7943	81.446	8000	81.446	8057	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
8058	81.446	8115	81.446	8172	81.446	8229	81.446	8286	81.446	8343	81.446	8400	81.446
8059	81.446	8116	81.446	8173	81.446	8230	81.446	8287	81.446	8344	81.446	8401	81.446
8060	81.446	8117	81.446	8174	81.446	8231	81.446	8288	81.446	8345	81.446	8402	81.446
8061	81.446	8118	81.446	8175	81.446	8232	81.446	8289	81.446	8346	81.446	8403	81.446
8062	81.446	8119	81.446	8176	81.446	8233	81.446	8290	81.446	8347	81.446	8404	81.446
8063	81.446	8120	81.446	8177	81.446	8234	81.446	8291	81.446	8348	81.446	8405	81.446
8064	81.446	8121	81.446	8178	81.446	8235	81.446	8292	81.446	8349	81.446	8406	81.446
8065	81.446	8122	81.446	8179	81.446	8236	81.446	8293	81.446	8350	81.446	8407	81.446
8066	81.446	8123	81.446	8180	81.446	8237	81.446	8294	81.446	8351	81.446	8408	81.446
8067	81.446	8124	81.446	8181	81.446	8238	81.446	8295	81.446	8352	81.446	8409	81.446
8068	81.446	8125	81.446	8182	81.446	8239	81.446	8296	81.446	8353	81.446	8410	81.446
8069	81.446	8126	81.446	8183	81.446	8240	81.446	8297	81.446	8354	81.446	8411	81.446
8070	81.446	8127	81.446	8184	81.446	8241	81.446	8298	81.446	8355	81.446	8412	81.446
8071	81.446	8128	81.446	8185	81.446	8242	81.446	8299	81.446	8356	81.446	8413	81.446
8072	81.446	8129	81.446	8186	81.446	8243	81.446	8300	81.446	8357	81.446	8414	81.446
8073	81.446	8130	81.446	8187	81.446	8244	81.446	8301	81.446	8358	81.446	8415	81.446
8074	81.446	8131	81.446	8188	81.446	8245	81.446	8302	81.446	8359	81.446	8416	81.446
8075	81.446	8132	81.446	8189	81.446	8246	81.446	8303	81.446	8360	81.446	8417	81.446
8076	81.446	8133	81.446	8190	81.446	8247	81.446	8304	81.446	8361	81.446	8418	81.446
8077	81.446	8134	81.446	8191	81.446	8248	81.446	8305	81.446	8362	81.446	8419	81.446
8078	81.446	8135	81.446	8192	81.446	8249	81.446	8306	81.446	8363	81.446	8420	81.446
8079	81.446	8136	81.446	8193	81.446	8250	81.446	8307	81.446	8364	81.446	8421	81.446
8080	81.446	8137	81.446	8194	81.446	8251	81.446	8308	81.446	8365	81.446	8422	81.446
8081	81.446	8138	81.446	8195	81.446	8252	81.446	8309	81.446	8366	81.446	8423	81.446
8082	81.446	8139	81.446	8196	81.446	8253	81.446	8310	81.446	8367	81.446	8424	81.446
8083	81.446	8140	81.446	8197	81.446	8254	81.446	8311	81.446	8368	81.446	8425	81.446
8084	81.446	8141	81.446	8198	81.446	8255	81.446	8312	81.446	8369	81.446	8426	81.446
8085	81.446	8142	81.446	8199	81.446	8256	81.446	8313	81.446	8370	81.446	8427	81.446
8086	81.446	8143	81.446	8200	81.446	8257	81.446	8314	81.446	8371	81.446	8428	81.446
8087	81.446	8144	81.446	8201	81.446	8258	81.446	8315	81.446	8372	81.446	8429	81.446
8088	81.446	8145	81.446	8202	81.446	8259	81.446	8316	81.446	8373	81.446	8430	81.446
8089	81.446	8146	81.446	8203	81.446	8260	81.446	8317	81.446	8374	81.446	8431	81.446
8090	81.446	8147	81.446	8204	81.446	8261	81.446	8318	81.446	8375	81.446	8432	81.446
8091	81.446	8148	81.446	8205	81.446	8262	81.446	8319	81.446	8376	81.446	8433	81.446
8092	81.446	8149	81.446	8206	81.446	8263	81.446	8320	81.446	8377	81.446	8434	81.446
8093	81.446	8150	81.446	8207	81.446	8264	81.446	8321	81.446	8378	81.446	8435	81.446
8094	81.446	8151	81.446	8208	81.446	8265	81.446	8322	81.446	8379	81.446	8436	81.446
8095	81.446	8152	81.446	8209	81.446	8266	81.446	8323	81.446	8380	81.446	8437	81.446
8096	81.446	8153	81.446	8210	81.446	8267	81.446	8324	81.446	8381	81.446	8438	81.446
8097	81.446	8154	81.446	8211	81.446	8268	81.446	8325	81.446	8382	81.446	8439	81.446
8098	81.446	8155	81.446	8212	81.446	8269	81.446	8326	81.446	8383	81.446	8440	81.446
8099	81.446	8156	81.446	8213	81.446	8270	81.446	8327	81.446	8384	81.446	8441	81.446
8100	81.446	8157	81.446	8214	81.446	8271	81.446	8328	81.446	8385	81.446	8442	81.446
8101	81.446	8158	81.446	8215	81.446	8272	81.446	8329	81.446	8386	81.446	8443	81.446
8102	81.446	8159	81.446	8216	81.446	8273	81.446	8330	81.446	8387	81.446	8444	81.446
8103	81.446	8160	81.446	8217	81.446	8274	81.446	8331	81.446	8388	81.446	8445	81.446
8104	81.446	8161	81.446	8218	81.446	8275	81.446	8332	81.446	8389	81.446	8446	81.446
8105	81.446	8162	81.446	8219	81.446	8276	81.446	8333	81.446	8390	81.446	8447	81.446
8106	81.446	8163	81.446	8220	81.446	8277	81.446	8334	81.446	8391	81.446	8448	81.446
8107	81.446	8164	81.446	8221	81.446	8278	81.446	8335	81.446	8392	81.446	8449	81.446
8108	81.446	8165	81.446	8222	81.446	8279	81.446	8336	81.446	8393	81.446	8450	81.446
8109	81.446	8166	81.446	8223	81.446	8280	81.446	8337	81.446	8394	81.446	8451	81.446
8110	81.446	8167	81.446	8224	81.446	8281	81.446	8338	81.446	8395	81.446	8452	81.446
8111	81.446	8168	81.446	8225	81.446	8282	81.446	8339	81.446	8396	81.446	8453	81.446
8112	81.446	8169	81.446	8226	81.446	8283	81.446	8340	81.446	8397	81.446	8454	81.446
8113	81.446	8170	81.446	8227	81.446	8284	81.446	8341	81.446	8398	81.446	8455	81.446
8114	81.446	8171	81.446	8228	81.446	8285	81.446	8342	81.446	8399	81.446	8456	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
8457	81.446	8514	81.446	8571	81.446	8628	81.446	8685	81.446	8742	81.446	8799	81.446
8458	81.446	8515	81.446	8572	81.446	8629	81.446	8686	81.446	8743	81.446	8800	81.446
8459	81.446	8516	81.446	8573	81.446	8630	81.446	8687	81.446	8744	81.446	8801	81.446
8460	81.446	8517	81.446	8574	81.446	8631	81.446	8688	81.446	8745	81.446	8802	81.446
8461	81.446	8518	81.446	8575	81.446	8632	81.446	8689	81.446	8746	81.446	8803	81.446
8462	81.446	8519	81.446	8576	81.446	8633	81.446	8690	81.446	8747	81.446	8804	81.446
8463	81.446	8520	81.446	8577	81.446	8634	81.446	8691	81.446	8748	81.446	8805	81.446
8464	81.446	8521	81.446	8578	81.446	8635	81.446	8692	81.446	8749	81.446	8806	81.446
8465	81.446	8522	81.446	8579	81.446	8636	81.446	8693	81.446	8750	81.446	8807	81.446
8466	81.446	8523	81.446	8580	81.446	8637	81.446	8694	81.446	8751	81.446	8808	81.446
8467	81.446	8524	81.446	8581	81.446	8638	81.446	8695	81.446	8752	81.446	8809	81.446
8468	81.446	8525	81.446	8582	81.446	8639	81.446	8696	81.446	8753	81.446	8810	81.446
8469	81.446	8526	81.446	8583	81.446	8640	81.446	8697	81.446	8754	81.446	8811	81.446
8470	81.446	8527	81.446	8584	81.446	8641	81.446	8698	81.446	8755	81.446	8812	81.446
8471	81.446	8528	81.446	8585	81.446	8642	81.446	8699	81.446	8756	81.446	8813	81.446
8472	81.446	8529	81.446	8586	81.446	8643	81.446	8700	81.446	8757	81.446	8814	81.446
8473	81.446	8530	81.446	8587	81.446	8644	81.446	8701	81.446	8758	81.446	8815	81.446
8474	81.446	8531	81.446	8588	81.446	8645	81.446	8702	81.446	8759	81.446	8816	81.446
8475	81.446	8532	81.446	8589	81.446	8646	81.446	8703	81.446	8760	81.446	8817	81.446
8476	81.446	8533	81.446	8590	81.446	8647	81.446	8704	81.446	8761	81.446	8818	81.446
8477	81.446	8534	81.446	8591	81.446	8648	81.446	8705	81.446	8762	81.446	8819	81.446
8478	81.446	8535	81.446	8592	81.446	8649	81.446	8706	81.446	8763	81.446	8820	81.446
8479	81.446	8536	81.446	8593	81.446	8650	81.446	8707	81.446	8764	81.446	8821	81.446
8480	81.446	8537	81.446	8594	81.446	8651	81.446	8708	81.446	8765	81.446	8822	81.446
8481	81.446	8538	81.446	8595	81.446	8652	81.446	8709	81.446	8766	81.446	8823	81.446
8482	81.446	8539	81.446	8596	81.446	8653	81.446	8710	81.446	8767	81.446	8824	81.446
8483	81.446	8540	81.446	8597	81.446	8654	81.446	8711	81.446	8768	81.446	8825	81.446
8484	81.446	8541	81.446	8598	81.446	8655	81.446	8712	81.446	8769	81.446	8826	81.446
8485	81.446	8542	81.446	8599	81.446	8656	81.446	8713	81.446	8770	81.446	8827	81.446
8486	81.446	8543	81.446	8600	81.446	8657	81.446	8714	81.446	8771	81.446	8828	81.446
8487	81.446	8544	81.446	8601	81.446	8658	81.446	8715	81.446	8772	81.446	8829	81.446
8488	81.446	8545	81.446	8602	81.446	8659	81.446	8716	81.446	8773	81.446	8830	81.446
8489	81.446	8546	81.446	8603	81.446	8660	81.446	8717	81.446	8774	81.446	8831	81.446
8490	81.446	8547	81.446	8604	81.446	8661	81.446	8718	81.446	8775	81.446	8832	81.446
8491	81.446	8548	81.446	8605	81.446	8662	81.446	8719	81.446	8776	81.446	8833	81.446
8492	81.446	8549	81.446	8606	81.446	8663	81.446	8720	81.446	8777	81.446	8834	81.446
8493	81.446	8550	81.446	8607	81.446	8664	81.446	8721	81.446	8778	81.446	8835	81.446
8494	81.446	8551	81.446	8608	81.446	8665	81.446	8722	81.446	8779	81.446	8836	81.446
8495	81.446	8552	81.446	8609	81.446	8666	81.446	8723	81.446	8780	81.446	8837	81.446
8496	81.446	8553	81.446	8610	81.446	8667	81.446	8724	81.446	8781	81.446	8838	81.446
8497	81.446	8554	81.446	8611	81.446	8668	81.446	8725	81.446	8782	81.446	8839	81.446
8498	81.446	8555	81.446	8612	81.446	8669	81.446	8726	81.446	8783	81.446	8840	81.446
8499	81.446	8556	81.446	8613	81.446	8670	81.446	8727	81.446	8784	81.446	8841	81.446
8500	81.446	8557	81.446	8614	81.446	8671	81.446	8728	81.446	8785	81.446	8842	81.446
8501	81.446	8558	81.446	8615	81.446	8672	81.446	8729	81.446	8786	81.446	8843	81.446
8502	81.446	8559	81.446	8616	81.446	8673	81.446	8730	81.446	8787	81.446	8844	81.446
8503	81.446	8560	81.446	8617	81.446	8674	81.446	8731	81.446	8788	81.446	8845	81.446
8504	81.446	8561	81.446	8618	81.446	8675	81.446	8732	81.446	8789	81.446	8846	81.446
8505	81.446	8562	81.446	8619	81.446	8676	81.446	8733	81.446	8790	81.446	8847	81.446
8506	81.446	8563	81.446	8620	81.446	8677	81.446	8734	81.446	8791	81.446	8848	81.446
8507	81.446	8564	81.446	8621	81.446	8678	81.446	8735	81.446	8792	81.446	8849	81.446
8508	81.446	8565	81.446	8622	81.446	8679	81.446	8736	81.446	8793	81.446	8850	81.446
8509	81.446	8566	81.446	8623	81.446	8680	81.446	8737	81.446	8794	81.446	8851	81.446
8510	81.446	8567	81.446	8624	81.446	8681	81.446	8738	81.446	8795	81.446	8852	81.446
8511	81.446	8568	81.446	8625	81.446	8682	81.446	8739	81.446	8796	81.446	8853	81.446
8512	81.446	8569	81.446	8626	81.446	8683	81.446	8740	81.446	8797	81.446	8854	81.446
8513	81.446	8570	81.446	8627	81.446	8684	81.446	8741	81.446	8798	81.446	8855	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
8856	81.446	8913	81.446	8970	81.446	9027	81.446	9084	81.446	9141	81.446	9198	81.446
8857	81.446	8914	81.446	8971	81.446	9028	81.446	9085	81.446	9142	81.446	9199	81.446
8858	81.446	8915	81.446	8972	81.446	9029	81.446	9086	81.446	9143	81.446	9200	81.446
8859	81.446	8916	81.446	8973	81.446	9030	81.446	9087	81.446	9144	81.446	9201	81.446
8860	81.446	8917	81.446	8974	81.446	9031	81.446	9088	81.446	9145	81.446	9202	81.446
8861	81.446	8918	81.446	8975	81.446	9032	81.446	9089	81.446	9146	81.446	9203	81.446
8862	81.446	8919	81.446	8976	81.446	9033	81.446	9090	81.446	9147	81.446	9204	81.446
8863	81.446	8920	81.446	8977	81.446	9034	81.446	9091	81.446	9148	81.446	9205	81.446
8864	81.446	8921	81.446	8978	81.446	9035	81.446	9092	81.446	9149	81.446	9206	81.446
8865	81.446	8922	81.446	8979	81.446	9036	81.446	9093	81.446	9150	81.446	9207	81.446
8866	81.446	8923	81.446	8980	81.446	9037	81.446	9094	81.446	9151	81.446	9208	81.446
8867	81.446	8924	81.446	8981	81.446	9038	81.446	9095	81.446	9152	81.446	9209	81.446
8868	81.446	8925	81.446	8982	81.446	9039	81.446	9096	81.446	9153	81.446	9210	81.446
8869	81.446	8926	81.446	8983	81.446	9040	81.446	9097	81.446	9154	81.446	9211	81.446
8870	81.446	8927	81.446	8984	81.446	9041	81.446	9098	81.446	9155	81.446	9212	81.446
8871	81.446	8928	81.446	8985	81.446	9042	81.446	9099	81.446	9156	81.446	9213	81.446
8872	81.446	8929	81.446	8986	81.446	9043	81.446	9100	81.446	9157	81.446	9214	81.446
8873	81.446	8930	81.446	8987	81.446	9044	81.446	9101	81.446	9158	81.446	9215	81.446
8874	81.446	8931	81.446	8988	81.446	9045	81.446	9102	81.446	9159	81.446	9216	81.446
8875	81.446	8932	81.446	8989	81.446	9046	81.446	9103	81.446	9160	81.446	9217	81.446
8876	81.446	8933	81.446	8990	81.446	9047	81.446	9104	81.446	9161	81.446	9218	81.446
8877	81.446	8934	81.446	8991	81.446	9048	81.446	9105	81.446	9162	81.446	9219	81.446
8878	81.446	8935	81.446	8992	81.446	9049	81.446	9106	81.446	9163	81.446	9220	81.446
8879	81.446	8936	81.446	8993	81.446	9050	81.446	9107	81.446	9164	81.446	9221	81.446
8880	81.446	8937	81.446	8994	81.446	9051	81.446	9108	81.446	9165	81.446	9222	81.446
8881	81.446	8938	81.446	8995	81.446	9052	81.446	9109	81.446	9166	81.446	9223	81.446
8882	81.446	8939	81.446	8996	81.446	9053	81.446	9110	81.446	9167	81.446	9224	81.446
8883	81.446	8940	81.446	8997	81.446	9054	81.446	9111	81.446	9168	81.446	9225	81.446
8884	81.446	8941	81.446	8998	81.446	9055	81.446	9112	81.446	9169	81.446	9226	81.446
8885	81.446	8942	81.446	8999	81.446	9056	81.446	9113	81.446	9170	81.446	9227	81.446
8886	81.446	8943	81.446	9000	81.446	9057	81.446	9114	81.446	9171	81.446	9228	81.446
8887	81.446	8944	81.446	9001	81.446	9058	81.446	9115	81.446	9172	81.446	9229	81.446
8888	81.446	8945	81.446	9002	81.446	9059	81.446	9116	81.446	9173	81.446	9230	81.446
8889	81.446	8946	81.446	9003	81.446	9060	81.446	9117	81.446	9174	81.446	9231	81.446
8890	81.446	8947	81.446	9004	81.446	9061	81.446	9118	81.446	9175	81.446	9232	81.446
8891	81.446	8948	81.446	9005	81.446	9062	81.446	9119	81.446	9176	81.446	9233	81.446
8892	81.446	8949	81.446	9006	81.446	9063	81.446	9120	81.446	9177	81.446	9234	81.446
8893	81.446	8950	81.446	9007	81.446	9064	81.446	9121	81.446	9178	81.446	9235	81.446
8894	81.446	8951	81.446	9008	81.446	9065	81.446	9122	81.446	9179	81.446	9236	81.446
8895	81.446	8952	81.446	9009	81.446	9066	81.446	9123	81.446	9180	81.446	9237	81.446
8896	81.446	8953	81.446	9010	81.446	9067	81.446	9124	81.446	9181	81.446	9238	81.446
8897	81.446	8954	81.446	9011	81.446	9068	81.446	9125	81.446	9182	81.446	9239	81.446
8898	81.446	8955	81.446	9012	81.446	9069	81.446	9126	81.446	9183	81.446	9240	81.446
8899	81.446	8956	81.446	9013	81.446	9070	81.446	9127	81.446	9184	81.446	9241	81.446
8900	81.446	8957	81.446	9014	81.446	9071	81.446	9128	81.446	9185	81.446	9242	81.446
8901	81.446	8958	81.446	9015	81.446	9072	81.446	9129	81.446	9186	81.446	9243	81.446
8902	81.446	8959	81.446	9016	81.446	9073	81.446	9130	81.446	9187	81.446	9244	81.446
8903	81.446	8960	81.446	9017	81.446	9074	81.446	9131	81.446	9188	81.446	9245	81.446
8904	81.446	8961	81.446	9018	81.446	9075	81.446	9132	81.446	9189	81.446	9246	81.446
8905	81.446	8962	81.446	9019	81.446	9076	81.446	9133	81.446	9190	81.446	9247	81.446
8906	81.446	8963	81.446	9020	81.446	9077	81.446	9134	81.446	9191	81.446	9248	81.446
8907	81.446	8964	81.446	9021	81.446	9078	81.446	9135	81.446	9192	81.446	9249	81.446
8908	81.446	8965	81.446	9022	81.446	9079	81.446	9136	81.446	9193	81.446	9250	81.446
8909	81.446	8966	81.446	9023	81.446	9080	81.446	9137	81.446	9194	81.446	9251	81.446
8910	81.446	8967	81.446	9024	81.446	9081	81.446	9138	81.446	9195	81.446	9252	81.446
8911	81.446	8968	81.446	9025	81.446	9082	81.446	9139	81.446	9196	81.446	9253	81.446
8912	81.446	8969	81.446	9026	81.446	9083	81.446	9140	81.446	9197	81.446	9254	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
9255	81.446	9312	81.446	9369	81.446	9426	81.446	9483	81.446	9540	81.446	9597	81.446
9256	81.446	9313	81.446	9370	81.446	9427	81.446	9484	81.446	9541	81.446	9598	81.446
9257	81.446	9314	81.446	9371	81.446	9428	81.446	9485	81.446	9542	81.446	9599	81.446
9258	81.446	9315	81.446	9372	81.446	9429	81.446	9486	81.446	9543	81.446	9600	81.446
9259	81.446	9316	81.446	9373	81.446	9430	81.446	9487	81.446	9544	81.446	9601	81.446
9260	81.446	9317	81.446	9374	81.446	9431	81.446	9488	81.446	9545	81.446	9602	81.446
9261	81.446	9318	81.446	9375	81.446	9432	81.446	9489	81.446	9546	81.446	9603	81.446
9262	81.446	9319	81.446	9376	81.446	9433	81.446	9490	81.446	9547	81.446	9604	81.446
9263	81.446	9320	81.446	9377	81.446	9434	81.446	9491	81.446	9548	81.446	9605	81.446
9264	81.446	9321	81.446	9378	81.446	9435	81.446	9492	81.446	9549	81.446	9606	81.446
9265	81.446	9322	81.446	9379	81.446	9436	81.446	9493	81.446	9550	81.446	9607	81.446
9266	81.446	9323	81.446	9380	81.446	9437	81.446	9494	81.446	9551	81.446	9608	81.446
9267	81.446	9324	81.446	9381	81.446	9438	81.446	9495	81.446	9552	81.446	9609	81.446
9268	81.446	9325	81.446	9382	81.446	9439	81.446	9496	81.446	9553	81.446	9610	81.446
9269	81.446	9326	81.446	9383	81.446	9440	81.446	9497	81.446	9554	81.446	9611	81.446
9270	81.446	9327	81.446	9384	81.446	9441	81.446	9498	81.446	9555	81.446	9612	81.446
9271	81.446	9328	81.446	9385	81.446	9442	81.446	9499	81.446	9556	81.446	9613	81.446
9272	81.446	9329	81.446	9386	81.446	9443	81.446	9500	81.446	9557	81.446	9614	81.446
9273	81.446	9330	81.446	9387	81.446	9444	81.446	9501	81.446	9558	81.446	9615	81.446
9274	81.446	9331	81.446	9388	81.446	9445	81.446	9502	81.446	9559	81.446	9616	81.446
9275	81.446	9332	81.446	9389	81.446	9446	81.446	9503	81.446	9560	81.446	9617	81.446
9276	81.446	9333	81.446	9390	81.446	9447	81.446	9504	81.446	9561	81.446	9618	81.446
9277	81.446	9334	81.446	9391	81.446	9448	81.446	9505	81.446	9562	81.446	9619	81.446
9278	81.446	9335	81.446	9392	81.446	9449	81.446	9506	81.446	9563	81.446	9620	81.446
9279	81.446	9336	81.446	9393	81.446	9450	81.446	9507	81.446	9564	81.446	9621	81.446
9280	81.446	9337	81.446	9394	81.446	9451	81.446	9508	81.446	9565	81.446	9622	81.446
9281	81.446	9338	81.446	9395	81.446	9452	81.446	9509	81.446	9566	81.446	9623	81.446
9282	81.446	9339	81.446	9396	81.446	9453	81.446	9510	81.446	9567	81.446	9624	81.446
9283	81.446	9340	81.446	9397	81.446	9454	81.446	9511	81.446	9568	81.446	9625	81.446
9284	81.446	9341	81.446	9398	81.446	9455	81.446	9512	81.446	9569	81.446	9626	81.446
9285	81.446	9342	81.446	9399	81.446	9456	81.446	9513	81.446	9570	81.446	9627	81.446
9286	81.446	9343	81.446	9400	81.446	9457	81.446	9514	81.446	9571	81.446	9628	81.446
9287	81.446	9344	81.446	9401	81.446	9458	81.446	9515	81.446	9572	81.446	9629	81.446
9288	81.446	9345	81.446	9402	81.446	9459	81.446	9516	81.446	9573	81.446	9630	81.446
9289	81.446	9346	81.446	9403	81.446	9460	81.446	9517	81.446	9574	81.446	9631	81.446
9290	81.446	9347	81.446	9404	81.446	9461	81.446	9518	81.446	9575	81.446	9632	81.446
9291	81.446	9348	81.446	9405	81.446	9462	81.446	9519	81.446	9576	81.446	9633	81.446
9292	81.446	9349	81.446	9406	81.446	9463	81.446	9520	81.446	9577	81.446	9634	81.446
9293	81.446	9350	81.446	9407	81.446	9464	81.446	9521	81.446	9578	81.446	9635	81.446
9294	81.446	9351	81.446	9408	81.446	9465	81.446	9522	81.446	9579	81.446	9636	81.446
9295	81.446	9352	81.446	9409	81.446	9466	81.446	9523	81.446	9580	81.446	9637	81.446
9296	81.446	9353	81.446	9410	81.446	9467	81.446	9524	81.446	9581	81.446	9638	81.446
9297	81.446	9354	81.446	9411	81.446	9468	81.446	9525	81.446	9582	81.446	9639	81.446
9298	81.446	9355	81.446	9412	81.446	9469	81.446	9526	81.446	9583	81.446	9640	81.446
9299	81.446	9356	81.446	9413	81.446	9470	81.446	9527	81.446	9584	81.446	9641	81.446
9300	81.446	9357	81.446	9414	81.446	9471	81.446	9528	81.446	9585	81.446	9642	81.446
9301	81.446	9358	81.446	9415	81.446	9472	81.446	9529	81.446	9586	81.446	9643	81.446
9302	81.446	9359	81.446	9416	81.446	9473	81.446	9530	81.446	9587	81.446	9644	81.446
9303	81.446	9360	81.446	9417	81.446	9474	81.446	9531	81.446	9588	81.446	9645	81.446
9304	81.446	9361	81.446	9418	81.446	9475	81.446	9532	81.446	9589	81.446	9646	81.446
9305	81.446	9362	81.446	9419	81.446	9476	81.446	9533	81.446	9590	81.446	9647	81.446
9306	81.446	9363	81.446	9420	81.446	9477	81.446	9534	81.446	9591	81.446	9648	81.446
9307	81.446	9364	81.446	9421	81.446	9478	81.446	9535	81.446	9592	81.446	9649	81.446
9308	81.446	9365	81.446	9422	81.446	9479	81.446	9536	81.446	9593	81.446	9650	81.446
9309	81.446	9366	81.446	9423	81.446	9480	81.446	9537	81.446	9594	81.446	9651	81.446
9310	81.446	9367	81.446	9424	81.446	9481	81.446	9538	81.446	9595	81.446	9652	81.446
9311	81.446	9368	81.446	9425	81.446	9482	81.446	9539	81.446	9596	81.446	9653	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
9654	81.446	9711	81.446	9768	81.446	9825	81.446	9882	81.446	9939	81.446	9996	81.446
9655	81.446	9712	81.446	9769	81.446	9826	81.446	9883	81.446	9940	81.446	9997	81.446
9656	81.446	9713	81.446	9770	81.446	9827	81.446	9884	81.446	9941	81.446	9998	81.446
9657	81.446	9714	81.446	9771	81.446	9828	81.446	9885	81.446	9942	81.446	9999	81.446
9658	81.446	9715	81.446	9772	81.446	9829	81.446	9886	81.446	9943	81.446	10000	81.446
9659	81.446	9716	81.446	9773	81.446	9830	81.446	9887	81.446	9944	81.446	10001	81.446
9660	81.446	9717	81.446	9774	81.446	9831	81.446	9888	81.446	9945	81.446	10002	81.446
9661	81.446	9718	81.446	9775	81.446	9832	81.446	9889	81.446	9946	81.446	10003	81.446
9662	81.446	9719	81.446	9776	81.446	9833	81.446	9890	81.446	9947	81.446	10004	81.446
9663	81.446	9720	81.446	9777	81.446	9834	81.446	9891	81.446	9948	81.446	10005	81.446
9664	81.446	9721	81.446	9778	81.446	9835	81.446	9892	81.446	9949	81.446	10006	81.446
9665	81.446	9722	81.446	9779	81.446	9836	81.446	9893	81.446	9950	81.446	10007	81.446
9666	81.446	9723	81.446	9780	81.446	9837	81.446	9894	81.446	9951	81.446	10008	81.446
9667	81.446	9724	81.446	9781	81.446	9838	81.446	9895	81.446	9952	81.446	10009	81.446
9668	81.446	9725	81.446	9782	81.446	9839	81.446	9896	81.446	9953	81.446	10010	81.446
9669	81.446	9726	81.446	9783	81.446	9840	81.446	9897	81.446	9954	81.446	10011	81.446
9670	81.446	9727	81.446	9784	81.446	9841	81.446	9898	81.446	9955	81.446	10012	81.446
9671	81.446	9728	81.446	9785	81.446	9842	81.446	9899	81.446	9956	81.446	10013	81.446
9672	81.446	9729	81.446	9786	81.446	9843	81.446	9900	81.446	9957	81.446	10014	81.446
9673	81.446	9730	81.446	9787	81.446	9844	81.446	9901	81.446	9958	81.446	10015	81.446
9674	81.446	9731	81.446	9788	81.446	9845	81.446	9902	81.446	9959	81.446	10016	81.446
9675	81.446	9732	81.446	9789	81.446	9846	81.446	9903	81.446	9960	81.446	10017	81.446
9676	81.446	9733	81.446	9790	81.446	9847	81.446	9904	81.446	9961	81.446	10018	81.446
9677	81.446	9734	81.446	9791	81.446	9848	81.446	9905	81.446	9962	81.446	10019	81.446
9678	81.446	9735	81.446	9792	81.446	9849	81.446	9906	81.446	9963	81.446	10020	81.446
9679	81.446	9736	81.446	9793	81.446	9850	81.446	9907	81.446	9964	81.446	10021	81.446
9680	81.446	9737	81.446	9794	81.446	9851	81.446	9908	81.446	9965	81.446	10022	81.446
9681	81.446	9738	81.446	9795	81.446	9852	81.446	9909	81.446	9966	81.446	10023	81.446
9682	81.446	9739	81.446	9796	81.446	9853	81.446	9910	81.446	9967	81.446	10024	81.446
9683	81.446	9740	81.446	9797	81.446	9854	81.446	9911	81.446	9968	81.446	10025	81.446
9684	81.446	9741	81.446	9798	81.446	9855	81.446	9912	81.446	9969	81.446	10026	81.446
9685	81.446	9742	81.446	9799	81.446	9856	81.446	9913	81.446	9970	81.446	10027	81.446
9686	81.446	9743	81.446	9800	81.446	9857	81.446	9914	81.446	9971	81.446	10028	81.446
9687	81.446	9744	81.446	9801	81.446	9858	81.446	9915	81.446	9972	81.446	10029	81.446
9688	81.446	9745	81.446	9802	81.446	9859	81.446	9916	81.446	9973	81.446	10030	81.446
9689	81.446	9746	81.446	9803	81.446	9860	81.446	9917	81.446	9974	81.446	10031	81.446
9690	81.446	9747	81.446	9804	81.446	9861	81.446	9918	81.446	9975	81.446	10032	81.446
9691	81.446	9748	81.446	9805	81.446	9862	81.446	9919	81.446	9976	81.446	10033	81.446
9692	81.446	9749	81.446	9806	81.446	9863	81.446	9920	81.446	9977	81.446	10034	81.446
9693	81.446	9750	81.446	9807	81.446	9864	81.446	9921	81.446	9978	81.446	10035	81.446
9694	81.446	9751	81.446	9808	81.446	9865	81.446	9922	81.446	9979	81.446	10036	81.446
9695	81.446	9752	81.446	9809	81.446	9866	81.446	9923	81.446	9980	81.446	10037	81.446
9696	81.446	9753	81.446	9810	81.446	9867	81.446	9924	81.446	9981	81.446	10038	81.446
9697	81.446	9754	81.446	9811	81.446	9868	81.446	9925	81.446	9982	81.446	10039	81.446
9698	81.446	9755	81.446	9812	81.446	9869	81.446	9926	81.446	9983	81.446	10040	81.446
9699	81.446	9756	81.446	9813	81.446	9870	81.446	9927	81.446	9984	81.446	10041	81.446
9700	81.446	9757	81.446	9814	81.446	9871	81.446	9928	81.446	9985	81.446	10042	81.446
9701	81.446	9758	81.446	9815	81.446	9872	81.446	9929	81.446	9986	81.446	10043	81.446
9702	81.446	9759	81.446	9816	81.446	9873	81.446	9930	81.446	9987	81.446	10044	81.446
9703	81.446	9760	81.446	9817	81.446	9874	81.446	9931	81.446	9988	81.446	10045	81.446
9704	81.446	9761	81.446	9818	81.446	9875	81.446	9932	81.446	9989	81.446	10046	81.446
9705	81.446	9762	81.446	9819	81.446	9876	81.446	9933	81.446	9990	81.446	10047	81.446
9706	81.446	9763	81.446	9820	81.446	9877	81.446	9934	81.446	9991	81.446	10048	81.446
9707	81.446	9764	81.446	9821	81.446	9878	81.446	9935	81.446	9992	81.446	10049	81.446
9708	81.446	9765	81.446	9822	81.446	9879	81.446	9936	81.446	9993	81.446	10050	81.446
9709	81.446	9766	81.446	9823	81.446	9880	81.446	9937	81.446	9994	81.446	10051	81.446
9710	81.446	9767	81.446	9824	81.446	9881	81.446	9938	81.446	9995	81.446	10052	81.446

Surcharged Outfall Details for Surface Network 1

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
10053	81.446	10057	81.446	10061	81.446	10065	81.446	10069	81.446	10073	81.446	10077	81.446
10054	81.446	10058	81.446	10062	81.446	10066	81.446	10070	81.446	10074	81.446	10078	81.446
10055	81.446	10059	81.446	10063	81.446	10067	81.446	10071	81.446	10075	81.446	10079	81.446
10056	81.446	10060	81.446	10064	81.446	10068	81.446	10072	81.446	10076	81.446	10080	81.446

Simulation Criteria for Surface Network 1

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.386		

Online Controls for Surface Network 1

Hydro-Brake® Optimum Manhole: S11, DS/PN: 1.010, Volume (m³): 13.3

Unit Reference	MD-SHE-0109-5000-0800-5000
Design Head (m)	0.800
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	109
Invert Level (m)	80.341
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	5.0	Kick-Flo®	0.537	4.2
Flush-Flo™	0.241	5.0	Mean Flow over Head Range	-	4.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.7	0.800	5.0	2.000	7.7	4.000	10.6	7.000	13.9
0.200	5.0	1.000	5.5	2.200	8.0	4.500	11.3	7.500	14.4
0.300	5.0	1.200	6.0	2.400	8.4	5.000	11.8	8.000	14.8
0.400	4.8	1.400	6.5	2.600	8.7	5.500	12.4	8.500	15.2
0.500	4.5	1.600	6.9	3.000	9.3	6.000	12.9	9.000	15.7
0.600	4.4	1.800	7.3	3.500	10.0	6.500	13.4	9.500	16.1

Storage Structures for Surface Network 1

Tank or Pond Manhole: S10, DS/PN: 1.009

Invert Level (m) 80.350

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	0.0	0.600	794.4	1.200	1073.3	1.800	0.0	2.400	0.0
0.100	577.5	0.700	839.5	1.300	1121.8	1.900	0.0	2.500	0.0
0.200	619.7	0.800	885.1	1.400	1170.0	2.000	0.0		
0.300	662.6	0.900	931.3	1.500	0.0	2.100	0.0		
0.400	705.9	1.000	978.1	1.600	0.0	2.200	0.0		
0.500	749.9	1.100	1025.4	1.700	0.0	2.300	0.0		

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.386 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 100
Climate Change (%) 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	S1	15 Winter	100	+40%	100/15 Summer				82.268	0.734
1.001	S2	15 Winter	100	+40%	100/15 Summer				82.151	0.762
1.002	S3	15 Winter	100	+40%	100/15 Summer				82.101	0.753
1.003	S4	15 Winter	100	+40%	100/15 Summer				81.965	0.693
1.004	S5	15 Winter	100	+40%	100/15 Summer				81.829	0.624
1.005	S6	15 Winter	100	+40%	100/15 Summer				81.515	0.457
1.006	S7	10080 Winter	100	+40%	100/15 Summer				81.491	0.446
1.007	S8	10080 Winter	100	+40%	100/15 Summer				81.491	0.536
1.008	S9	10080 Winter	100	+40%	100/15 Summer				81.490	0.576
1.009	S10	10080 Winter	100	+40%	100/60 Winter				81.490	0.615
1.010	S11	10080 Winter	100	+40%	100/15 Summer				81.491	0.850

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	0.000	0.88			132.3	SURCHARGED	
1.001	S2	0.000	1.21			139.7	SURCHARGED	
1.002	S3	0.000	1.33			187.3	SURCHARGED	
1.003	S4	0.000	1.43			196.6	SURCHARGED	
1.004	S5	0.000	1.43			241.3	SURCHARGED	
1.005	S6	0.000	1.87			279.9	SURCHARGED	
1.006	S7	0.000	0.02			3.7	SURCHARGED	
1.007	S8	0.000	0.03			4.5	SURCHARGED	
1.008	S9	0.000	0.03			4.4	FLOOD RISK	
1.009	S10	0.000	0.04			6.6	FLOOD RISK	

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

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.010	S11	0.000	0.10			5.8	SURCHARGED	