JBA consulting

# Ryde Flood Investigation - Phase 1 Summary Report

## Final Report

**July 2025**

**Prepared for:**

**Environment Agency**

Environment Agency

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# Abbreviations

| | |
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| AEP | Annual exceedance probability |
| AFWDO | Assistant Flood Warning Duty Officer |
| EA | Environment Agency |
| FAS | Flood Alleviation Scheme |
| FEH | Flood Estimation Handbook |
| FFC | Flood Forecasting Centre |
| FIDO | Flood Incident Duty Officer |
| FMP | Flood Modeller Pro (hydraulic modelling package) |
| FODO | Flood Operations Duty Officers |
| FWDO | Flood Warning Duty Officer |
| IMFS | Incident Management Forecasting System |
| Infoworks ICM | Hydraulic modelling software |
| IoW | Isle of Wight |
| IWC | Isle of Wight Council |
| JBA | Jeremy Benn Associates |
| mAOD | meters above ordnance datum |
| MFAS | Monktonmead Flood Alleviation Scheme |
| MFDO | Monitoring and Forecasting Duty Officer |
| RL | River Level |
| SETEL | South East Telemetry Service |
| SSD | Solent and South Downs (EA operational area) |
| TDDP | Temporary Defence Deployment Plan |
| TUFLOW | Hydraulic modelling package |

# Contents

# 1 Introduction

## 1.1 Background

### 1.1.1 25 October 2023 Flooding

Flooding occurred in Ryde, Isle of Wight, on the 25th October 2023. Reportedly, over 100 properties were affected by the flooding following heavy rainfall over a period of 12 hours.

In 2019, the Environment Agency completed upgrades to the existing flood alleviation scheme in Ryde, including construction of a new outfall to the marina and a floodwall which converts Simeon Street Recreation Ground to a flood storage area during high river flows. The flood alleviation scheme was designed to better protect properties up to and including a fluvial event of a 1% Annual Exceedance Probability (AEP) event.

Due to the extent and severity of the flooding which occurred on the 25th of October, a flood investigation has been conducted. It should be acknowledged that it is not possible to comprehensively answer all questions raised in the scope of the investigation. Without undertaking hydraulic and hydrological modelling, it is not possible to comprehensively understand the impacts on flood risk to Ryde if different actions had been taken during the event.

This high-level report outlines the findings from the initial investigation which included:

- A review of the incident response and decision-making logs during the event on the 25th October 2023 and a brief assessment of its suitability, given the conditions.
- A hydrological overview of the rainfall and fluvial flows during the event on the 25th October 2023. An estimation of the rainfall return period was calculated.
- A method statement outlining the proposed approach for hydrological calculations as part of potential hydraulic modelling activities that may be required.
- A modelling method statement reviewing currently available hydraulic models for their suitability for analysis in understanding flood mechanisms. The modelling method statement also outlines the proposed approach to hydraulic modelling analysis as part of this flood investigation.

### 1.1.2 Scope of Flood Investigation

In preparing this investigation, the Environment Agency outlined an initial scope of works including:

**Incident response:**

- A review of the incident response logs made during the event
- A review of the Environment Agency Flood Alleviation Scheme and Incident Response procedures and whether these were followed (based on the available logs)

**Hydrology:**

- Catchment familiarisation and assessment of flood mechanisms
- Rainfall return period estimation, including depth duration analysis
- An assessment of the 25 October 2023 event including establishing the timeline of the event, a review of antecedent conditions, and the response of the St Johns river level gauge to rainfall
- Preparation of a hydrology method statement outlining work that may be required to fully understand the hydrological conditions of the catchment during the event.

**Hydraulic modelling:**

- Review the modelling available for Ryde
- Prepare a method statement outlining a proposed approach to hydraulic modelling that may be required to fully resolve uncertainties in the causes and impacts of the flood event.

## 1.2 Recommendations to fully address scope

This report is unable to fully address the Environment Agency's scope without undertaking further hydraulic and hydrological modelling work. To fully address the initial scope and address key knowledge gaps, we recommend that the following work is undertaken.

The development of a new Infoworks-ICM model of Ryde (as recommended by this initial review, and to be based on currently available data and from previous models), the development of a range of scenarios, the development of hydrological inputs, simulation, and interpretation of mapped outputs.

This work is aimed at providing answers to the following key questions:

- A fluvial flow estimate for the Monktonmead Brook during the 25 October 2023 event
- Detailed hydraulic modelling for both fluvial and surface water sources of flooding
- Options modelling to understand the flood risk impacts if different actions had been taken

- Understanding of whether the design standard of protection afforded by the MFAS was exceeded
- Consideration of joint probabilities of flooding from different sources.

A full list of recommendations has been developed following this initial analysis in and can be found in Section 5.2 of this report.

# 2 Incident Response Review

## 2.1 Environment Agency role in Incident Response

The Environment Agency is a Category 1 responder under the Civil Contingencies Act 2004. The Environment Agency works within geographic operational areas to fulfil this role. The Isle of Wight sits within the Solent and South Downs (SSD) operational area.

The key purpose of this review was to understand if the Environment Agency and their contractors complied with its documented procedures when operating the Monktonmead Flood Alleviation Scheme (MFAS). If it was found that the Environment Agency had not complied with their procedures, it was to be considered whether this deviation from procedures could be deemed 'reasonable'.

## 2.2 Environment Agency incident roles and logging responsibilities

There are written procedures for flood response in Ryde which are used by Environment Agency incident duty officers. These procedures provide a background on Environment Agency sites and outline the triggers and resulting actions that should be undertaken by duty officers. As part of their duties, Environment Agency staff take on incident response roles. On-call duty officers responded to the event of the 24th and 25th October 2023 and maintained logs documenting their actions and decision making throughout.

As part of the review, the Flood Incident Duty Officer (FIDO) and Flood Warning Duty Officer (FWDO) procedures were compared to the actions and decisions noted in the corresponding logs. As well as any additional information found in the Flood Operations Duty Officer (FODO), Area Base Controller (ABC) and the Monitoring and Forecasting Duty Officer (MFDO) logs.

## 2.3 Installation of drop boards

### 2.3.1 Documented procedure

The procedure provided to the FIDO regarding the implementation of drop boards at Simeon Street Recreation ground is summarised as below:

- When Monktonmead Brook water level reaches 2.5mAOD a discussion should take place between the FIDO and FODO regarding whether to install the drop boards at Simeon Street Recreation Ground.
- There are three locations for drop boards installation, the drop boards for the South of Simeon Street Recreation Ground (Rink Road) should not be installed until Monktonmead Brook overtops bank level and water enters the recreation ground.

- Installation before water flowing into the Recreation Ground can lead to surface water being prevented from entering the Recreation Ground.
- 2" pumps are required at the site to drain gardens. The contractor should provide updates on the pumps and recreation ground.

The Environment Agency has a Temporary Defence Deployment Plan (TDDP) for Ryde, which provides specific detail as to how the MFAS should be operated. Note that the use of the term 'temporary' in this case refers to the temporary barriers i.e. the stop logs, as opposed to the plan itself. The plan also details deployment triggers for operating the scheme which are consistent with the FIDO/ FWODO procedures.

The TDDP indicates that there is a provision in the EA operational procedures for a partial stop log deployment, albeit only for the stop log gate to the south of the recreation ground. It is understood that rather than leaving a gap under the stop logs, EA contractors and staff have found it more effective to deploy two stop logs, allowing surface water to build up and overtop, achieving a similar impact.

### 2.3.2 Actions taken during October 2023 event

In the early hours of the 25th October 2023, a decision was made to install two drop boards at Simeon Street Recreation Ground.

The rationale for this decision stated by the FIDO in the FODO post-event interview was it was: "*still not clear the rec would be utilised. Precautionary and go to Newport as levels increasing. Use of 2 boards so they can be lifted (not possible when all 5 are in) to allow surface water builds up under the board and into the rec."* The FODO further rationalised that with two boards only then the *"public can step over to get into the rec"*.

Based on this guidance, the local contractor left Simeon Street Recreation Ground to attempt to clear a blockage in Newport, therefore not maintaining a continuous site presence.

Within the procedures there is reference to the partial installation of boards as an option to reduce the risk of flooding in Ryde. The log also does not acknowledge the need to wait until water levels exceed bank levels before installing the boards at the south of Simeon Street Recreation Ground.

## 2.4 Assessing Simeon Street Flood Storage Area capacity

### 2.4.1 Documented procedure

There is a 'consider flood warning' action when river levels at Monktonmead Grill – Upstream Trash Screen reach 3.2m Above Ordnance Datum (AOD). Under these circumstances, "a significant amount of water will be in the recreation ground. There should still be capacity within the defence but as it is impossible to see when the defence wall will be overtopped" (FWDO Procedures).

The peak level reached at Monktonmead Grill was 3.16mAOD at 09:15 on 25/10/2025. According to the above statement, under these conditions the floodwater in the recreation ground should have been able to have been contained, with some remaining capacity, if the stop logs had been installed fully.

## 2.5 Incident management response

### 2.5.1 Communication

In the lead up to the event, the forecast was provided by the MFDO and Flood Forecasting Centre (FFC) and this information was shared with the FWDO stating that widespread rainfall was expected between 18:00 on the 24th October 2023 until midday on the 25th October 2023, with totals of 30mm and isolated totals of 60mm. According to the FWDO log there was no correspondence between the MFDO and FWDO overnight on the 24/10/2023.

As a result, the incident duty officers' response and decision making was based on information that may have no longer been the most accurate for the event. The available forecasts were used to inform resourcing of out-of-hours standby for operational staff which is why only one gang was on standby

The incident response contractor (ATM) and the Environment Agency were unable to effectively communicate throughout the event. This resulted in a delay in communicating the decision to install two drop boards to the local contractor (Brighstone) and required EA staff to bypass the incident response contractor. It then took an additional 1 hour 15 minutes for the contractor to install the boards. Therefore, no action was taken until 2 hours and 15 minutes after the original decision was made. Despite this, the local contractor managed to attend site before the recreation grounds had filled and the installed two boards.  This delay in communication with the contractor would have impacted the EA incident response during a rapidly developing event.

### 2.5.2 Logging

Logs are a primary source of evidence created during the rapidly evolving circumstances of an event. While the duty officer logs from the 24th and 25th October 2023 lack consistent detail regarding the reasoning behind key decisions, the combined record does provide a comprehensive timeline of actions taken.

## 2.6 Conclusions

From the information provided it can be determined that the Environment Agency did deviate from procedures. However the FIDO procedures highlight that there is flexibility in the timing of the decision to deploy stop logs noting that: *'Plan based on available resources and other demands on the IOW – it may be more effective to deploy early before resources are stretched.' [FIDO procedures page 169].*

Actions which deviated from procedures are as follows:

- The TDDP specifically permits partial installation of stop logs at the southern gate adjacent to Rink Road, to allow surface water to enter the recreation ground and prevent it being diverted toward properties on West Hill Road. The decision to install two stop logs at this gate aligns with the TDDP. However, the installation of two stop logs at the other two access points is not supported by the TDDP and therefore constitutes a procedural deviation.
- The decision to install only two stop logs at the other gates is unlikely to have materially affected the scheme's performance. Even with full deployment at those two gates, the system would not have operated as designed while the southern gate only had two stop logs deployed.
- The procedures also make reference to use of seepage pumps and maintaining continuous presence at the site. Although this is recognised in the logs, it is not clear from the information provided whether these procedures were followed during the event.
- It should be noted that the installation of two stop logs in all of the gates, as occurred would have provided some flood storage and therefore some mitigation in flood risk terms whilst balancing the risk of diverting surface water flows from being unable to enter the Recreation Ground, which may have led to properties on West Hill Road and elsewhere being flooded.

The TDDP allows for a partial deployment of the stop logs in the southern stop log gate in the interests of managing surface water. The FIDO/ FWODO logs also acknowledge the need to wait until water levels exceed bank levels before installing the stop logs at the south of Simeon Street Recreation Ground as this can otherwise prevent surface water entering the recreation ground, backing up and causing flooding.

The decision to install only two stop logs at the other gates is unlikely to have materially affected the scheme's performance. Even with full deployment at those two gates, the system would not have operated as designed while the southern gate only had two stop logs deployed. It was not possible for the incident response contractor to complete the installation as they were unable to return to the site due to flooding. It should be noted that the installation of two stop logs in all of the gates, as occurred would have provided some flood storage and therefore some mitigation in flood risk terms. It should also be noted that the Environment Agency has responsibility for incident response for the whole of the Isle of Wight. Therefore, the movement of the local contractor to Newport to try to resolve a blockage at Hunnyhill may be deemed 'reasonable' if not undertaking this action could have caused severe flooding in Newport.

### 2.7 Recommendations to further address scope

As previously noted, it is difficult for JBA to fully comment on the Environment Agency's response to the flooding in Ryde in October 2023 due to the limited information available for review. We recommend the following actions to fully address the scope.

- An understanding of potential impacts flood risk impacts elsewhere on the Isle of Wight to understand whether incident response actions, notably the decision to attempt to clear a grille at Hunnyhill and not maintain a continuous site presence was ‘reasonable’.
- Detailed hydraulic modelling including options testing, to understand the potential flooding impacts if different decisions had been made during the event.

# 3 Hydrological Overview

## 3.1 Catchment characteristics

The Monktonmead Brook flows through Ryde in the north east of the Isle of Wight. The Monktonmead brook catchment is small, at approximately 11km$^2$, with the southern section of the catchment being dominated by rural arable land and the northern third of the catchment being dominated by the town of Ryde. From Simeon Street, the Monktonmead Brook flows through a culvert before emerging via a tidal outfall. The culvert includes two pumps which maintain flows out of the catchment during high tide, and a tidal flap which prevents backflow.

## 3.2 Post event analysis

Data has been used to assess the timeline of events which may have contributed to flooding on the 25th October 2023 in Ryde. Data which documented the rainfall, river flows, tides, and pumping station activity were used to build the picture of the event. This includes estimation of the rainfall return period to put the severity of the event into context.

### 3.2.1 Former conditions

Lots of rainfall in the weeks and months before an event can cause the river levels to already be raised, and soils to be saturated before a storm occurs, causing a more severe response to a storm. Because of this, the conditions prior to the event on the 25th October 2023 were examined to understand how they may have affected the outcome.

Rainfall, groundwater levels, and soil moisture were slightly higher than the long-term average for October, but only marginally and conditions would not be considered 'saturated'. Wetter-than-average conditions may have contributed marginally to flooding on October 25, 2023, but the flooding that occurred was more likely caused by the extreme rainfall that fell over the night of October 24th and 25th, 2023.

### 3.2.2 Rainfall return period estimation

Total rainfall depth for the catchment area was calculated using radar rainfall data. Rainfall depths are recorded and measured every 15 minutes.

The event occurred over a period of twelve hours (21:30 24/10/2023 to 09:30 25/10/2023), with a total of 72.6mm of rainfall over this period. However, the majority of the rainfall fell within a period of six hours between 21:30 24/10/2023 and 02:30 25/10/2023. 52.5mm of the total 72.6mm fell within this six-hour period. Therefore, the intensity of the rainfall during this six-hour period was high.

Accounting for the variation in recorded rainfall from different sources (e.g. rainfall gauges and radar rainfall, and storm duration) and the uncertainty in the estimating event rarity, the depth and duration of this event is estimated between a 1.4% and 0.5% Annual Exceedance Probability (or between an 80-year and 200-year return period event).

We note that this differs to the rainfall return period estimate provided in the report published by Isle of Wight Council. There is commonly a significant amount of uncertainty in hydrological estimates and in this case it is understood that a combination of rain gauge and rainfall radar data was used to inform the estimate for this investigation, as opposed to the Isle of Wight study where rainfall radar data was not made available. Consequently, there is greater confidence in the estimate provided as part of this flood investigation; acknowledging the uncertainties involved in estimating rainfall return periods.

### 3.2.3 Tidal influence

The outlet of Monktonmead Brook in Ryde is managed by a tidal outfall with a flap located directly downstream of the pumping station that closes during high tides to prevent backflow. During high tides, two pumps move water through the culvert to maintain flows out of the catchment. At low tide, water flows out by gravity. Consequently, the outflows from Ryde depend on tides and the pump. If the water flow exceeds the pump and/or culvert capacity, it can cause backing up and flooding.

The data shows that the October 2023 event was not classified as a tidal storm, but large waves were recorded during the event. Further assessment of how wave heights may have affected the tidal flap and outflows is required.

The rainfall peak was recorded mid-tide, but peak water level was recorded at high tide when the pumping station was active. Therefore, when flows and water levels were greatest, outflows were constrained by the pump and outfall capacity.

### 3.2.4 Pumping station

During the investigation, it became evident that the lower Monktonmead Brook is significantly influenced by the tides and the pumping regime. Two pumps are present in the Simeon Street culvert which are activated at water level thresholds. During a typical high tide, one pump turns on and off approximately every hour to maintain outflows during high tide periods.

During the event, both pumps were activated, showing that fluvial flows were high. During the event, on the 25th October the first pump switched on at approximately 02:30. The second pump switched on at approximately 06:00, shown by the significant drop in water level. This also coincided with high tide. The second pump switched off at approximately 10:30, allowing river water levels to raise slightly. At this stage in the event, flood water levels over the land were receding, and the tide was also falling.

The first pump remained on until approximately 03:00 on the 26th October 2023 at low tide.

Peak water level and flow coincided with high tide in the lower part of the catchment. At this time, both pumps were active. Flows out of the catchment would have been limited by pump capacity, which could have contributed to backing up exacerbating river levels in Ryde. Hydraulic modelling is needed to better understand the complex relationship between river flows, the tide, the public sewer network, the pumping station, and how this affects flood risk.

### 3.2.5 Fluvial flow estimation

An estimate of fluvial flow return period cannot be made at this stage. This is because the usual relationship between catchment characteristics, rainfall and flow do not apply in this case due to the influence of the tide and the pumping station on flows and water levels in the lower Monktonmead Brook catchment.

Fluvial flow return periods may be estimated as part of additional hydraulic modelling work that may be required to comprehensively understand the flood mechanisms of using an iterative process.

## 3.3 Hydrological summary of event

The event on the 25th October 2023 was defined by intense heavy rainfall, with approximately 72.6mm of rainfall falling over a period of 12 hours. This is estimated as between a 1.4% and 0.5% AEP event (or between an 80-year and 200-year return period event).

Both the tide and the pumping station were found to have a large impact on flow and water level in the lower Monktonmead Brook in Ryde. The 25th October event was not classified as a tidal storm, but large waves were recorded. The water level peak coincided with high tide. Both pumps in the pumping station were activated due to high water levels.

Whilst the relationship between the pumping station, tide, and river flows is yet to be established, the fact that both pumps were active at the peak water level indicates that flows out of the catchment were limited by pump capacity, which could have exacerbated flooding.

Without hydraulic modelling, the complex flood processes (including the influence of tides, the pumps and flow) cannot yet be fully understood. As a result, a flow return period estimate cannot be provided at this this stage. The hydraulic modelling in proposed will be crucial in better understanding the causes of 25th October 2023 event.

## 3.4 Proposals for additional work

To more comprehensively investigate the causes of mechanism of flooding, the following hydrological tasks would need to be undertaken:

- A site visit to Ryde and the Monktonmead Brook catchment to better understand catchment processes
- Development of a range of fluvial flow hydrographs estimates from observed rainfall and design rainfall estimates
- Comparison of flow hydrographs against model outputs. Through multiple rounds of testing, a fluvial flow return period estimate may be developed, if the data supports this.
- Joint probability analysis of the variety of processes within the Monktonmead Brook catchment, including rainfall, tide, and soil moisture (a proxy for surface runoff).

# 4 Hydraulic modelling

## 4.1 Use of modelling as part of the Flood Investigation

Hydraulic modelling will be the crucial part of the flood investigation to understand the effect of the operation of the FAS during the October 2023 flood event in Ryde. The hydraulic model would represent the Monktonmead Brook and the flows within the river channel. The effect of the tidal outfall and the tidal flap on river level and flow will also be represented in the model.

The hydraulic model will also provide a digital representation of the land surface in the catchment, including the FAS, the immediate area surrounding it and Ryde. Therefore, it also represents the direction, speed and depth of flows on floodplain and land surface, should flows in the Monktonmead Brook exceed the riverbanks.

The October 2023 event was unique because surface water flooding played a key role in the operational decision making of the Simeon Street Recreation Ground FAS. It is therefore key that the hydraulic modelling undertaken as part of this study can also represent surface water and the risk this posed. It is understood that during the October 2023 event, an operational decision was made to utilise the Simeon Street Recreation Ground to store both fluvial bank overtopping flows, as well as surface water. Therefore, it is essential that the modelling as part of this study can represent the interaction between surface water flooding from impermeable surfaces, and fluvial flooding from the Monktonmead Brook.

## 4.2 Existing modelling

There are multiple existing models available of the study area:

- A Flood Modeller Pro (FMP) - TUFLOW model (developed in 2018/19 and recently updated in 2025). This represents the flows in the river channel of the Monktonmead Brook and how they interact when flowing out of bank and into the Simeon Street Recreation Ground.
- An integrated Infoworks-ICM model was developed as part of the 2015 Surface Water Management Plan for Isle of Wight Council. This represents the Southern Water sewerage, surface water flow pathways, and flows from the Monktonmead Brook. This model predates the FAS, so it the FAS not included in the representation of the study area.
- The current Infoworks-ICM model is based on a Southern Water sewer network model from 2008. It is known that a more up to date sewer network model is available. This has been requested but has not available at the time of writing.

## 4.3 Proposed hydraulic modelling approach

It is recommended that a new integrated hydraulic model is developed using Infoworks-ICM in a 1D-2D format. This approach allows for a robust representation of fluvial flows and tide levels in the Monktonmead Brook as well as the urban drainage network and routing of runoff resulting from rainfall applied directly to the 2D Zone. Where relevant, information from the 2015 Infoworks-ICM model from the Surface Water Management Plan could be used as a base to build the new model. As-Built information of the FAS from the 2025 FMP-TUFLOW model can also be used to develop the new integrated model.

InfoWorks-ICM includes a scenario feature that allows a range of conditions to be developed and tested in parallel. This will be used when comparing pre and post scheme scenarios, as well as sensitivity and validation tests based on the flood event. The 1D-2D modelling approach allows for a series of deliverables such as depth, water level, velocity and hazard ASCII format grids to be extracted to provide further information on predicted flood risk throughout the study area during the event.

Three scenarios main are proposed to be represented in the proposed integrated hydraulic model:

- Scenario 1a - As-Built scheme designs included in the model with all elements of the scheme deployed throughout the event
- Scenario 1b - As-Built scheme with 2 drop boards height in place (as it was configured during the 25th October 2023 event)
- Scenario 1c - As-Built scheme with no drop boards installed throughout the event

This is not a definitive list of scenarios. Other scenarios can be added as felt appropriate, including a range of return periods.

## 4.4 Proposal for hydraulic modelling

Key hydraulic modelling tasks would include:

- Ascertain if the most recent Southern Water sewer network data (not the 2008 version currently held) is available for this study
- Undertake a site visit to visualise the catchment and key processes
- Build a new integrated Infoworks-ICM model using relevant information from the site visit, available sewer network data, 2015 Infoworks-ICM model, and the 2025 FMP-TUFLOW fluvial model and As-Built FAS scheme data
- Confirm the final set of scenarios to be tested using the integrated hydraulic model
- Comparison of flow hydrographs against model outputs. Through multiple rounds of testing, a fluvial flow return period estimate may be developed, if the data supports this.

- Assess flows in Monktonmead Brook and assess the combined influence of the tides and pump operation on water levels in the river channel
- Estimate surface water flows into Simeon Street Recreation Ground from the surrounding area. Assess the impact on flood storage and flood risk
- Assess the performance of the MFAS against its design specifications
- Assess whether the nature of the storm event exceeded that of the standard of the protection of the MFAS
- Assess the impact of the operational decisions regarding the number of drop boards installed on modelled flooding in the surrounding area

# 5 Conclusion and Recommendations

## 5.1 Conclusions

The EA scope posed a number of questions that this investigation should answer:

Table 1: EA scope and conclusions of this report

| Question | Conclusion |
|---|---|
| A) *confirm what rainfall fell across the Monktonmead Brook catchment and determine rainfall return period (i.e. all day of 25th).* | This investigation has determined an estimate of 1 in 80 to 1 in 200 years for a catchment rainfall return period estimate, accounting for uncertainties in data and hydrological estimates. |
| B) *What were the fluvial flows in the Monktonmead Brook?* | See Hydrological Overview and FEH Calculation Record. Too much uncertainty to provide an accurate estimate without undertaking hydraulic modelling. |
| C) *What were the surface water flows into the Ground and into the nearby flooded streets; The Strand, Simeon Street, Cornwall Street and West Hill Road?* | Not possible to determine at this stage without undertaking further hydraulic modelling work. |
| D) *Confirm whether the MFAS performed as designed, bearing in mind the EA procedures for its operation and the nature of the storm?* | Not possible to determine at this stage without undertaking further hydraulic modelling work. |
| E) *Did the event exceed the MFAS design parameters, by which we mean what standard of protection MFAS provides* | Not possible to determine at this stage without undertaking further hydraulic modelling work. |

| Question | Conclusion |
| --- | --- |
| F) *Did the Environment Agency comply with its procedures and if it did not, was the departure from the procedures reasonable?* | No, the Environment Agency did not strictly comply with its procedures, as the installation of two stop logs at each of the three access points at Simeon Street Recreation Ground is not supported by the TDDP or associated operational guidance. However, the partial installation at the southern gate adjacent to Rink Road is explicitly allowed under the TDDP to manage surface water flow meaning this aspect of the deployment was compliant. The rationale for the wider partial deployment is recorded in the incident logs and appears to reflect a pragmatic response to conflicting risks in real time. Nonetheless, the scheme would not have functioned as intended with a partial installation at the southern gate, and therefore the partial installation at the other gates is unlikely to have materially altered the outcome. Further hydraulic modelling may help to confirm the impact of different deployment configurations. |
| G) *Was the flooding of nearby houses exacerbated by the fact that only 2 boards were fixed at each Opening?* | Not possible to determine at this stage without undertaking further hydraulic modelling work. |

The table below is a summary of the findings and conclusions to the key questions laid out in the scope of works following Phase 1.

### 5.1.1 Incident management conclusions

We consider that the Environment Agency did deviate from its procedures as follows:

- The TDDP specifically permits partial installation of stop logs at the southern gate adjacent to Rink Road, to allow surface water to enter the recreation ground and prevent it being diverted toward properties on West Hill Road. The decision to install two stop logs at this gate aligns with the TDDP. However, the installation of two stop logs at the other two access points is not supported by the TDDP and therefore constitutes a procedural deviation.
- The decision to install only two stop logs at the other gates is unlikely to have materially affected the scheme's performance. Even with full deployment at those two gates, the system would not have operated as designed while the southern gate only had two stop logs deployed.

- The procedures also make reference to use of seepage pumps and maintaining continuous presence at the site. Although this is recognised in the logs, it is not clear from the information provided whether these procedures were followed during the event.
- It should be noted that the installation of two stop logs in all of the gates, as occurred would have provided some flood storage and therefore some mitigation in flood risk terms whilst balancing the risk of diverting surface water flows from being unable to enter the Recreation Ground, which may have led to properties on West Hill Road and elsewhere being flooded.

### 5.1.2 Hydrological event overview conclusions

- Approximately 72.6mm of rainfall falling over a period of 12 hours. This is estimated as between a 1.4% and 0.5% AEP event (or between an 80-year and 200-year return period event).
- Catchment flood processes are highly complex due to the interaction between the tide, tidal flap and pumping station
- It is not possible to determine a fluvial flow return period without undertaking further hydraulic modelling work (Section 4) and joint probability analysis

### 5.1.3 Hydraulic modelling conclusions

- Currently available models are not suitable for analysis
- The hydraulic model required to undertake analysis will need to represent fluvial and surface water flows, and the interactions between them.
- A new Infoworks-ICM model is proposed which includes As-Built representation of the MFAS.

## 5.2 Recommendations for further work

To fully address the required scope of the investigation, and to comprehensively understand the causes and mechanisms of flooding additional work will be required. Below is a synthesised list of recommendations:

### 5.2.1 Key recommendations from hydrological overview and method statement

- A site visit to Ryde and the Monktonmead Brook catchment to better understand catchment processes
- Development of a range of fluvial flow hydrographs estimates from observed rainfall and design rainfall estimates
- Comparison of flow hydrographs against model outputs. Through multiple rounds of testing, a fluvial flow return period estimate may be developed, if the data supports this.

- Joint probability analysis of the variety of processes within the Monktonmead Brook catchment, including rainfall, tide, and soil moisture (a proxy for surface runoff).

### 5.2.2 Key recommendations following model review and method statement

- Build a new integrated Infoworks-ICM model using relevant information from the site visit, available sewer network data, 2015 Infoworks-ICM model, and the 2025 FMP-TUFLOW fluvial model and As-Built FAS scheme data
- Ascertain if the most recent Southern Water sewer network data (not the 2008 version currently held) is available for this study
- Undertake a site visit to visualise the catchment and key processes
- Confirm the final set of scenarios to be tested using the integrated hydraulic model
- Comparison of flow hydrographs against model outputs. Through multiple rounds of testing, a fluvial flow return period estimate may be developed, if the data supports this.
- Assess flows in Monktonmead Brook and assess the combined influence of the tides and pump operation on water levels in the river channel
- Estimate surface water flows into Simeon Street Recreation Ground from the surrounding area. Assess the impact on flood storage and flood risk
- Assess the performance of the MFAS against its design specifications
- Assess whether the nature of the storm event exceeded that of the standard of the protection of the MFAS
- Assess the impact of the operational decisions regarding the number of drop boards installed on modelled flooding in the surrounding area


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