Medworth Energy from Waste
Combined Heat and Power Facility

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Environmental Statement

Chapter 12 Hydrology Appendix 12F: Outline Drainage Strategy

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Executive Summary

This Outline Drainage Strategy accompanies the Environmental Statement (ES) for the proposed Energy from Waste (EfW) Combined Heat and Power (CHP) Facility (the 'EfW CHP Facility'). The EfW CHP Facility is located on the industrial estate, Algores Way, Wisbech, Cambridgeshire.

This document sets out the outline drainage strategy for managing surface water runoff from the Proposed Development during the construction and operational phases in a sustainable manner, in accordance with the requirements of National Policy Statement (NPS) EN-1 and the National Planning Policy Framework (NPPF) to manage surface water flood risk on-site, not increase flood risk elsewhere, and where possible, reduce flood risk overall. Any pumped groundwater during construction will also be managed as part of this drainage strategy. Management of runoff during the decommissioning phase will be detailed in a Decommissioning Plan; secured by a Development Consent Order (DCO) requirement.

Outline drainage strategy for EfW CHP Facility

During the construction phase, it is proposed that surface water runoff and any pumped groundwater will be collected by a series of French drains which will discharge to perimeter swales. Three attenuation basins in the southern area of the site will receive flows from the perimeter swales (gravity fed from southern area and pumped from northern area) prior to discharge into the Hundred of Wisbech Internal Drainage Board (HWIDB) drainage network. Surface water runoff from the Temporary Construction Compound (TCC) will be collected in swales and attenuated in an underground attenuation tank prior to discharge into the HWIDB drainage network. All discharges into the HWIDB drains will be limited to greenfield rates for events up to and including the 1% Annual Exceedance Probability (AEP) with a 20% climate change allowance as agreed with HWIDB and CCC. The indicative SuDS proposals provide the required pollution control in accordance with The CIRIA SuDS Manual C753.

For the operational phase, it is proposed to provide surface water attenuation in underground geo-cellular tanks due to the spatial constraints within the EFW CHP Facility Site, although other forms of SuDS features have been considered. These include permeable paving in car parking areas, infiltration in laydown and maintenance areas, rainwater harvesting and brown roofs for the gatehouse and administration building. Discharge would be into the HWIDB drains at greenfield rates for all events up to the 1% AEP plus 40% climate change as agreed with HWIDB and CCC. The indicative SuDS proposals provide the required pollution control in accordance with The CIRIA SuDS Manual C753. Spent fire water will also be collected in the surface water drainage system. In the event of a fire the discharge to the HWIDB drains ceases and the spent fire water (together with any surface runoff) will be tankered off site.

Outline Drainage Strategy for Walsoken Substation

During the construction phase, it is proposed that surface water is collected by French drains which convey water into a swale and a small detention basin, before discharge into an adjacent drainage ditch as discussed with Norfolk County Council (NCC) and King's Lynn Internal Drainage Board (KLIDB) and subject to consent by KLIDB. The discharge location will be agreed as part of the detailed Drainage Strategy with KLIDB and NCC post DCO

consent and prior to construction following a topographical and ditch walkover survey. The indicative SuDS proposals provide the required pollution control in accordance with The CIRIA SuDS Manual C753.

During the operational phase, it is proposed that surface water runoff will be allowed to infiltrate to the ground via permeable paving. Further investigation of the viability of infiltration as a means by which surface water runoff could be discharged to ground will be undertaken post DCO consent and prior to construction, through liaison with NCC and by undertaking a soakaway testing exercise and a topographical and ditch walkover survey. If infiltration into the ground is not a viable solution, then surface water flows will be attenuated in a detention basin prior to discharge into a nearby ditch. The necessary powers have been included within the DCO to allow for the discharge and discharge infrastructure into the ditch in agreement with the relevant drainage authority.

Outline Drainage Strategy for the Electricity and Water grid connections

The underground electricity cable grid connection and water connections will be installed in an open cut trench (approximate trench depth of 1200-2000mm below ground level, and trench width of between 450–600mm), although the water connection may be horizontally directionally drilled (typical depth of 4m) beneath the A47 carriageway using trenchless techniques. If dewatering of the excavations is required then appropriate treatment will be provided before discharge to surface or groundwater, and this could include the use of silt busters (or similar), if necessary. The DCO includes for the necessary powers to allow for the discharge of surface water into the drain which runs parallel to New Bridge Lane.

The permanent infrastructure associated with the underground electricity cable grid connection and water connections would be entirely underground and would not affect surface runoff rates. Therefore, no specific drainage measures are proposed in relation to the operational phase.

Outline Drainage Strategy for Access Improvement Works

During the construction phase, it is proposed that surface water runoff is collected by temporary cut-off drainage ditches (or swales) along the improved section of New Bridge Lane (and access bell mouth), before being discharged into the HWIDB drain located on the southern edge of New Bridge Lane. Surface water runoff generated during the construction phase would pass through a number of straw bales located in the temporary drainage ditches to remove silts and solids before entering into the HWIDB drain at an agreed discharge point. The Applicant will replace the straw bales regularly to prevent decomposition of the bales and subsequent release ammonia into the drainage system .

During the operational phase, it is proposed that surface water runoff from the improved section of New Bridge Lane and new entrance into the EfW CHP Facility will discharge into the HWIDB drain south of New Bridge Lane, subject to the approval of HWIDB. New trapped gullies will be installed along the southern carriageway of improved section along New Bridge Lane, which will ensure the settlement of solids prior to discharge into the HWIDB drain.

Highway drainage runoff from the new access bell-mouth at Algores Way will primarily be discharged into the adjacent HWIDB drain, but there may be a small quantity of highway drainage runoff which discharges into the existing highway drainage network, which will require approval from the local Highway Authority.

Contents

1. Introduction

1.1 Background

1.1.1 Medworth CHP Limited (the Applicant) is applying to the Secretary of State (SoS) for a Development Consent Order (DCO) to construct operate and maintain an Energy from Waste (EfW) Combined Heat and Power (CHP) Facility on the industrial estate, Algores Way, Wisbech, Cambridgeshire. Together with associated Grid Connection, CHP Connection, Access Improvements, Water Connections, and Temporary Construction Compound (TCC), these works are the Proposed Development.

1.1.2 The Proposed Development would recover useful energy in the form of electricity and steam from over half a million tonnes of non-recyclable (residual), non-hazardous municipal, commercial and industrial waste each year. The Proposed Development has a generating capacity of over 50 megawatts and the electricity would be exported to the grid. The Proposed Development would also have the capability to export steam and electricity to users on the surrounding industrial estate. Further information is provided in **Chapter 3: Description of the Proposed Development (Volume 6.2)**.

1.1.3 The Proposed Development is a Nationally Significant Infrastructure Project (NSIP) under Part 3 Section 14 of the Planning Act 2008 (2008 Act) by virtue of the fact that the generating station is located in England and has a generating capacity of over 50 megawatts (section 15(2) of the 2008 Act). It, therefore, requires an application for a DCO to be submitted to the Planning Inspectorate (PINS) under the 2008 Act. PINS will examine the application for the Proposed Development and make a recommendation to the SoS for Business, Energy and Industrial Strategy (BEIS) to grant or refuse consent. On receipt of the report and recommendation from PINS, the SoS will then make the final decision on whether to grant the Medworth EfW CHP Facility DCO.

1.2 The Applicant and the project team

1.2.1 The Applicant is a wholly owned subsidiary of MVV Environment Limited (MVV). MVV is part of the MVV Energie AG group of companies. MVV Energie AG is one of Germany's leading energy companies, employing approx. 6,500 people with assets of around €5 billion and annual sales of around €4.1 billion. The Proposed Development represents an investment of approximately £350m.

1.2.2 The company has over 50-years' experience in constructing, operating, and maintaining EfW CHP facilities in Germany and the UK. MVV Energie's portfolio includes a 700,000 tonnes per annum residual EfW CHP facility in Mannheim, Germany.

1.2.3 MVV Energie has a growth strategy to be carbon neutral by 2040 and thereafter carbon negative, i.e., climate positive. Specifically, MVV Energie intends to:

- reduce its direct carbon dioxide (CO_2) emissions by over 80% by 2030 compared to 2018;
- reduce its indirect CO_2 emissions by 82% compared to 2018;
- be climate neutral by 2040; and
- be climate positive from 2040.

1.2.4 MVV's UK business retains the overall group ethos of 'belonging' to the communities it serves whilst benefitting from over 50 years' experience gained by its German sister companies.

1.2.5 MVV's largest project in the UK is the Devonport EfW CHP Facility in Plymouth. Since 2015, this modern and efficient facility has been using around 265,000 tonnes of municipal, commercial and industrial residual waste per year to generate electricity and heat, notably for Her Majesty's Naval Base Devonport in Plymouth, and exporting electricity to the grid.

1.2.6 In Dundee, MVV has taken over the existing Baldovie EfW Facility and has developed a new, modern facility alongside the existing facility. Operating from 2021, it uses up to 220,000 tonnes of municipal, commercial and industrial waste each year as fuel for the generation of usable energy.

1.2.7 Biomass is another key focus of MVV's activities in the UK market. The biomass power plant at Ridham Dock, Kent, uses up to 195,000 tonnes of waste and non-recyclable wood per year to generate green electricity and is capable of exporting heat.

1.2.8 To prepare the ES for the Proposed Development, the Applicant has engaged Wood Group UK Limited (Wood). Wood is registered with the Institute of Environmental Management and Assessment (IEMA)'s Environmental Impact Assessment (EIA) Quality Mark scheme. The scheme allows organisations that lead the co-ordination of EIAs in the UK to make a commitment to excellence in their EIA activities and have this commitment independently reviewed.

1.3 The Proposed Development

1.3.1 The Proposed Development comprises the following key elements:

- The EfW CHP Facility;
- CHP Connection;
- TCC;
- Access Improvements;
- Water Connections; and
- Grid Connection.

1.3.2 A summary description of each Proposed Development element is provided below. A more detailed description is provided in **ES Chapter 3: Description of the Proposed Development (Volume 6.2)** of the ES. A list of terms and abbreviations can be found in **Chapter 1 Introduction, Appendix 1F Terms and Abbreviations (Volume 6.4)**.

- EfW CHP Facility Site: A site of approximately 5.3ha located south-west of Wisbech, located within the administrative areas of Fenland District Council and Cambridgeshire County Council. The main buildings of the EfW CHP Facility would be located in the area to the north of the Hundred of Wisbech Internal Drainage Board (HWIDB) drain bisecting the site and would house many development elements including the tipping hall, waste bunkers, boiler house, turbine hall, air cooled condenser, air pollution control building, chimneys and administration building. The gatehouse, weighbridges, 132kV switching compound and laydown maintenance area would be located in the southern section of the EfW CHP Facility Site.
- CHP Connection: The EfW CHP Facility would be designed to allow the export of steam and electricity from the facility to surrounding business users via dedicated pipelines and private wire cables located along the disused March to Wisbech railway. The pipeline and cables would be located on a raised, steel structure.
- TCC: Located adjacent to the EfW CHP Facility Site, the compound would be used to support the construction of the Proposed Development. The compound would be in place for the duration of construction.
- Access Improvements: includes access improvements on New Bridge Lane (road widening and site access) and Algores Way (relocation of site access 20m to the south).
- Water Connections: A new water main connecting the EfW CHP Facility into the local network will run underground from the EfW CHP Facility Site along New Bridge Lane before crossing underneath the A47 (open cut trenching or Horizontal Directional Drilling (HDD)) to join an existing Anglian Water main. An additional foul sewer connection is required to an existing pumping station operated by Anglian Water located to the northeast of the Algores Way site entrance and into the EfW CHP Facility Site.
- Grid Connection: This comprises a 132kV electrical connection using underground cables. The Grid Connection route begins at the 132kV switching compound in the EfW CHP Facility Site and runs underneath New Bridge Lane, before heading north within the verge of the A47 to the Walsoken Substation on Broadend Road. From this point the cable would be connected underground to the Walsoken DNO Substation.

1.4 Purpose of this Document

1.4.1 This document sets out the outline drainage strategy for managing surface water runoff (and pumped groundwater during construction) from the Proposed Development during the construction and operational phases in a sustainable manner, in accordance with the requirements of NPS EN-1 and the NPPF to manage surface water flood risk on-site, not increase flood risk elsewhere, and where possible, reduce flood risk overall. Management of runoff during the decommissioning phase will be detailed in a Decommissioning Plan; secured by a DCO requirement.

1.5 Overview of Drainage Strategy Scope

1.5.1 The need for sustainable surface water management for the Proposed Development is set out in the overarching National Policy Statement on Energy (NPS EN-1 and draft NPS EN-1 (2011 and 2021)), the NPPF and the Defra Non-Statutory Technical Standards for Sustainable Drainage Systems (Defra, 2015). Best practice guidance is provided in the CIRIA SuDS manual (CIRIA, 2015). At the local level, guidance is provided by Cambridgeshire County Council (CCC), and Norfolk County Council (NCC) as the Local Lead Flood Authority (LLFA), who have prepared the following strategies: Cambridgeshire Surface Water Management Plan (2014), Cambridgeshire Flood and Water Supplementary Planning Document (2016), Kings Lynn and West Norfolk Settlements Surface Water Management Plan (2010) and Surface Water Drainage: Local Guidance for Planning Applications (Sequential Test and Exception Test) and Surface Water Drainage Guidance for Developers (2018).

1.5.2 The creation of the hardstanding surfaces associated with the buildings and vehicle movement areas within the EfW CHP Facility Site has the potential to increase surface water runoff rates and volumes and modify runoff pathways. The creation of temporary and new permanent infrastructure associated with the Grid Connections and Walsoken Substation must also be considered. Appropriate management of surface water will therefore be necessary to ensure risks to on-site and off-site (down-gradient) third party Receptors are appropriately addressed.

1.5.3 A water management system has been designed for the Proposed Development to address surface water runoff (surface water originating from within the site); surface water run-on (surface water originating from outside of the site, if any); and any groundwater ingress to temporary excavations or permanent underground structures (which it is anticipated would be dealt with in the surface water management system).

1.5.4 Initial conceptual strategies for the EfW CHP Facility were developed by the designers for the construction and operational phases at PEIR stage and were presented at statutory consultation. These have been developed into this Outline Drainage Strategy which forms **Appendix 12F (Volume 6.4)** of **Chapter 12: Hydrology**. The detailed design of these systems is to be developed subsequent to approval of the DCO and would form a DCO Requirement.

1.5.5 A SuDS system for the Proposed Development has been established to meet runoff storage and treatment requirements. This has been achieved by using a number of SuDS features, including permeable paving, swales and attenuation in the form of attenuation basins and underground geo-cellular attenuation tanks. Initial estimates of surface water runoff attenuation volumes for the construction and operational phases of the Proposed Development are provided in **Annex A**.

1.6 Structure of this Document

1.6.1 The Document is structured as follows:

- **Section 2 -** provides a review of the SuDS legislation and guidance which set out the context for the attenuation requirements;
- **Section 3** – provides a summary of key consultation responses on the proposed Outline Drainage Strategy and the method through which the proposed strategy would comply with each requirement;
- **Section 4** – provides details of the proposed Outline Drainage Strategy for the Proposed Development during both the construction and operational phases;
- **Section 5** – provides a summary of the proposed surface water drainage maintenance plan; and
- **Section 6** – provides a summary of the key features of the proposed Outline Drainage Strategy.

2. SuDS Legislation and Guidance

2.1 Introduction

2.1.1 This Section provides a review of the SuDS legislation and guidance which set out the context for the attenuation requirements provided in this Outline Drainage Strategy.

2.2 National Policy

2.2.1 NPS EN-1 (and draft NPS EN-1) requirements for SuDS are consistent with those of the NPPF which is described below and are summarised in **Appendix 12A**: **FRA Table 2.2 EN-1 and Draft EN-1 requirements relating to flood risk, and the location in which the requirements are addressed in this report (Volume 6.4)**.

2.2.2 The NPPF requires that the volumes and peak flow rates of surface water leaving a developed site are no greater than the rates prior to the proposed development (unless specific off-site arrangements are made and result in the same net effect). Typically, run-off volumes generated during a storm will have to be stored for the duration of the storm and infiltrated to ground or released slowly afterwards to meet the required discharge rate.

2.2.3 The NPPF further advises that planning authorities should promote the use of SuDS principles in the management of surface-water run-off from new developments. There is a presumption for the use of SuDS within any development, except in rare instances that it can be demonstrated that SuDS principles cannot be feasibly incorporated within a development, as agreed with the planning authority.

2.3 Floods and Water Management Act, 2010

2.3.1 Under the Floods and Water Management Act 2010, CCC is designated as the LLFA for activities relating to the EfW CHP Facility, CHP Connection, TCC, Access Improvements, Water Connection and a section of the Grid Connection (up to the boundary with Norfolk at Elm High Road (A1101)). NCC is designated as the LLFA for activities for the remainder and majority of the Grid Connection. The Proposed Development is also located in the operating areas of the HWIDB and KLIDB, who are also risk management authorities under the FWMA 2010. These bodies, therefore, are statutory consultees on major planning applications in relation to surface water drainage.

2.4 CIRIA SuDS Manual (C753)

2.4.1 The CIRIA SuDS Manual (C753, 2015) is the most up-to-date industry standard containing revised principles and technical advice for the planning, design, construction, management, and maintenance of effective SuDS. The drainage systems for new developments should be designed to align with the SuDS Manual.

The Manual provides guidance on SuDS principles of attenuation storage and treatment.

2.5 DEFRA Non-statutory technical standards for sustainable drainage systems, 2015

2.5.1 The Non-Statutory Technical Standards for Sustainable Drainage Systems is a national guidance document that provides a set of standards to be applied when designing SuDS systems for new developments. Standards include controls on peak flow and volume of run-off, and flood risk internal to the development and downstream. CCC, and NCC as the LLFAs, are likely to judge any proposed surface water management system according to their own flow standards, which are aligned with the national non-statutory technical standards.

2.6 Cambridgeshire Flood and Water and Supplementary Planning Document

2.6.1 The Cambridgeshire Water Flood and Supplementary Planning Document[1]provides the following advice:

- Designers should be recommended to look into incorporating source control drainage wherever possible as part of the design, i.e., permeable paving, rainwater harvesting, living walls, rain gardens, filter strips, green roofs, and bio retention areas.
- Design and layout should seek to manage and convey surface water above-ground, avoiding the use of underground piping as far as possible. This is particularly pertinent in Cambridgeshire due to the flat landscape and areas of high groundwater.
- It is important that environment improvements from SuDS are not reduced by incorporating high carbon solutions. The excessive use of concrete and other aggregates with high levels of embodied energy is discouraged. Eliminating energy consuming water pumps whenever possible is also encouraged.
- Design should also consider Construction Design and Management (CDM) Regulations from the outset to ensure that access is provided for maintenance and that health and safety measures are adhered to. Those responsible for SuDS across a development should ideally be provided with an operation and maintenance manual by the designer and this could be part of the documentation provided under CDM.

2.6.2 These matters have been considered in this drainage strategy through the implementation of SuDS for attenuation storage and treatment, and source control measures, e.g., permeable paving and green roofs.

[1] Cambridgeshire County Council, Cambridgeshire Flood and Water Supplementary Planning Document 2016. Available online at: https://www.scambs.gov.uk/planning/local-plan-and-neighbourhood-planning/cambridgeshire-flood-and-water-spd/

2.7 Norfolk County Council Lead Local Flood Authority Statutory Consultee for Planning Guidance Document

2.7.1 The Norfolk County Council Lead Local Flood Authority Statutory Consultee for Planning Guidance Document (2021) provides the following advice:

- NCC encourages the identification of greenfield areas within the site boundary to be protected and every opportunity made to improve existing flood issue.
- Within any critical drainage catchment, it is expected any brownfield development to limit surface water drainage discharge as close to greenfield rates as possible. Retaining pre-development 100% runoff rates and volume from impermeable areas is unlikely to be acceptable.
- Surface water drainage should be managed in a way that replicates the natural drainage processes on the site as closely as possible. Development sites can be split into sub catchments for drainage and proposals put forward on how to best manage runoff within these sub catchments.
- It should clearly be demonstrated in any submission how the proposals follow the SuDS hierarchy, as detailed in the CIRIA SuDS Manual. Adequate justification and evidence will be required should surface water be proposed to be discharged using methods lower down the hierarchy than infiltration. It is expected that at least one option is demonstrated to be feasible, can be adopted and properly maintained and would not lead to any other environmental problems.
- An applicant should risk assess the development for water quality and propose mitigation in a SuDS treatment train as in Section 4 and 26 of CIRIA SuDS Manual (C753) and would expect the assessment of pollution hazard and mitigation to be included within the application.
- The management and maintenance of SuDS should appropriately account for the construction, operation and maintenance requirements of all components of the drainage system.

3. Consultation Advice on Surface Water Drainage

3.1 Introduction

3.1.1 This section provides details of the key consultation responses on the proposed Outline Drainage Strategy and the method through which it would comply with each consultee requirement. Full details of issues/response to matters raised prior to DCO submission are provided in **Appendix 12B of ES Chapter 12: Hydrology (Volume 6.4)**. This section has been updated to include additional issues/responses received from the consultees since DCO submission and as reflected in the Relevant Representations. Consultation responses were received from:

- HWIDB as the Internal Drainage Board for the area where the EfW CHP Facility Site, CHP Connection Corridor, Access Improvements, TCC and Water Connection and part of the Grid Connection (underground cable and Walsoken Substation) are located;
- KLIDB as the Internal Drainage Board for the area where part of the Grid Connection (underground cable and Walsoken Substation) is located;
- CCC as the LLFA where the EfW CHP Facility Site, CHP Connection Corridor, Access Improvements, TCC and Water Connection and part of the Grid Connection (underground cable and Walsoken Substation) are located;
- NCC as the LLFA for the area where part of the Grid Connection (underground cable and Walsoken Substation) is located; and
- EA for the Proposed Development.

3.2 HWIDB Surface Water Drainage Advice

3.2.1 The key surface water drainage advice provided by HWIDB in consultation meetings and correspondence to date and the method through which the proposed strategy would comply with each requirement are summarised in **Table 3.1 HWIDB requirements and compliance in Outline Drainage Strategy.**

Table 3.1: HWIDB requirements and compliance in Outline Drainage Strategy

Comment reference	Requirements from consultation response	Compliance with requirement
1	The EfW CHP Facility Site is within a Critical Drainage Area, and therefore, any water discharge into the HWIDB drains would need to be at the equivalent greenfield rate of runoff.	As requested, surface water discharges from the EfW CHP Facility Site into the HWIDB network will be limited to greenfield runoff rate both during construction and operational phases.

Comment reference	Requirements from consultation response	Compliance with requirement
2	A single discharge point to the HWIDB drains is preferred. The location of the outfall would primarily be guided by the layout of the EfW CHP Facility. An outfall near IDB drain node 46 (as indicated **in Appendix** **12A: FRA Figure 2.3a: Water Environment (Proposed Development)**), **Volume 6.4** would be the preferred location as this is downstream of the IDB system adjacent to the EfW CHP Facility.	As requested, the majority of the runoff from the operational EfW CHP Facility Site is proposed to be discharged as a single outfall near node 46. The runoff from the smaller car park area is proposed to be discharged between nodes 46 and 47 (**Figure 4.2 Proposed Drainage Strategy for Operational Phase**).
3	Preference is given to a solution that considers the whole water cycle process, including water recycling and a closed water system.	There is limited demand for reuse of surface water runoff in the process which would be difficult to use because of its water quality. However, source control features such as permeable paving, rainwater harvesting and green wall and brown roof for the Administration building and a brown roof for weighbridge gatehouse have been adopted in the design of the EfW CHP Facility.
4	No reference is made to the drainage system serving the widened road or any adverse impacts upon it given that Cambridgeshire County Council do not currently adopt SuDS features and that the Board's system is considered to be close to capacity and will require all discharges to be attenuated to greenfield rates of runoff.	As detailed in **Section 4** of this document, it is proposed that surface water runoff from the improved section of New Bridge Lane and new entrance into the EfW CHP Facility Site will discharge into the HWIDB drain south of New Bridge Lane, subject to the approval of HWIDB. New trapped gullies will be installed along the southern carriageway of the improved section of New Bridge Lane, which will ensure the settlement of solids prior to discharge into the HWIDB drain. Surface water runoff from the bell-mouth of the new access into the EfW CHP Facility Site will be

Comment reference	Requirements from consultation response	Compliance with requirement
		conveyed via a series of trapped gullies and carrier drains before discharging into the HWIDB drain at an agreed location. Flows from the bell-mouth will be attenuated within the new pipework, before passing through a penstock valve chamber and entering the HWIDB drain. It is not proposed to attenuate the flows to the access from Algores Way as the net increase in impermeable area will be small. Attenuation requirements will be agreed in consultation with HWIDB during the detailed design stage.
5	Water quality Also, the quality of water discharge from the site, during all phases does not appear to have been considered. Given the ecological sensitivity of the hydraulically-linked (European Protected Species (EPS) particularly to water levels and quality, the Board would expect the development to be able (or be required) to demonstrate 'water and nutrient neutrality' if it is to avoid an adverse impact upon the integrity of the sites, under the Habitats Regulations.	As set out in **Section 4** of this document, SuDS principles will be utilised for attenuation storage and treatment of the water discharge from the site. This will reduce the discharge to greenfield runoff rates and prevent pollution of the HWIDB drains. The proposed SuDS components have been determined in accordance with The CIRIA SuDS Manual C753 to provide the required pollution control prior to discharge into the HWIDB drains. The indicative proposals for SuDS components will be confirmed at the detailed design stage. This is secured in **Draft DCO (Volume 3.1) [APP 013]** Requirement 8 (Drainage Strategy).
6	Water quality The interception and containment of fire-fighting run-off will need to be of a significant volume. Fire-fighting operations which have become necessary after fire suppression systems have been unable to extinguish the fire may operate for a	The EfW CHP Facility will be designed to deal with water contaminated during a fire. The tipping hall and waste bunkers have a large capacity for retaining fire-fighting water within the building footprint. The water will then be directed towards the waste reception

Comment reference	Requirements from consultation response	Compliance with requirement
	number of days, delivering 1000's of litres of water per minute. If the surface water run-off interception ponds are to be used to store such run-off, they will have to be off-line from the wider surface water drainage network in the area.	pit for storage, treatment (if required) and appropriate disposal. The shut off valve to the surface water drainage system is connected to the alarm system and will close to prevent contaminated water being discharged into the drains. The water would be retained in the SuDS and underground tanks for treatment (if required) and appropriate disposal.
7	Water Quality In order to reduce any detrimental impacts resulting in the deterioration in the water quality during the lifetime of the proposed development including the construction, operational and decommissioning phases, the Board requests that appropriate systems are installed and implemented to ensure that no building and constructional materials, foreign debris or polluting matter is discharged or becomes deposited into an open watercourse by any means. This may require the installation of a suitable pollution retention device or devices to contain any foreign debris or polluting matter that enter the adjacent open watercourses. In addition, the Board expects that adequate provision is made to retain any harmful pollutants or contaminated water on the site for disposal to a suitably permitted location and not allowed to discharge into the local aquatic network.	As set out in **Section 4** of this document, SuDS principles will be utilised for attenuation storage and treatment of the water discharge from the site. The proposed SuDS components have been determined in accordance with The CIRIA SuDS Manual C753 to provide the required pollution control prior to discharge into the HWIDB drains. The drainage strategy and indicative proposals for SuDS components will be confirmed at the detailed design stage and agreed in consultation with HWIDB. This is secured in **Draft DCO (Volume 3.1) [APP 013]** Requirement 8 (Drainage Strategy).
8	Groundwater Table/Infiltration Whilst the Commissioners and associated Boards generally	As set out in **Section 4** of this document, discharge of surface water runoff via infiltration is not proposed during the construction

Comment reference	Requirements from consultation response	Compliance with requirement
	promote the use of the drainage hierarchy, there is substantial evidence that during periods of wet weather or high rainfall events, particularly during the winter months, the local ground water table can rise close to the ground surface thus precluding the use of infiltration based systems. It is suggested that the water table may be higher than the figures shown on the Groundwater Contours plans. The poor infiltration is inferred in the Site Walkover photographs which suggests a saturated site.	and operation of the EfW CHP Facility and during construction of the Walsoken Substation. The proposed use of infiltration at the Walsoken Substation (operational phase) will be subject to further investigation undertaken prior to construction, through consultation with NCC and KLIDB and by undertaking a soakaway testing exercise. If infiltration into the ground is not a viable solution at the Walsoken Substation, then runoff would be attenuated prior to discharge into a nearby ditch/watercourse.
9	Hydraulic Calculations The Board accepts that there are agreed standard methods of designing surface water systems and, in this respect the Board would normally request that the respective surface water systems should be designed for the worst case 1% AEP (Annual Exceedance Probability), a 1 in 100 year storm, and must consider a range of durations to determine the maximum volume required with an allowance for the impact of climate change, normally 40% but could be greater, and siltation should be included within the calculations.	Extensive consultation has been undertaken with CCC during pre-application regarding the proposed drainage strategy and remains ongoing following the submission of the DCO application. As agreed with CCC, the drainage design calculations presented in **Section 4** of this document used a climate change allowance of 20% for the construction phase and 40% for the operational phase and considered the 1% AEP storm event as well as the 3.3% AEP storm event. The climate change allowances used in the hydraulic modelling are in line with the latest Environment Agency guidance. The 1% AEP storm event result was used in the sizing of the attenuation tanks and basins as a worst-case scenario. Any effects on the drainage system due to siltation will be assessed at detailed design stage, and if required, mitigation will be proposed.

Comment reference	Requirements from consultation response	Compliance with requirement
10	Hydraulic Calculations It is suggested that a 100% impermeability factor is used for the design of the water level and flood risk management systems. This will allow for future development, extensions to buildings etc to be accommodated and/or depreciation in efficiency of the systems, lack of maintenance etc.	The initial attenuation calculations set out in **Section 4** and **Annex A** of this document include for a future increase in hardstanding footprint associated with any future works to facilitate the reopening of the disused March to Wisbech Railway. These works do not form part of the DCO Application.
11	Hydraulic Calculations It is understood that the surface water disposal system is reliant on pumping systems. It is considered that with some careful design and re-evaluation there may be an alternative and more sustainable solution which reduces a significant residual risk which is prone to failure during extreme events, is easier to maintain and a more appropriate solution.	As set out in **Section 4** of this document, during the construction phase of the EfW CHP Facility, there is a requirement for pumping surface water runoff from the northern area into the temporary drainage network in the southern area and into the HWIDB drainage system. The pumping of surface water runoff is also required from the underground attenuation tank located in the TCC(ii), since levels do not permit a gravity outfall into the IDB drainage network. At the request of CCC, the impact of a potential pump failure has been assessed for both the northern area of the EfW CHP Facility and the TCC(i). The calculations are presented in **Section 4** of this document.
12	Hydraulic Calculations Current design standards do not allow for such circumstances or the special drainage arrangements within the Fens where it may take several days for the flows to be dealt with. Because of this the normal requirements concerning half drain times within a twenty four hour period are unlikely to be achieved particularly given the size of the proposed facility. Such situations are not normally accommodated within accepted design and the Commissioners are currently	The half drain times exceed 24h within the system but additional calculations were undertaken to confirm that the system has suitable capacity to receive a follow up 1 in 10-year storm after 24h. Details of these calculations are provided in **Annex A** of this document.

Comment reference	Requirements from consultation response	Compliance with requirement
	reviewing its position concerning this aspect.	
13	Long term ownership, funding and maintenance of environmental water management systems In order to alleviate any adverse impact upon the respective systems; the Boards; the Councils' ratepayers and the natural, built and aquatic environment; it is considered appropriate that the Board ensures that adequate arrangements are made for the long-term ownership, funding, management and maintenance arrangements for the upkeep of any environmental, water level and flood risk management systems, whether on or off site, in perpetuity. These requirements may be in addition to those imposed by planning conditions or required by the LLFA and that details of the works to be carried out by the occupier/landowner, adopting authority, the "Management Company" or other responsible person/authority, together with the costs attached, are included in the "Operators Manual" and any Deed of Sale.	For the lifetime of the development, the Drainage Strategy secured by Draft DCO Requirement 8 (Volume 3.1) [APP-013] will be maintained. This includes maintenance of the proposed surface water drainage network infrastructure in accordance with the Maintenance Plan provided in **Section 5** of this document. The Decommissioning Plan, secured by Draft DCO Requirement 25 (Volume 3.1) [APP-013], will address the removal of the plant infrastructure.

3.3 KLIDB Surface Water Drainage Advice

3.3.1 The key surface water drainage advice provided by KLIDB in consultation meetings and correspondence to date and the method through which the proposed strategy would comply with each requirement are summarised in **Table 3.2 KLIDB requirements and compliance in Outline Drainage Strategy.**

Table 3.2: KLIDB requirements and compliance in Outline Drainage Strategy

Comment reference	Requirements from consultation response	Compliance with requirement
1	Consent would be required from the KLIDB for the infrastructure supporting discharge of surface water runoff into their drains.	As requested, a consent will be sought from KLIDB at the detailed drainage design stage should surface water runoff be proposed to be discharged into the KLIDB drainage network.
2	The LLFA (NCC) should be consulted on the creation of new impermeable surfaces at the substation site.	As requested, NCC has been consulted on the proposed Outline Drainage Strategy for Walsoken Substation (see **Table 3.4: NCC agreements and requirements and compliance in Outline Drainage Strategy**).
3	Surface water discharge: The applicant intends to discharge surface water from the construction phase for the Walsoken substation to a watercourse within the IDD. Contrary to references within doc ref: APP-086 this would also require temporary consent from the Board under Byelaw 3.	Agreed. It was confirmed as part of the extensive consultation undertaken with KLIDB during pre-application, and which remains ongoing following the submission of the DCO application, that a consent from KLIDB is required for the proposed water discharge from the site into the drains under Byelaws 3 and 10 (for maintained drains) or Byelaw 3 (for non-maintained drains).
4	Walsoken substation: KLIDB indicated at a meeting on 10/01/23, that a discharge rate above Q_{BAR} may be acceptable for the construction phase of the Walsoken substation given the temporary nature (2 months) of the discharge and subject to confirmation of the capacity of the receiving drain by KLIDB.	The outline drainage strategy for Walsoken substation presented in Section 4 of this document assumes a discharge rate of 4 litres/sec, subject to agreement by KLIDB.

CCC (LLFA) Surface Water Drainage Advice

3.3.2 CCC as the LLFA for the area where the EfW CHP Facility Site is located, has been consulted and provided details of guidance to be used in the development of the

Outline Drainage Strategy. CCC also agreed with the proposed approach for the management of surface water at the EfW CHP Facility Site specifically.

3.3.3 The key surface water drainage agreements and advice provided by CCC in consultation meetings and correspondence to date and the method through which the proposed strategy would comply with each requirement are summarised in **Table 3.3 CCC agreements and requirements and compliance in Outline Drainage Strategy.**

Table 3.3: CCC agreements and requirements and compliance in Outline Drainage Strategy

Comment reference	Requirements from consultation response	Compliance with requirement
1	CCC agreed with the need for below ground SuDS measures to be part of the operational drainage strategy in order to meet the attenuation requirements necessary to achieve discharge at greenfield runoff rates within the spatial constraints of the EfW CHP Facility. A full pump failure scenario should be assessed in the drainage design.	Due to spatial constraints at the EfW CHP Facility Site, below ground SuDS measures are proposed in the Outline Drainage Strategy as agreed with CCC. A gravity solution and pump failure scenario were assessed as part of the drainage strategy.
2	Allowance for climate change should be incorporated into the Outline Drainage Strategy (increase in rainfall intensity of 20% for the construction phase and 40% for the operational phase).	Theses allowances for climate change have been incorporated into drainage calculations and attenuation storage requirements.
3	The importance of using source control measures at the EfW CHP Facility Site was highlighted.	Proposed source control drainage features have been adopted into the design of the EfW CHP Facility (e.g., permeable paving in car park area, rainwater harvesting and green wall and brown roof for the Administration building and a brown roof for weighbridge gatehouse.
4	The LLFA expects that as much water is reused within the scheme as possible, in line with the drainage hierarchy. This could be through techniques such as rainwater	There is limited potential for water reuse in the process at the EfW CHP Facility. In addition, there would be constraints in the reuse of surface water runoff in the process due to its

Comment reference	Requirements from consultation response	Compliance with requirement
	harvesting for grey water within any part of the proposed facilities. It must be clearly demonstrated within the submissions that the rainwater reuse has been fully covered and utilised as widely as possible.	water quality (pre-treatment required). However, source control features have been adopted in the design of the EfW CHP Facility. These are set out in Section 4 and are secured in **Draft DCO (Volume 3.1) [APP 013]** Requirement 8 (Drainage Strategy).
5	**Climate Change Allowance** Climate change allowances have been applied to the 1% Annual Exceedance Probability (AEP) storm event. However, in accordance with the latest climate change peak rainfall intensity allowances, a climate change allowance should be incorporated into the surface water management scheme for the 3.3% annual exceedance probability rainfall event. The allowance used should be based on the lifetime of the development.	The drainage design calculations presented in **Section 4** and **Annex A** of this document use a climate change allowance of 20% for the construction phase and 40% for the operational phase and considered the 1% AEP storm event as well as the 3.3% AEP storm event. The climate change allowances used in the hydraulic modelling are in line with the latest Environment Agency guidance[2]. The 1% AEP storm event result was used in the sizing of the attenuation tanks and basins as a worst-case scenario.
6	**Pumping of surface water** It is acknowledged that pumping may be required where levels do not permit a gravity outfall. However, justification must be provided for the reasoning for the use of pumps for surface water disposal. Surface water is proposed to be pumped from the Temporary Construction Compound (TCC). Pump failure modelling would be required for any pumped discharge, modelling full pump failure, with 50% capacity in attenuation during the critical duration 1% AEP storm.	The impact of a potential pump failure for both the northern area of the EfW CHP Facility Site and the TCC(i) is provided in **Section 4** and **Annex A** of this document.

[2] Environment Agency (2022) Guidance Flood risk assessments: climate change allowances. Published 19 February 2016. Last updated 27 May 2022. Available online: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#peak-rainfall-intensity-allowance [accessed 28/11/22].

Comment reference	Requirements from consultation response	Compliance with requirement
7	**Pumped groundwater** The additional volumes for the maximum volume of groundwater pumped from deep excavations must be available within the receiving body, be it a basin, tanks or watercourse.	Preliminary groundwater pumping calculations are provided in **Section 4** and in **Annex B** of this document. The indicative groundwater pumping rates will be confirmed at the detailed design stage. The total volume of the attenuation basins has been increased to accommodate the indicative volume of pumped groundwater (30m^3/day).
8	**Half Drain Times** It is noted that some of the half drain times are exceeding 24 hours within the system. These should be retained as close to 24 hours as possible. Where this is not feasible, the LLFA would accept the available capacity within the system has suitable capacity to receive a follow up 1 in 10-year storm after 24 hours.	The half drain times exceed 24h within the system but additional calculations were undertaken to confirm that the system has suitable capacity to receive a follow up 1 in 10-year storm after 24h. Details of these calculations are provided in **Annex A** of this document.
9	**Hydraulic Calculations** Acknowledging the submitted calculations are calculating the volume attenuation required, performance calculations for the 100%, 3.3% and 1% AEP storms should be provided including a suitable allowance for climate change on the 3.3% and 1% AEP storm. There should be no surcharging in the 100% AEP storm and no water outside the system in the 3.3% AEP storm including climate change. Low levels of flooding may be acceptable during the 1% AEP storm including an allowance for climate change, however, this must be managed safely within the red line boundary, keeping the future users of the facility safe, and mitigating any risk of flooding of the development, or adjacent land and property.	CCC confirmed that these comments apply to the detailed design stage of the drainage strategy. Further hydraulic calculations will be undertaken at the detailed design stage.

Comment reference	Requirements from consultation response	Compliance with requirement
10	**Hydraulic Calculations** Caution should be taken with the diameters of flow controls. Generally, the minimum acceptable diameter from open attenuation is 75mm, to reduce the risk of blockage from litter and debris. From completely closed systems, such as permeable paving or underdrained swales, this can be as low as 20mm in line with the CIRIA SuDS Manual.	CCC confirmed that these comments apply to the detailed design stage of the drainage strategy. The diameter of the flow controllers will be specified in accordance with the CIRIA SuDS Manual at the detailed design stage.
11	**Wider drainage proposals** Details for all parts of the scheme, such as drainage layout and calculations are required. It is noted that the Outline Drainage Strategy focusses on the main facility. However, there are temporary works to the highways and the Walsoken Substation that should be provided.	It was confirmed at the meeting with CCC that the Walsoken Substation falls outside the CCC jurisdiction. Drainage proposals for Walsoken Substation will be confirmed with NCC (as the Lead Local Authority) and KLIDB. The drainage proposals for the access improvement works are described in detail in **Section 4.6** of this document.
12	**Consultation with the Internal Drainage Board** The proposed scheme is within the Hundreds of Wisbech Internal Drainage Board (IDB), which is within the jurisdiction of Middle Level Commissioners (MLC). Works around the watercourses and that may impact the watercourse network, such as discharge rates, water quality or consenting requirements must be discussed with the IDB and MLC. Correspondence must be undertaken with the IDB/MLC from an early stage to ensure consideration is given to their requirements.	Extensive consultation has been undertaken with the HWIDB and MLC during pre-application and remains ongoing following the submission of the DCO application. The Applicant is working to produce a Statement of Common Ground with HWIDB and MLC which will be submitted during the DCO examination.

Comment reference	Requirements from consultation response	Compliance with requirement
13	**Maintenance** Management and maintenance schedules have been provided for the scheme, setting out required assets for maintenance as well as the maintenance activity and frequency for each structure. At a preliminary stage this covers the detail for maintenance, however this is subject to change as the design progresses. It should also be noted that maintenance consideration to existing structures must be accommodated for within the design of the site, such as access to existing watercourse networks. Watercourses in an IDB area will be subject to bylaws, which should be discussed with the IDB/MLC.	Extensive consultation has been undertaken with the HWIDB during pre-application and remains ongoing following the submission of the DCO application. The Applicant is working to produce a Statement of Common Ground with HWIDB which will be submitted during the DCO examination.
14	**Surface water discharge** It is noted some areas of infiltration are proposed. Infiltration testing will be required for the Lead Local Flood Authority (LLFA) to support this as a point of discharge. It is acknowledged that this is the second stage on the drainage hierarchy, however, there must be infiltration testing in line with BRE365[3] to support this. If infiltration is not feasible, then discharge into a watercourse will be required. The minimum acceptable rate is 1 x 10^{-6} m/s measured off three repeat tests in each pit, and there must be at least 1.2m between the base of any infiltration feature and peak groundwater levels.	The Applicant agrees with CCC's comment on the minimum requirements for infiltration to be considered a viable discharge route for runoff from the Proposed Development. The proposed drainage strategy presented in **Section 4** of this document assumes no infiltration (discharge to local drains) for the EfW CHP Facility Site and but assumes infiltration (subject to confirmation by soakaway tests in line with BRE365[1]) for the Walsoken substation. If the soakaway tests show that infiltration is not feasible at the Walsoken substation, discharge will be to an adjacent drain (subject to consent from KLIDB and CCC). The commitment to carry out soakaway testing and topographic and ditch surveys will be secured by a DCO Requirement.

[3] BRE (2016) BRE 365. Soakaway design (DG 365 - 2016)

NCC (LLFA) Surface Water Drainage Advice

3.3.4 The key surface water drainage agreements and advice provided by NCC in consultation meetings and correspondence to date and the method through which the proposed strategy would comply with each requirement are summarised in **Table 3.4 NCC agreements and requirements and compliance in Outline Drainage Strategy**.

Table 3.4: NCC agreements and requirements and compliance in Outline Drainage Strategy

Comment reference	Requirements from consultation response	Compliance with requirement
1	A Surface Water Management Plan and a Drainage Strategy will be required as part of a DCO submission. Building on our previous comments, this will need to include a plan for temporary dewatering discharges should any groundworks become flooded. These will need to be agreed with the appropriate regulators. The CEMP should consider the management of surface water quality management.	Temporary groundwater dewatering from the base of the excavations is considered in **Section 4**. Surface water management measures are considered in the **Outline CEMP (Volume 7.12)**.
2	SuDS strategy for Walsoken Substation. The proposed SuDS strategy should be in accordance with the 4 pillars of SuDS (Quantity (flood reduction), Quality (pollution reduction), Amenity (landscape) and Biodiversity (wildlife benefit)). Consider off-setting the small area taken up by the kiosk using for example a rain garden.	This Outline Drainage Strategy document sets out the outline drainage strategy for managing surface runoff from the Walsoken Substation in a sustainable manner, in accordance with the requirements of the NPPF, NPS and local policy guidance. Discharge rates from the site will be agreed with NCC and KLIDB. The discharge will be treated using SuDS features designed to meet the pollution mitigation index. Any trees disturbed during the construction works will be replanted, and the option of including a 'rain garden' will be considered in the detailed design phase.

Comment reference	Requirements from consultation response	Compliance with requirement
3	Management of runoff from Walsoken Substation (construction phase). NCC agreed with the proposed outline drainage strategy. Any discharge into non-IDB drains should be limited to greenfield runoff rate and a consent is needed from NCC for the discharge structure.	As requested, discharge rates from the Walsoken Substation into the non-IDB drains will be agreed with NCC and KLIDB. A consent will be sought from NCC at the detailed drainage design stage for the construction of the discharge structure. It is noted that during the meeting dated 10/01/23, KLIDB indicated that a discharge rate above Q_{BAR} may be acceptable given the temporary nature (2 months) of the discharge and subject to confirmation of the capacity of the receiving drain.
4	Management of runoff from Walsoken Substation (operational phase). Soakaway tests should be undertaken to assess the viability of infiltration for managing surface runoff from Walsoken Substation (operational). Carry out a high-level assessment of the viability of infiltration based on BGS boreholes soil types. Identify an alternative discharge route for surface runoff from Walsoken Substation if infiltration is found to not be a viable discharge approach.	It is proposed that surface water runoff from the operational substation area will be allowed to infiltrate to the ground via permeable paving. Further investigation of the viability of infiltration as a means by which surface water runoff could be discharged to ground will be undertaken prior to construction, through liaison with NCC and by undertaking a soakaway testing exercise. If infiltration into the ground is not a viable solution, then surface water flows will be attenuated in a detention basin or in an underground attenuation tank prior to discharge into a nearby ditch. Additional solids removal during construction using a silt-buster or other similar approved system could be provided if required. The discharge will be subject to a consent from the relevant drainage authority.
5	Appropriate attenuation approaches are proposed. In addition, consideration to the dewatering activities associated with the construction phase activities has been provided and standard site	The Outline Drainage Strategy for the Proposed Development, including dewatering and attenuation requirements, has been agreed through extensive consultation with HWIDB, CCC, KLIDB and NCC and

Comment reference	Requirements from consultation response	Compliance with requirement
	management and mitigation approaches are intended to be applied with further detail provided in the Construction Environmental Management Plan (CEMP).	remains ongoing following submission of the DCO application.

Environment Agency Surface Water Drainage Advice

3.3.5 The key surface water drainage agreements and advice provided by the EA in consultation meetings and correspondence to date and the method through which the proposed strategy would comply with each requirement are summarised in **Table 3.5 EA agreements and requirements and compliance in Outline Drainage Strategy**.

Table 3.5: EA agreements and requirements and compliance in Outline Drainage Strategy

Comment reference	Requirements from consultation response	Compliance with requirement
1	Outline Water Management Plan We have reviewed the Outline Water Management Plan and advise that the use of straw bales as a pollution prevention measure can increase ammonia levels in a watercourse as they decompose. We suggest that the straw bales are replaced regularly, or an alternative solution is found.	Agreed. This document sets out an obligation on the part of the Applicant to replace the straw bales.

Anglian Water Surface Water Drainage Advice

3.3.6 Anglian Water advised that they would be seeking assurance through a FRA that the Proposed Development would not impact the capacity of their surface water drainage network. The drainage strategy proposal is to discharge surface water runoff into the HWIDB network and not into the Anglian Water drainage network. However, there may be a small quantity of highway drainage runoff entering into the existing highway drainage network from the highway/access improvements at Algores Way. These highway drains are the responsibility of the Highway Authority.

4. Proposed Outline Drainage Strategy

4.1 Introduction

4.1.1 This Section provides a description of the Outline Drainage Strategy for the Proposed Development. The selection of the appropriate SuDS strategy is discussed in **Section 4.2** followed by a description of the drainage strategy for the EfW CHP Facility Site (**Section 4.3**), Walsoken Substation (**Section 4.4**), Grid Connection (**Section 4.5**) and Access Improvements (**Section 4.6**).

4.2 Selecting the appropriate SuDS strategy

Requirements of the drainage system

4.2.1 The drainage strategy for managing surface water needs to be based on the Management Train in the SuDS Manual (CIRIA C753). By managing surface water at source and as the water is conveyed through the site of the Proposed Development, each sequential technique is designed to reduce the intensity of flow and enhance the water quality by removing pollutants. The most useful techniques for use across the Proposed Development elements was ascertained by undertaking a SuDS assessment. A high-level assessment was undertaken by considering the surface water drainage hierarchy and choosing suitable techniques in line with the Main Objectives of Quantity (flood reduction), Quality (pollution reduction), Amenity (landscape) and Biodiversity (wildlife benefit).

Surface water drainage hierarchy

4.2.2 In accordance with the SuDS Manual (CIRIA C753) and locally with the Cambridgeshire Flood and Water Supplementary Planning Document (2016), Cambridgeshire County Council Surface Water Planning Guidance (2021), Norfolk County Council Lead Local Flood Authority Statutory Consultee for Planning Guidance Document (2021), the proposed drainage strategy needs to meet the following discharge hierarchy (with acceptable justification for moving between levels), listed in order of priority:

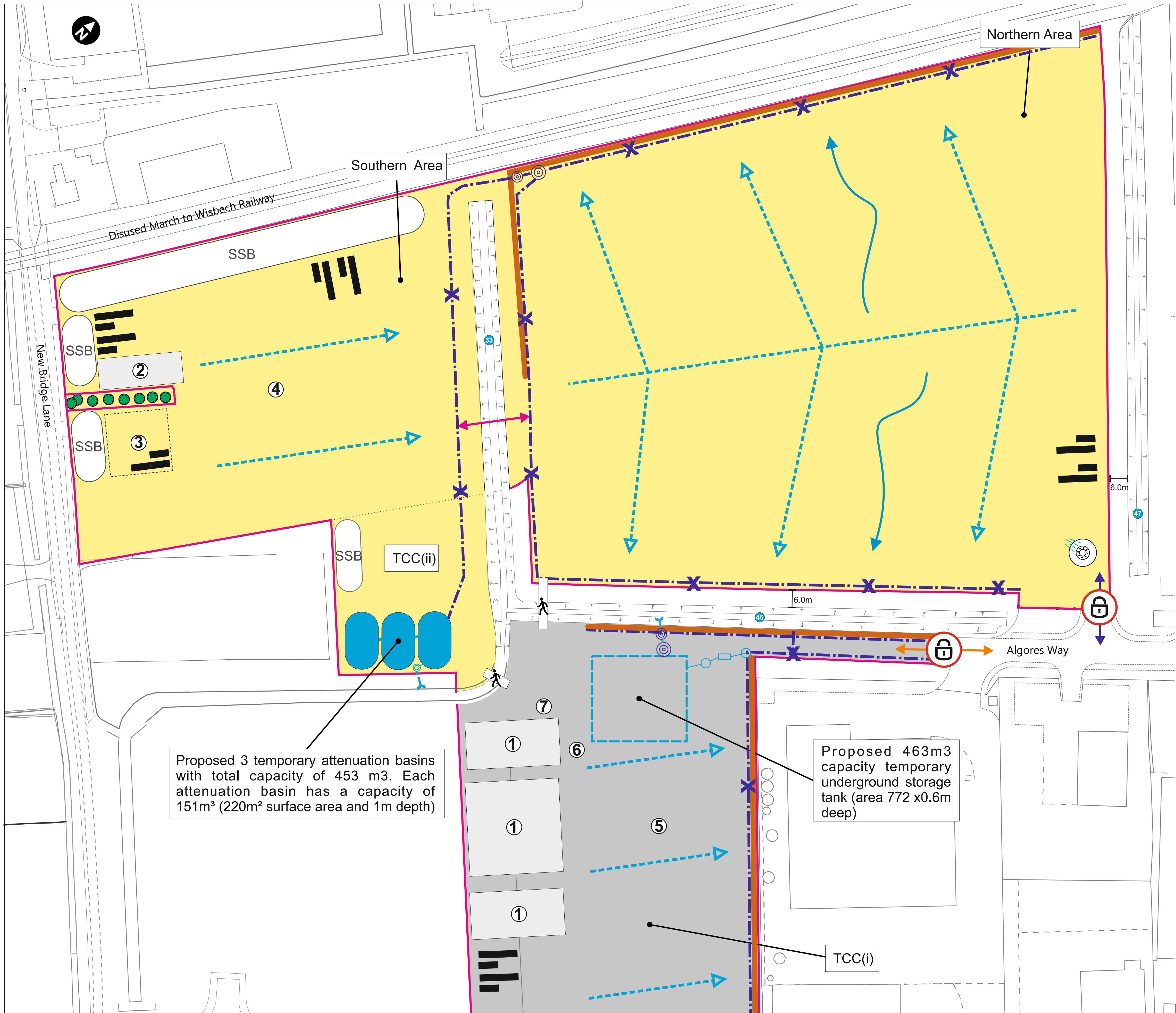
1. Discharge by infiltration to the ground;
2. Discharge to an open surface water body;
3. Discharge to a surface water sewer; and
4. Discharge to a combined or foul sewer.

Pollution control

4.2.3 The proposed SuDS components have been determined in accordance with The CIRIA SuDS Manual C753 to provide the required pollution control prior to discharge of surface water runoff off-site.

4.2.4 In accordance with the Simple Index Approach set out in The CIRIA SuDS Manual C753, each SuDS component is assigned a pollution mitigation index for total suspended solids (TSS), metals and hydrocarbons which relates to the ability of the SuDS feature to treat runoff. The use of a number of SuDS components results in a total sum of the mitigation indices. This combined index must be greater than the pollution hazard indices assigned to the particular site land use (as defined in Table 26.2 from the CIRIA SuDS Manual C753). The pollution hazard indices for the different elements of the Proposed Development are listed in **Table 4.1 Pollution hazard indices for EfW CHP Facility Site, TCC(i) and Walsoken Substation (construction phase) and Table 4.2: Pollution hazard indices for EfW CHP Facility and Walsoken Substation (operational phase)** and described below:

- Construction phase:
  - EfW CHP Facility Site: given the nature and scale of the construction works involving ground level raising and excavations of a waste bunker with a maximum limit of deviation up to 14m below FFL, a pollution hazard level of High was selected ('sites with heavy pollution' as defined in Table 26.2 of The CIRIA SuDS Manual C753).
  - TCC(i): as the area would be used as a temporary car park and office/welfare facilities for construction workers a pollution hazard level of Low was selected ('non-residential car parking with infrequent changes i.e., < 300 traffic movements/day' as defined in Table 26.2 of The CIRIA SuDS Manual C753).
  - Walsoken Substation: given the small-scale construction works associated with the substation, a pollution hazard level of Medium ('commercial yard and delivery areas, all roads except low traffic roads').
- Operational phase:
  - EfW CHP Facility Site: as the site falls under the land use type identified as a "Waste site" in Table 26.2 of The CIRIA SuDS Manual C753, a pollution hazard level of High was assigned. This is a conservative approach as only road/roof runoff will be collected in the surface water drainage system. Runoff from certain potentially contaminated areas of the site will be collected and discharged to foul sewer.
  - EfW CHP Facility Site (car park): as the car park would have low traffic movements a pollution hazard level of Low was selected ('non-residential car parking with infrequent changes i.e., < 300 traffic movements/day' as defined in Table 26.2 of The CIRIA SuDS Manual C753).
  - Walsoken Substation: as the area would include switch gear, GRP kiosk and access road with low traffic movements a pollution hazard level of Low was selected ('non-residential car parking with infrequent changes i.e. < 300 traffic movements/day' as defined in Table 26.2 of The CIRIA SuDS Manual C753).



NOTES
1. Do not scale from this drawing.
2. Approach for management of surface runoff and any groundwater pumped from excavations:
   a) flows from northern area will be attenuated in drainage ditches and pumped over IBD drain and into the southern area.
   b) flows from northern area plus direct runoff from southern area will be attenuated in suds basins and discharged into the IDB drain at the Q_{c25}bar; equivalent rate. (agreed with IDB)
   c) surface runoff from TCC to be attenuated in underground tank and discharged into the IDB drain at the Q_{c256}bar; equivalent rate. (agreed with IDB)
3. water quality of site discharge:
   a) flow through straw bales in the ditches and sediment settlement in the ditches and suds basin would reduce the sediment loading of the discharge.
   b) an oil interceptor would also be used for runoff collected in the car parking area to remove any hydrocarbon contamination prior to discharge into the IDB drains

Key
- Construction compound fence
- Controlled access point
- Wheel wash facilities
- HGV entrance/exit
- Staff entrance/exit
- Pedestrian bridge (See Figure 3.23, ES Chapter 3)
- Tarmacadam surface
- Hardstanding and construction area
- SSB Soil storage bund
- Tree/hedge retained and fenced off
- ISO storage containers (See Figure 3.21, ES Chapter 3)
- ① Single and two storey mess/welfare/civils/office buildings (See Figure 3.22)
- ② Temporary workshop/store building (see Figure 3.20, ES Chapter 3)
- ③ Grid Connection compound
- ④ Storage and pre-assembaly area
- ⑤ Car park
- ⑥ Disabled car parking
- ⑦ Cycle/motorcycle parking
- Surface water drain
- underground tank
- Surface water discharge to drain
- Direction of fall
- Surface water storage pond with interceptor
- Swale
- Straw bale
- Overground pumping of ground water from e.g., bunker excavations and through siltbuster systems
- Pump Chamber to over pump into existing IDB ditch
- Manhole Chamber
- Oil interceptor
- Proposed 0.5m high bund to contain surface water flooding in an event of pumping failure
- Temporary bridge
- 33 IDB ditch number

Notes:
Proposed general arrangements for the Temporary Construction Compound (TCC). Details are representative; final arrangements subject to appointment of EPC Contractor.

0 25 50 75m 100m

OS Licence number 0100004458 2020.

Scale at A3: 1:2,500

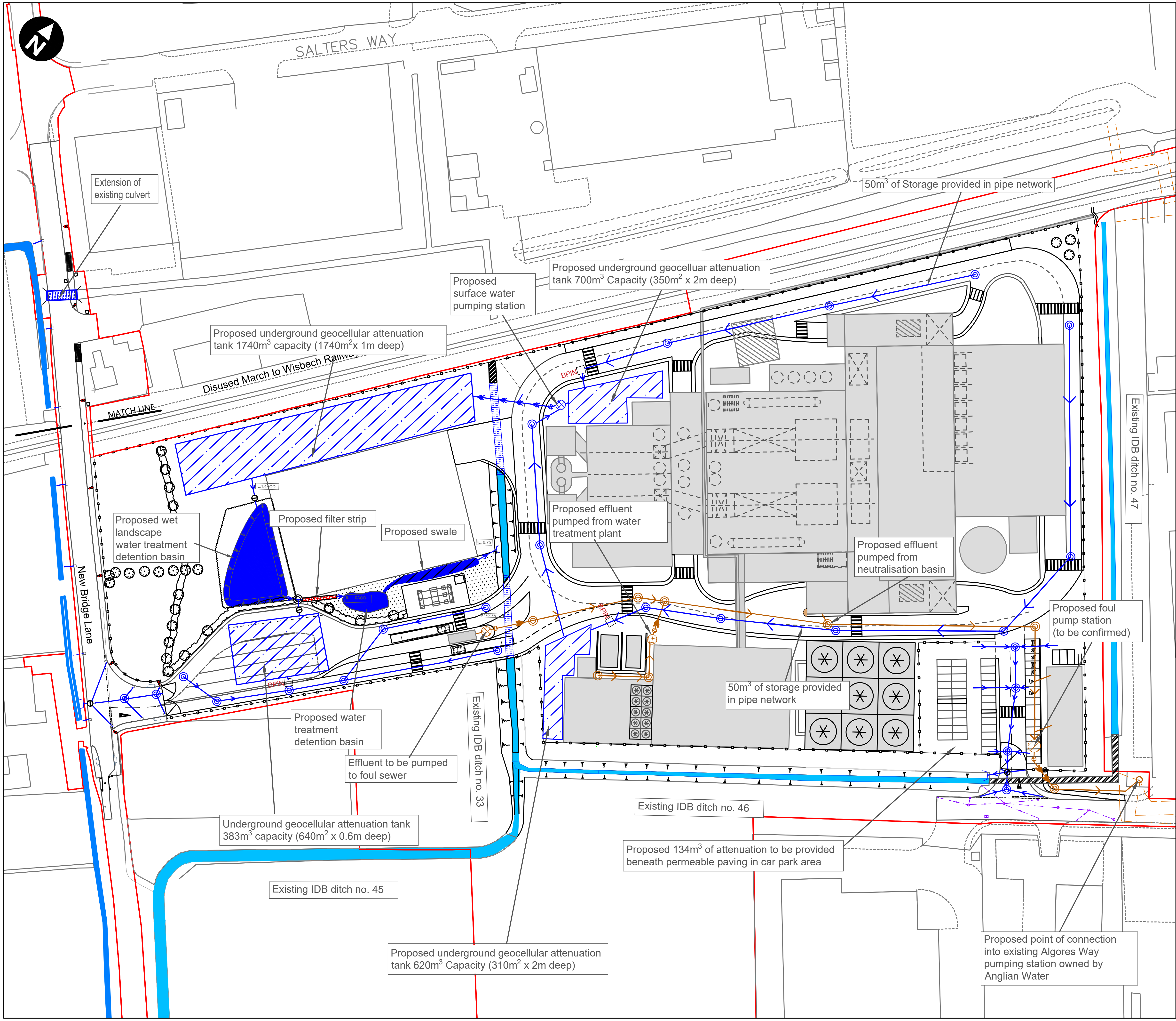
Client

Medworth CHP Limited
Medworth Energy from Waste Combined Heat and Power Facility
Environmental Statement
Appendix 12F - Outline Drainage Strategy

Figure 4.1
Proposed drainage strategy for Construction Phase

March 2023

wsp



Originator: JACQUI.PARKIN

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NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. UNLESS NOTED OTHERWISE, LOCATIONS OF ALL SERVICES SHOWN TAKEN FROM PUBLIC RECORDS AND PRIVATE RECORDS BASED ON THE INFORMATION PROVIDED BY ATKINS/SNC.
3. SEWER DETAILS SHOWN ON THIS DRAWING HAVE BEEN PROVIDED IN GOOD FAITH BY EACH STATUTORY UNDERTAKER OR A LICENSED COMPANY ACTING ON THEIR BEHALF, NO LIABILITY OF ANY KIND IS ACCEPTED BY WOOD GROUP, THE OPERATOR, ITS AGENTS OR SERVANTS FOR ANY ERROR OR OMISSION. THE INFORMATION IS GIVEN WITHOUT OBLIGATION, OR WARRANTY AND AS A RESULT THE ACCURACY OF THE INFORMATION SHOWN CANNOT BE GUARANTEED.
4. THE LOCATION OF ALL PUBLIC SEWERS SHOWN ARE TO BE CONFIRMED WITH THE RELEVANT STATUTORY UNDERTAKER PRIOR TO ANY WORKS COMMENCING ON SITE.
5. THE LOCATION OF ALL UNDERGROUND PRIVATE SERVICES ARE TO BE CONFIRMED PRIOR TO ANY WORKS COMMENCING ON SITE.
6. FOR DETAIL OF PROPOSED ACCESS AT ALGORES WAY, PLEASE REFER TO DRAWING 40130-WOOD-XX-XX-DR-C-0002-S01-P01
7. FOR DETAIL OF PROPOSED ACCESS AT NEW BRIDGE LANE, PLEASE REFER TO DRAWINGS 41310-WOOD-XX-XX-DR-C-0003 & 41310-WOOD-XX-XX-DR-C-0004
8. FOR OUTLINE LANDSCAPING DETAILS, SEE FIGURES 4.3 OUTLINE LANDSCAPING AND ECOLOGY STRATEGY LANDSCAPING.

KEY

- Existing Anglian Water foul sewer
- Proposed surface water sewer
- Proposed foul sewer
- Proposed rising main for surface water
- Proposed rising main for foul drainage
- Proposed surface water manhole
- Proposed foul water manhole
- Proposed catchpit chamber
- Proposed penstock chamber
- Proposed gully and outlet
- Existing gully
- Existing manhole
- Assumed existing highway drainage network
- Existing culvert
- Proposed culvert 2.5m X 1.5m deep
- BPIN Proposed class 1 bypass interceptor
- Proposed filter strip
- Proposed underground geocellular attenuation tank
- Proposed surface water pumping station
- Proposed foul water pumping station
- Order limits
- Proposed outfall headwall

0 m 50 m

Scale 1:1250 @ A3

Client

Medworth CHP Limited
Medworth Energy from Waste Combined Heat and Power Facility DCO
Environmental Statement
Appendix 12F - Outline Drainage Strategy

Figure 4.2
Proposed drainage strategy for Operational Phase

June 2022

wood.

41310-WOOD-XX-XX-DR-C-00001_P05 Rev D.dwg

Table 4.1: Pollution hazard indices for EfW CHP Facility Site, TCC(i) and Walsoken Substation (construction phase)

Proposed development area	Land use*	Pollution hazard level	Pollution mitigation indices		
			TSS	Metals	Hydrocarbons
EfW CHP Facility	Sites with heavy pollution	High	0.8	0.8	0.9
TCC(i)	Non-residential car parking with infrequent changes i.e., < 300 traffic movements/day	Low	0.5	0.4	0.4
Walsoken Substation	Commercial yard and delivery areas, all roads except low traffic roads (assumed to be representative of the small-scale constructions works)	Medium	0.7	0.6	0.7

Notes: * As defined in Table 26.2 of The CIRIA SuDS Manual C753

Table 4.2: Pollution hazard indices for EfW CHP Facility and Walsoken Substation (operational phase)

Proposed development area	Land use*	Pollution hazard level	Pollution mitigation indices		
			TSS	Metals	Hydrocarbons
EfW CHP Facility	Sites with heavy pollution[#]	High	0.8	0.8	0.9
EfW CHP Facility (car park) and Walsoken Substation	Non-residential car parking with infrequent changes i.e., < 300 traffic movements/day	Low	0.5	0.4	0.4

Notes: * As defined in Table 26.2 of The CIRIA SuDS Manual C753
[#] Conservative approach as only road/roof runoff will be collected in the surface water drainage system. Runoff from certain potentially contaminated areas of the site will be collected and discharged to foul sewer.

4.3 Proposed drainage strategy for the EfW CHP Facility Site

Surface Water Drainage Hierarchy

Infiltration

4.3.1 Based on desktop geotechnical information, the underlying ground conditions comprise "loamy and clayey soils of coastal flats with naturally high groundwater" (Reference; Soilscape/BGS data). Due to the shallow depth to groundwater (0.32m below ground level (bgl) in the made ground and 2.7m and 4.5mbgl in the underlying Tidal Flat Deposits) and presence of made ground at the EfW CHP Facility Site, the use of SuDS techniques that promote point source infiltration are unlikely to be suitable for discharging surface water run-off to any great degree (although limited diffuse infiltration at source may be possible). This is consistent with the Fenland District SFRA which indicates the Proposed Development is within an area of low infiltration potential. As such, infiltration-based SuDS have not been considered further at this stage.

Discharge to surface waters

4.3.2 All surface water runoff from the EfW CHP Facility Site is proposed to be discharged to the surrounding HWIDB drains as agreed with the HWIDB. It is acknowledged that the HWIDB have indicated a preference for a single discharge location, and this has been sought as far as possible.

Discharge to sewer

4.3.3 No discharge of surface water runoff into Anglian Water's public sewer is anticipated. As stated in **Section 3.3** above, there may be a small quantity of highway drainage runoff entering into the existing highway drainage network from the highway/access improvements at Algores Way. These highway drains are the responsibility of the highway authority.

Discharge rate

4.3.4 Consistent with the location of the EfW CHP Facility Site in a Critical Drainage Area, as advised by HWIDB, it is proposed that discharges of surface water runoff be limited to greenfield rates (as agreed with HWIDB), for both construction and operational phases. The calculation of greenfield runoff rates is presented in **Annex A** for which Q_{BAR} rates of less than 2 l/s/ha have been estimated.

4.3.5 Consistent with good practice guidance in the CIRIA SuDS manual (The SuDS Manual C753 DEFRA 2015), a rate of Q_{BAR} and/or 2 l/s/ha, whichever is greater can be used, and thus an equivalent Q_{BAR} greenfield rate of 2 l/s/ha has been selected for both the construction and operational phases. This is considered an appropriate rate which would ensure sufficient volumetric control to not adversely affect flood risk, consistent with the requirements of the Non-Statutory Technical Standards for Sustainable Drainage Systems.

4.3.6 Much of the EfW CHP Facility Site is currently compacted ground, with some soil perimeter bunds. The existing drainage measures are unlikely to include any formal attenuation. It is therefore anticipated that despite any increase in the impermeable surfaces, with the incorporation of SuDS to restrict runoff to the equivalent Q_{BAR} greenfield rates for events up to 1% AEP plus climate change events, would likely provide a betterment on the current situation in terms of run-off rates to the HWIDB network. In addition, the initial attenuation calculations set out in **Annex A** include for a future increase in hardstanding footprint associated with any future permitted development.

Construction Phase Drainage Strategy

4.3.7 The conceptual drainage layout for the EfW CHP Facility Site and TCC during the construction phase is illustrated in **Figure 4.1 Proposed Drainage Strategy for Construction Phase** and described below.

4.3.8 As part of the construction of the EfW CHP Facility, it will be necessary to manage and discharge surface water runoff and any pumped groundwater for the duration of the works. On completion of the construction, the permanent drainage systems will be in place, commissioned and fully operational.

4.3.9 A large proportion of the site will have a temporary working platform constructed to allow the safe operation of piling rigs, mobile cranes and other heavy plant. The platform will comprise primarily of imported granular material. Surface water runoff and pumped groundwater from the excavations (mainly from the deeper excavations associated with the waste bunker) on the EfW CHP Facility Site will be collected by a series of French drains which will discharge to perimeter swales. Flows from the area to the north of the IDB drain bisecting the site will be pumped into the southern area of the site. Three attenuation basins in the southern area of the site will receive flows from the perimeter swales (gravity fed from southern area and pumped from northern area) prior to discharge into the HWIDB drainage network. Surface water runoff from the TCC will be collected in swales and attenuated in an underground tank prior to discharge into the HWIDB drainage network.

4.3.10 The two temporary discharge points (from EfW CHP Facility Site and TCC) will be piped into the HWIDB drain between HWIDB nodes 45–48 and 46–47. The outfall pipes will emerge through the sides of the drainage ditch through simple bagwork headwalls. It will therefore not be necessary to undertake any pipe and headwall work within the drain itself at the discharge location. The discharge pipe will be fitted with a penstock (upstream of the outfall headwall) which will enable the discharge flow to be throttled or shut off if required. Discharge infrastructure is subject to a Consent from the HWIDB.

4.3.11 As part of environmental management systems, daily site inspections will be carried out throughout the construction period. Inspections would include the drainage system, swales, discharges and headwalls. These inspections will confirm the efficiency of the temporary systems and highlight any maintenance requirements, which will be addressed on an ongoing basis throughout the construction period.

Construction Phase Attenuation Requirements

4.3.12 Initial estimates of the surface water runoff attenuation volumes required are provided in **Annex A.** In summary, the attenuation volume required to limit discharge from the site to greenfield rates for events up to and including the 1% AEP with a 20% climate change allowance is 326m^3 for the northern part of the EfW CHP Facility Site, 126m^3 for the southern part and 463m^3 for the TCC(i).

4.3.13 It is anticipated that attenuation of surface runoff will be provided in three attenuation basins located in series in the southern area of the EfW CHP Facility. Each of these basins will be 1m deep, 151m^3 in volume, with 1 in 4 side slopes and will result in a combined surface area of 660m^2 for the three basins. From these basins flows will be discharged into the HWIDB drain at the Q_{BAR} equivalent rate of 4 l/s (using a hydrobrake flow control device). A Consent is required from HWIDB for the discharge infrastructure pursuant to the DCO.

4.3.14 It is anticipated that surface runoff from the TCC(i) will be attenuated in an underground geo-cellular tank due to spatial constraints. Attenuated flows from the storage structure will be pumped into the HWIDB drain at the Q_{BAR} equivalent rate of 2.16 l/s (using a hydrobrake flow control device). A Consent is required from HWIDB for the discharge infrastructure pursuant to the DCO.

4.3.15 To limit discharge to the greenfield rate for all events up to a return period of 1% AEP with a 20% climate change allowance, the attenuation volume required is 463m^3. The final location and dimensions of these units are to be determined by the construction contractor.

4.3.16 Pumped groundwater arising from the deeper excavations in the Tidal Flat Deposits associated with the waste bunker (80m long, 26m wide and 14m deep) will also be discharged into the HWIDB network via the attenuation basins provided in the southern part of the EfW CHP Facility Site. Preliminary dewatering calculations using the *EA's Assessing the impacts of dewatering on water resources Spreadsheet of Tier 1 analytical tools* (**Annex B**) indicate that the likely steady state groundwater pumping rate is between 5 to 95m^3/day, with the most likely value of 30m^3/day (pumping from ground described as fine sand overlain by clay/silt). The indicative groundwater pumping rates will be confirmed at detailed design stage. It is recommended that pumping tests are undertaken at the detailed design stage to confirm the hydraulic conductivity of the Tidal Flat Deposits aquifer (assumed in the preliminary calculations to be 0.1m/day (range 0.05 to 0.3m/day) based on the particle size distribution data for Tidal Flat Deposits samples which is consistent with the description of the samples as a fine sand; (**Chapter 13: Geology Hydrogeology and Contaminated Land (Volume 6.2)**).

4.3.17 Based on the preliminary dewatering calculations, groundwater daily pumping rates (most likely value 30m^3/day) are small (less than 10%) in comparison with the capacity of the attenuation basins (453m^3). This suggests that there is sufficient attenuation capacity available in the three attenuation basins to accommodate pumped groundwater from the bunker excavation. Furthermore, the attenuation basin storage calculations have been based on a storm return period of 1 in 100yr (plus a 20% climate change allowance) which is conservative for a 3-year construction period for the EfW CHP Facility, and it is anticipated that dewatering from the bunker excavation will be required over an even shorter period of 3-4 months. The volume of the three basins has also been increased by 30m^3 to accommodate the indicative volume of pumped groundwater (as agreed with CCC), which equates to the estimated daily quantity of pumped groundwater. If the aquifer pumping tests at the detailed design stage indicate that the dewatering rates are higher than the preliminary calculations indicate, then sufficient space will still be available in the southern area of the EfW CHP Facility Site to increase the capacity of the attenuation basins if this is required.

4.3.18 Although both the EfW CHP Facility Site and TCC(i) (and proposed SuDS) are located in Flood Zone 3, the flood model data provided by the EA (**Appendix 12A: Flood Risk Assessment (Volume 6.4)**) indicates that the area is not at risk of flooding during the design event (0.5% AEP overtopping event plus climate change) due to the presence of flood defences along the River Nene.

4.3.19 It is proposed that 0.5m high temporary earth bunds are formed on the northern area of the EfW CHP Facility Site to contain the build-up of surface water runoff in the event of pump failure. The bunds would be located along the western and southern boundaries of the northern area of the EfW CHP Facility Site (location of the pumping station and low topographic point of this part of the site). The proposed location of the bunds is shown on **Figure 4.1 Proposed Drainage Strategy for Construction Phase**. A high-level calculation has been undertaken to estimate the volume of surface water runoff which may be generated in this area in the event of a pump failure. Based on a Micro-drainage model output for the 1%AEP storm event over a critical storm period of 12h and 20% climate change allowance, an attenuation volume of approximately 296m3 is required. A 0.5m high bund provides a maximum storage capacity of approximately 7,250m3 and therefore provides ample storage in the event of a pump failure over a 12h period during a critical storm event.

4.3.20 It is also proposed that 0.5m high temporary earth bunds are formed on the TCC(i), to contain the build-up of surface water in the event of pump failure. It is proposed that the temporary bunds are located along the western and northern boundaries of the TCC(i) (location of pumping station and low topographic point in this area). The location of the proposed bund is shown on **Figure 4.1 Proposed Drainage Strategy for Construction Phase.** Based on the Micro-drainage model output for the 1% AEP storm event with a critical storm period of 24h and 20% climate change allowance, an attenuation volume of approximately 470m^3 is required. A 0.5m high bund provides a maximum storage capacity of approximately 2,000m^3 and therefore provides ample storage in the event of a pump failure period of 24h during a critical storm event.

Construction Phase Pollution Control Requirements

4.3.21 The indicative SuDS components for the EfW CHP Facility Site includes a swale followed by detention basins whilst for the TCC it includes a swale and an oil separator. Straw bales will be placed in the swales to further remove silts and solids. The Applicant will replace the straw bales regularly. This design provides a pollution mitigation index exceeding the minimum required for High and Low pollution hazard level sites **Table 4.3 Indicative SuDS components for EfW CHP Facility Site and TCC (construction phase)**. The indicative proposals for SuDS components will be confirmed at the detailed design stage.

Table 4.3 Indicative SuDS components for EfW CHP Facility Site and TCC (construction phase)

	Description	Pollution hazard level	Pollution mitigation indices		
			TSS	Metals	Hydrocarbons
EfW CHP Facility Site					
Land use pollution hazard index	Sites with heavy pollution	High	**0.8**	**0.8**	**0.9**
SuDS component 1	Swale		0.5	0.6	0.6
SuDS component 2	Attenuation Basin 1		0.5	0.5	0.6
SuDS component 3	Attenuation Basin 2		0.5	0.5	0.6
SuDS component 4	Attenuation Basin 3		0.5	0.5	0.6
Combined pollution mitigation indices*			**1.25**	**1.35**	**1.5**
Sufficient mitigation?			Sufficient	Sufficient	Sufficient
TCC(i)					
Land use pollution hazard index	Non-residential car parking with infrequent changes i.e. < 300 traffic movements/day	Low	0.5	0.4	0.4
SuDS component 1	Swale		0.5	0.6	0.6
Sufficient mitigation?			Sufficient	Sufficient	Sufficient

Notes: Calculated as Total SuDS mitigation index = mitigation index of SuDS component 1 + 0.5 (mitigation index of SuDS component 2) +0.5 (mitigation index of SuDS component 3)

Operational Phase Drainage Strategy

4.3.22 The conceptual drainage layout for the EfW CHP Facility Site during the operational phase is illustrated in **Figure 4.2 Proposed Drainage Strategy for Operational Phase** and set out below.

4.3.23 Due to spatial constraints, it is proposed to provide surface water attenuation in underground geo-cellular tanks. Discharge would be into the HWIDB drain at the greenfield equivalent rate of 2 l/s/ha for all events up to the 1% AEP plus 40% climate change event as agreed with HWIDB and CCC. It is also anticipated that the collection system will be a traditional pipe and manhole/gully network. A consent and an approval from the IDB is required for discharge of surface water drainage into the HWIDB drain.

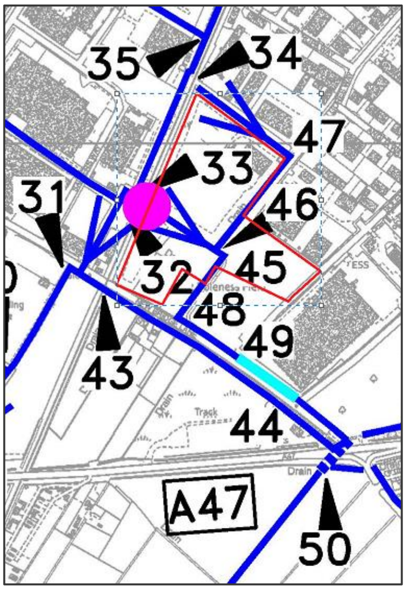
Source control

4.3.24 The Cambridgeshire Flood and Water Supplementary Planning Document (2016) recommends that designers explore incorporating source control drainage features such as permeable paving, rainwater harvesting, living walls, rain gardens, filter strips, green roofs and bio-retention, especially in areas where the majority of surface water will be managed through the use of underground attenuation and pumping. Such approaches have been considered in the design and agreed with CCC. The proposed source control drainage features include permeable paving with total infiltration in the laydown maintenance area and rainwater harvesting and green wall and brown roof for the Administration building and a brown roof for weighbridge gatehouse (**Appendix 12B: Stakeholder engagement, Volume 6.4).**

Spatial location of SuDS

4.3.25 As the EfW CHP Facility Site is bisected by HWIDB drains between nodes 33–46, 45-48 and 46-47 (**Graphic 4.1**), there is the requirement for multiple surface water collection and discharge locations, as summarised below.

Graphic 4.1 Extract from the HWIDB's District plan showing the HWIDB adopted watercourses, flow direction, node numbers and separation dam (pink circle) near EfW CHP Facility Site and TCC (red line)[4]



[4] Mapping provided by Hundred of Wisbech IDB on email dated 25th January 2021 (Appendix 12D: IDB drainage plans of Chapter 12: Hydrology of the ES)

Operational Phase Attenuation

4.3.26 For the operational phase, it is proposed to attenuate flows from the northern, north-eastern (car park) and southern development areas before being discharged into the HWIDB drainage network. Due to spatial constraints within the EFW CHP Facility Site, it is anticipated that the attenuation volumes will be achieved underground by the provision of geo-cellular attenuation structures. This was agreed with CCC. A Consent is required from HWIDB for the discharge infrastructure pursuant to the DCO.

4.3.27 The attenuation volumes are calculated for the critical storm duration events up to and including the 1% AEP with a 40% climate change allowance as agreed with CCC.

4.3.28 Surface water from the northern operational area will be attenuated in underground storage tanks via an oil interceptor which are located beneath the northern and southern operational areas. Approximately 1,420m^3 of underground storage may be accommodated beneath the northern area, from which point surface water is pumped into a 1,740m^3 capacity underground attenuation structure which is located in the southern operational area between the disused railway line and Area 36, the laydown area. Surface water needs to be pumped from the northern area to the southern area to cross above the culverted section of IDB Drain No 33, as this would not be possible using a gravity solution, due to the depth of the IDB Drain. Attenuated flows from the 1,740m^3 capacity underground storage tank, will pass through a filter strip, detention basin and swale before discharging into the HWIDB drain which bisects the site between nodes 33-45. The northern area requires a total attenuation volume of 3,160m^3, and to limit the discharge rate to a Q_{BAR} equivalent rate of 5.5 l/s.

4.3.29 Surface water runoff from the car park (north-eastern area of the site) will be attenuated in an underground storage tank via an oil interceptor beneath the permeable paved surfaced area, before discharging into the HWIDB drain between nodes 46-47. This area will require 134m^3 of storage to limit the discharge to the Q_{BAR} rate of 2 l/s.

4.3.30 Surface water runoff from the southern operational area will be conveyed into an underground storage tank via an oil interceptor located beneath the EfW CHP Facility Site access road. Flows from this underground storage tank will pass through a filter strip, detention basin and swale before being discharged into the HWIDB drain which bisects the site between nodes 33-45. The southern area will require a total attenuation volume of 383m^3 to limit discharge at a Q_{BAR} equivalent rate of 2 l/s.

4.3.31 No post-development attenuation is required for the TCC(i), as it will be restored to a greenfield condition once construction is completed.

4.3.32 Spent fire water collected externally will also be managed in the surface water drainage system. In the event of a fire the discharge to the HWIDB drains ceases and the spent fire water (together with any surface runoff) will be tankered off site.

4.3.33 The attenuation features will all be fitted with flow control devices (e.g., hydro-brakes) to regulate the discharge rates into the HWIDB network down to the greenfield Q_{BAR} equivalent rate of 2 l/s/ha. This results in an actual flow rate of 5.5

l/s from the north, 2 l/s from the north-east and 2 l/s from the southern areas of the EfW CHP facility Site. The flow rate of 2 l/s has been selected as this is the minimum rate of discharge.

4.3.34 Although both the EfW CHP Facility Site and proposed SuDS are located in Flood Zone 3, the flood model data provided by the EA and assessed in **Appendix 12A: FRA (Volume 6.4)** indicates that the area is not at risk of flooding during the design event (0.5% AEP overtopping of flood defences event plus climate change) due to the presence of flood defences along the River Nene.

Operational Phase Pollution Control Requirements

4.3.35 As described above, the proposed SuDS components include a filter strip followed by a detention basin and then a swale for the EfW CHP Facility Site and permeable paving for the car park. This design provides a pollution mitigation index exceeding the minimum required for High and Low pollution hazard level sites (**Table 4.4 Indicative SuDS components for EfW CHP Facility Site (operational phase)**). The indicative proposals for SuDS components will be confirmed at the detailed design stage.

Table 4.4 Indicative SuDS components for EfW CHP Facility Site (operational phase)

	Description	Pollution hazard level	Pollution mitigation indices		
			TSS	**Metals**	**Hydrocarbons**
EfW CHP Facility Site (operational phase)					
Land use pollution hazard index	Waste site	High	**0.8**	**0.8**	**0.9**
SuDS component 1	Filter strip		0.4	0.4	0.5
SuDS component 2	Attenuation basin		0.5	0.5	0.6
SuDS component 3	Swale		0.5	0.6	0.6
Combined pollution mitigation indices*			**0.9**	**0.95**	**1.1**
Sufficient mitigation?			Sufficient	Sufficient	Sufficient
EfW CHP Facility car park					
Land use pollution hazard index	Non-residential car parking with infrequent	Low	**0.5**	**0.4**	**0.4**

	Description	Pollution hazard level	Pollution mitigation indices		
			TSS	Metals	Hydrocarbons
EfW CHP Facility Site (operational phase)					
	changes i.e. < 300 traffic movements/day				
SuDS component 1	Permeable paving		0.7	0.6	0.7
Sufficient mitigation?			Sufficient	Sufficient	Sufficient

* Notes: Calculated as Total SuDS mitigation index = mitigation index of SuDS component 1 + 0.5 (mitigation index of SuDS component 2) + 0.5 (mitigation index of SuDS component 3)

4.4 Proposed surface water drainage strategy for the Walsoken Substation

4.4.1 For the purposes of this strategy the drainage of the Walsoken Substation has been separated from drainage associated with the Grid Connection.

Surface Water Drainage Hierarchy

Infiltration

4.4.2 Due to the relatively small surface area of the substation of approximately 675 m^2 (gross area), it is proposed that surface water runoff will be allowed to infiltrate into the ground using permeable paving. However, from the available records, the underlying ground conditions may not be suitable to allow the infiltration of surface water into the ground using soakaways or permeable paving, this will need to be confirmed by further investigation including infiltration testing and through liaison with NCC and KLIDB post-DCO consent and is secured via Draft DCO requirement 8 (Volume 3.1)

Discharge to surface waters

4.4.3 If infiltration into the ground is not a viable solution, then the surface water flows will need to be attenuated and discharged into an adjacent watercourse or ditch. A topographical, walkover and ditch connectivity survey will be required post-DCO consent. The discharge will be subject to a Consent from NCC or KLIDB depending on the discharge point.

Discharge to sewer

4.4.4 No discharge of surface water runoff to sewer is anticipated at this stage.

Discharge rate

4.4.5 If infiltration into the ground is deemed not a viable solution, it is proposed to limit the discharge to surface water to greenfield runoff rates for the operational phase. KLIDB indicated that a discharge rate above Q_{BAR} may be acceptable during the construction phase given the temporary nature (2 months) of the discharge and subject to confirmation of the capacity of the receiving drain. An estimate of the calculation for the greenfield run-off rate is presented in **Annex A**, for which Q_{BAR} rates of less than 2 l/s/ha have been estimated.

4.4.6 Consistent with good practice guidance in the CIRIA SuDS manual (The SuDS Manual C753 DEFRA 2015), a rate of Q_{BAR} and/or 2 l/s/ha, whichever is greater can be used, and thus an equivalent Q_{BAR} greenfield rate of 2 l/s/ha has been selected for the operational phase. This is considered an appropriate rate which would ensure sufficient volumetric control to not adversely affect flood risk, consistent with the requirements of the Non-Statutory Technical Standards for Sustainable Drainage Systems.

4.4.7 Much of the Walsoken Substation is currently not covered in hardstanding. It is anticipated that, despite a small, predicted increase in the impermeable surface area, the incorporation of SuDS will restrict runoff to the equivalent Q_{BAR} greenfield rates for events up to 1% AEP plus climate change events.

Construction Phase Drainage Strategy

4.4.8 During the construction phase, it is proposed that surface water is collected by French drains which convey water into a swale and a small detention basin (about 2.5m^3 volume), before discharge into an adjacent drainage ditch at a discharge rate of 4 litres/sec, subject to agreement by KLIDB. The surface water runoff generated would pass through straw bales located in the temporary swale to remove silts and solids before entering into the temporary detention basin. The straw bales will be replaced frequently. This design provides a pollution mitigation index exceeding the minimum required for medium pollution hazard level sites **Table 4.5 Indicative SuDS components for Walsoken Substation (construction phase)**). The indicative proposals for SuDS components will be confirmed at the detailed design stage. The discharge infrastructure will be subject to a Consent from NCC or KLIDB pursuant to the DCO.

4.4.9 Although both the Walsoken Substation and proposed SuDS are located in Flood Zone 2, the flood model data provided by the EA and assessed in **Appendix 12A: FRA (Volume 6.4)** indicates that the area is not at risk of flooding during the design event (0.5% AEP overtopping of flood defences event plus climate change) due to the presence of flood defences along the River Nene.

Table 4.5 Indicative SuDS components for Walsoken Substation (construction phase)

	Description	Pollution hazard level	Pollution mitigation indices		
			TSS	**Metals**	**Hydrocarbons**
Walsoken Substation (construction phase)					
Land use pollution hazard index	Commercial yard and delivery areas, all roads except low traffic roads (assumed to be representative of the small-scale constructions works)	Medium	**0.8**	**0.8**	**0.9**
SuDS component 1	Swale**		0.5	0.6	0.6
SuDS component 2	Detention basin		0.5	0.5	0.6
Combined pollution mitigation indices*			**0.9**	**0.95**	**1.1**
Sufficient mitigation?			Sufficient	Sufficient	Sufficient

* Notes: Calculated as Total SuDS mitigation index = mitigation index of SuDS component 1 + 0.5 (mitigation index of SuDS component 2)
** Straw bales will be placed in the swales to further remove silts and solids.

Operational Phase Drainage Strategy

4.4.10 It is proposed that surface water runoff from the substation area will be allowed to infiltrate to the ground via permeable paving. Further investigation of the viability of infiltration as a means by which surface water runoff could be discharged to ground will be undertaken post-DCO consent and prior to construction, through liaison with NCC and by undertaking a soakaway testing exercise. If infiltration into the ground is not a viable solution, it is proposed that surface water is collected by French drains which convey water into a swale and a small detention basin (about 18m^3 volume), before discharge into an adjacent drainage ditch at a proposed discharge rate of 2 litres/sec, subject to consent by KLIDB. The necessary powers have been included within the DCO to allow for the discharge and discharge infrastructure into the ditch in agreement with the relevant drainage authority.

4.4.11 Although Walsoken Substation (and proposed SuDS) are located in Flood Zone 2, the flood model data provided by the EA and assessed in **Appendix 12A: FRA** indicates that the area is not at risk of flooding during the design event (0.5% AEP overtopping event plus climate change) due to the presence of flood defences along the River Nene.

4.4.12 This design provides a pollution mitigation index exceeding the minimum required for Low pollution hazard level sites (**Table 4.6 Indicative SuDS components for Walsoken Substation (operational phase)**). The indicative proposals for SuDS components will be confirmed at the detailed design stage.

Table 4.6 Indicative SuDS components for Walsoken Substation (operational phase)

	Description	Pollution hazard level	Pollution mitigation indices		
			TSS	Metals	Hydrocarbons
Walsoken substation (operational phase)					
Land use pollution hazard index	Non-residential car parking with infrequent changes i.e. < 300 traffic movements/day	Low	**0.5**	**0.4**	**0.4**
Option 1 – Infiltration to ground option					
SuDS component 1	Permeable pavement		0.7	0.6	0.7
Sufficient mitigation?			Sufficient	Sufficient	Sufficient
Option 2 – Discharge to watercourse					
SuDS component 1	Detention basin		0.5	0.5	0.6
Sufficient mitigation?			Sufficient	Sufficient	Sufficient

4.5 Proposed surface water drainage strategy for Grid Connection and Water Connections

Construction Phase Drainage Strategy

4.5.1 The Grid Connection would be installed in an open cut trench (approximate depth of 1.2 - 2m below ground level, width between 450–600mm and a minimum cover depth to the top of the cable of 900mm). For further information refer to **Volume 6.2, Chapter 3: Description of the Proposed Development Section 3.9 for details of the Construction (Grid Connection).**

4.5.2 Similar to the Grid Connection described above, the potable Water Connection would be installed in an open cut trench (D=1.2m; W=450mm), with a minimum depth of cover above the pipe of 900mm, laid along New Bridge Lane and crossing the A47 carriageway. As an alternative crossing of the A47, a Horizontal Directional Drilling (HDD) solution may be considered, which will involve drilling to a depth of approximately 4m below ground level. The duration over which time any excavations are open will be kept to a minimum to minimise water ingress and dewatering requirements. For the HDD option, the preparatory works and HDD process would be undertaken during daytime construction hours and take approximately 3-weeks to complete. If dewatering of the excavations is required appropriate treatment will be provided before discharge to surface or groundwater, and this could include the use of silt busters (or similar), if necessary. The DCO includes for the necessary powers to allow for the discharge of surface water into the drain which runs parallel to New Bridge Lane. For further information refer to **Volume 6.2, Chapter 3: Description of the Proposed Development Section 3.10 for details of the Construction (Water Connections).**

Operational Phase Drainage Strategy

4.5.3 The permanent infrastructure associated with the Grid Connection and Water Connections would be entirely underground and would not affect surface runoff rates. Therefore, no specific drainage measures are proposed in relation to the operational phase.

4.6 Proposed surface water drainage strategy for Access Improvements Works

Construction Phase Drainage Strategy

4.6.1 During the construction phase, it is proposed that surface water runoff is collected by temporary cut-off drainage ditches (or swales) along the improved section of New Bridge Lane (and access bell mouth) and Algores Way, before being discharged into a HWIDB drain. Surface water runoff generated during the construction phase would pass through a number of straw bales located in the temporary drainage ditches to remove silts and solids before entering into the HWIDB drain at an agreed discharge point. The straw bales will be replaced regularly. A Consent is required from HWIDB for the discharge infrastructure pursuant to the DCO.

Operational Phase Drainage Strategy

4.6.2 It is proposed that surface water runoff from the improved section of New Bridge Lane and new entrance into the EfW CHP Facility Site will discharge into the HWIDB drain south of New Bridge Lane, ~~subject to the approval of HWIDB~~and/or be directed to the existing road drainage system and/or to the EfW CHP Facility Site. If discharged into the HWIDB drain, n~~N~~ew trapped gullies and interceptors will be installed along the southern carriageway of the improved section of New Bridge Lane, which will ensure the settlement of solids prior to discharge into the HWIDB drain. The detailed design will be subject to approval of the HWIDB.

4.6.3 Surface water runoff from the bell-mouth of the new access into the EfW CHP Facility Site will be conveyed via a series of trapped gullies and carrier drains before discharging into the HWIDB drain (as above) at an agreed location. Flows from the bell-mouth will be attenuated within the new pipework, before passing through a penstock valve chamber and entering the HWIDB drain.

4.6.4 Highway drainage runoff from the new access bell-mouth at Algores Way will primarily be discharged into the adjacent HWIDB drain, but there may be a small quantity of highway drainage runoff which discharges into the existing highway drainage network, which will require approval from the local highway authority.

5. Surface Water Drainage Maintenance Plan

5.1.1 It is anticipated that the proposed surface water drainage infrastructure will be maintained by the Applicant with the exception of the highway drainage (New Bridge Lane Access Improvements) which will be the responsibility of the local highway authority. A proposed maintenance schedule is shown in **Table 5.1 Proposed maintenance regime of proposed surface water drainage network infrastructure** below.

Table 5.1 Proposed maintenance regime of proposed surface water drainage network infrastructure

Assets	Maintenance Regime	Task
Swale	Monthly	Remove litter and debris, cut grass to retain grass height within specified design range (during growing season), inspect inlets, outlets, and overflows for blockages, and clear if required, inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours, inspect vegetation coverage.
	Six monthly	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies.
	Following significant storm event	Inspect and carry out remediation works to ensure the feature is in full working order.
Detention Basins	Monthly	Remove litter and debris, cut grass – for spillways and access routes (during growing season), inspect inlets, outlets and overflows for blockages, and clear if required, inspect banksides, structures, pipework etc for evidence of physical damage.
	Six monthly	Cut grass – meadow grass in and around basin.

Assets	Maintenance Regime	Task
	Annually	Check any penstocks and other mechanical devices, tidy all dead growth before start of growing season, Remove sediment from inlets, outlet and forebay.
	Following significant storm event	Inspect and carry out remediation works to ensure the feature is in full working order.
	2 years or as required	Prune and trim any trees and remove cuttings.
	5 years or as required	Remove sediment from inlets, outlets, forebay and main basin when required.
Underground Geo-cellular Storage	Three months following installation	Inspect and identify any areas that are not operating correctly and remediate.
	Monthly	Remove debris from catchment surface, inspect system as recommended by manufacturer.
	Six monthly	Inspect and identify any areas that are not operating correctly and remediate.
	Annually	Remove sediment from upstream catchpits, ensure inlets and outlets are free from debris and rubbish.
	Following significant storm event	Inspect and carry out remediation works to ensure the feature is in full working order.
	5 years or as required	Survey inside of tank for sediment build-up and remove if necessary.
Manholes, Pipework and Gullies	Three months following installation	Inspect and identify any areas that are not operating correctly and remediate.
	Monthly	Inspect and identify any areas that are not operating correctly and remediate, remove litter and debris, inspect and clear gullies.

Assets	Maintenance Regime	Task
	Six monthly	Desilt gullies, catchpits and linear drains.
	Every two to four years	Suction sweeping (to Water Jetting Association standards) and CCTV where necessary.
	Following significant storm event	Inspect and carry out remediation works to ensure that the feature is in full working order, remove litter and debris, inspect and clear gullies.
Hydraulic Flow Controls (i.e. HydroBrakes)	Three months following installation	Inspection of drain down mechanism.
	Annually, with additional inspections (if required).	Desilting of the sump.

6. Summary

6.1.1 This Outline Drainage Strategy has been undertaken in accordance with requirements of the NPPF and NPS EN-1 (and Draft NPS EN-1) to manage surface water flood risk at the Proposed Development, not increase flood risk elsewhere, and where possible, reduce flood risk overall during the construction and operational phases. Consultation responses from HWIDB, KLIDB, CCC and NCC were also taken into account in the development of this strategy.

6.1.2 A SuDS system for the Proposed Development has been established to meet the treatment requirements set out in the CIRIA SuDS Manual C753. This is achieved by using a number of SuDS features including swales, permeable paving and detention basins. Attenuation storage will also be provided on site in detention basins or underground tanks (where spatial constraints are a limiting factor) to control the discharges into watercourses to greenfield runoff rates as agreed with HWIDB, KLIDB and NCC. The indicative proposals for SuDS components will be confirmed at the detailed design stage.

6.1.3 The Outline Drainage Strategy for the Proposed Development is summarised below:

Construction Phase:

- EfW CHP Facility Site and TCC(i):
  - Surface water runoff will be collected by temporary French drains and perimeter swales and attenuated by three detention basins (EfW CHP Facility Site) and an underground tank (TCC(i)). Pumped groundwater from the deeper excavations (waste bunker) will be managed in the surface water drainage system. Attenuated and treated runoff (and any pumped groundwater) in SuDS features will be discharged into the HWIDB network at greenfield runoff rates.
- Walsoken Substation:
  - Surface water runoff will be collected and treated by temporary swales, with straw bales placed in the base of the swales, and would pass through a small attenuation basin, before being discharged into a nearby NCC or KLIDB drainage ditch at a discharge rate of 4 litres/sec, subject to agreement with KLIDB and NCC. The straw bales will be replaced regularly.
- Grid Connection:
  - Excavation time will be kept to a minimum to minimise water ingress and dewatering requirements. If dewatering of the excavations is required, appropriate treatment will be provided before discharge to surface or groundwater, and this could include the use of silt busters (or similar), if necessary. Any temporary dewatering discharge to a watercourse within the HWIDB and KLIDB districts will require temporary consent from HWIDB or KLIDB under Byelaw 3.

- Access Improvements site:
  - Surface water runoff is to be collected by temporary cut-off drainage ditches (or swales), with straw bales, before being discharged into the HWIDB drain located on the southern edge of New Bridge Lane. The Applicant will replace the straw bales regularly.

Operational Phase:

- EfW CHP Facility Site:
  - Surface water runoff will be collected and attenuated underground with treatment occurring in a swale, detention basin and filter strip. Attenuated and treated runoff will be discharged into the HWIDB network at greenfield runoff rates. Runoff from the car park will be attenuated beneath the permeable paved surfaced area, before discharging into the HWIDB drain at greenfield runoff rates.
- Walsoken substation:
  - Surface water runoff will be allowed to infiltrate to the ground via permeable paving and soakaways. Further investigation of the viability of infiltration will be undertaken post-DCO consent and prior to construction and is secured via DCO requirement 8 (Volume 3.1). If infiltration into the ground is not a viable solution, then surface water flows will be attenuated and treated prior to discharge into a nearby drainage ditch at greenfield runoff rates, subject to confirmation of the capacity of the receiving ditch by KLIDB and consent requirements.
- Grid Connection:
  - Scoped out, as the permanent infrastructure would be entirely underground and would not affect surface runoff rates.
- Access Improvements site:
  - It is proposed that surface water runoff from the improved section of New Bridge Lane and new entrance into the EfW CHP Facility Site will discharge into the HWIDB drain south of New Bridge Lane.

Annex A
Estimation of Surface Water Runoff Attenuation Volumes

Medworth Energy from Waste
Combined Heat and Power Facility

PINS ref. EN010110
Document Reference:
~~March~~ August 2023

Annex A of Outline Drainage Strategy

Estimation of Surface Water Runoff Attenuation Volumes

We inspire
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Contents

~~1 Introduction 3~~
~~1.1 Purpose of this document 3~~
~~1.2 Overview of the Proposed Development 3~~
~~1.3 Infiltration viability for discharge of runoff 3~~

~~2. Greenfield runoff rates 5~~
~~2.1 SAAR 5~~
~~2.2 Soil 5~~
~~2.3 Hydrological Region 5~~

~~3. Approach to estimation of attenuation volumes 7~~
~~3.1 Introduction 7~~

1. ~~1~~ Introduction

1.1 Purpose of this document

1.1.1 Initial surface water drainage modelling has been carried out to estimate the likely requirements for surface water attenuation required for the proposed Energy from Waste (EfW) Combined Heat and Power (CHP) Facility Site at Medworth, Wisbech.

1.1.2 This preliminary assessment is based on the high-level conceptual drainage strategies for the construction and operational phases of the EfW CHP Facility which were set out by the design team for the wider project. It is anticipated that further work will be undertaken post-DCO submission to develop a detailed Drainage Strategy which will cover the required drainage considerations (such as sustainable drainage systems (SuDS) selection, attenuation volumes and water quality considerations), in sufficient detail to enable Cambridgeshire County Council (CCC), Norfolk County Council (NCC), Hundred of Wisbech Internal Drainage Board (HWIDB) and King's Lynn IDB (KLIDB) to undertake their role as consultees for surface water drainage.

1.1.3 The detailed Drainage Strategy is secured by a DCO Requirement **(Requirement 8, Draft DCO (Volume 3.1) [APP-013]**.

1.2 Overview of the Proposed Development

1.2.1 The EfW CHP Facility Site covers an area of approximately 5.129ha during the construction phase and 3.629ha during the operational phase. The EfW CHP Facility Site is located between the B198 road, Salters Way and New Bridge Lane in Wisbech. It is centred at National Grid Reference (NGR) 545564 307955.

1.2.2 A detailed description of each Proposed Development is provided in **Chapter 3: Description of the Proposed Development (Volume 6.2 of the ES**). The Proposed Development comprises the following elements:

- The EfW CHP Facility;
- CHP Connection;
- Temporary Construction Compound;
- Access Improvements;
- Water Connections; and
- Grid Connection.

1.3 Infiltration viability for discharge of runoff

1.3.1 The ground conditions at the EfW CHP Facility are considered unlikely to be suitable for point source infiltration of runoff of any great degree (diffuse infiltration at source may still be appropriate). The LANDIS soils database indicates that the EfW CHP

Facility Site is underlain by loamy and clayey soil of coastal flats, with naturally high groundwater. High groundwater was encountered during a ground investigation in 2020, which also identified Made Ground (described in detail in **Chapter 13: Geology, Hydrogeology and Contaminated Land (Volume 6.2 of the ES**).

1.3.2 Further investigation of the viability of infiltration as a means by which surface water runoff could be discharged could be undertaken post-DCO submission, through liaison with CCC and HWIDB, but for this study it has been assumed that infiltration would not be possible for the EfW CHP Facility Site, and that surface water will need to be attenuated before discharge to the nearby HWIDB drains. It may be possible to drain the proposed Walsoken Substation using infiltration techniques, but this will be confirmed by soakaway testing and a topographical and ditch connectivity survey which will be undertaken post DCO Consent, in consultation with NCC and KLIDB, and is secured by DCO requirement 8.

2. Greenfield runoff rates

2.1.1 The undeveloped 'greenfield' site runoff rates for the EfW CHP Facility Site and Walsoken Substation have been estimated using the ICP SuDS Method, which is similar to the IH124 method but is more suitable for catchments less than 50ha. The calculation is based on the following factors:

2.1 SAAR

2.1.2 Standard average annual rainfall (SAAR) for the period 1961-1990, from the Flood Estimation Handbook, which is 562 mm for the EfW CHP Facility Site and 568mm for the Walsoken Substation.

2.2 Soil

2.2.1 The Wallingford Maps (Flood Studies Report, 1975) indicate that both the EfW CHP Facility Site and the Walsoken Substation are underlain by **Soil Type 2** (East), resulting in **Soil Index 0.3**.

2.3 Hydrological Region

2.3.1 The hydrological region number of the catchment based on the Flood Studies Report (FSR) Figure I.2.4, is **Region 5** for both the EfW CHP Facility Site and the Walsoken Substation.

2.3.2 Based on the above information, the calculated greenfield runoff rates for the EfW CHP Facility Site are shown in **Table 2.1**, and for the Walsoken Substation shown in **Table 2.2.**

Table 2.1 Existing Site Runoff Rates for EfW CHP Facility Site

Annual Exceedance Probability (%)	Return Period (1 in X years)	Unit Greenfield Runoff Rate (l/s/ha)
100	1	1.2
3.33	30	3.4
1	100	5.0
Q_{BAR}	2.3 (approx.)	1.4

Table 2.2 Table 2.2 Existing Site Runoff Rates for Walsoken Substation

Annual Exceedance Probability (%)	Return Period (1 in X years)	Unit Greenfield Runoff Rate (l/s/ha)
100	1	1.2
3.33	30	3.4
1	100	5.1
Q_{BAR}	2.3 (approx.)	1.4

2.3.3 The greenfield runoff rate calculations are provided in **Attachment A.**

3. Approach to estimation of attenuation volumes

3.1 Introduction

3.1.1 A MicroDrainage assessment was undertaken to estimate the surface water attenuation storage volume necessary to enable discharges to be limited to the greenfield rate. The methodology is based on the premise that the flow rate discharge limits for surface water runoff from the EfW CHP Facility Site are defined by greenfield rates for the return period of 1% annual exceedance probability (AEP). The drainage design criteria are in line with best practice in the CIRIA SuDS manual (The SuDS Manual C753 DEFRA 2015). This approach was discussed and agreed with CCC and HWIDB (**Volume 6.4, Appendix 12B of the ES**).

3.1.2 In line with current best practice on management of volume control, where runoff cannot be infiltrated, any increase in runoff volume should be discharged at a rate that does not adversely affect flood risk. The rate chosen at which to discharge flows is the mean annual maximum flow rate (Q_{BAR}) and/or 2 l/s/ha, whichever is greater. In this case a rate of 2 l/s/ha will be adopted, given the excessively low greenfield Q_{BAR} rate. Given the existing hardstanding footprint of much of the proposed EfW CHP Facility Site, this rate will still be significantly less than the discharge from the development prior to redevelopment (owing to the hardstanding footprint of the existing waste facility site) and should provide betterment in terms of runoff rates compared to the existing situation (for which no formal attenuation of flows is provided).

3.1.3 The approach set out below includes a number of assumptions in terms of input parameters required for the initial estimation of attenuation volumes. These assumptions have been based on the high-level conceptual drainage strategies which have been developed by the engineer/designers for the EfW CHP Facility itself. These initial assumptions are discussed further in the sections below. The attenuation volumes are estimated for TCC(i), the northern area and southern area (including TCC(ii)) of the EfW CHP Facility Site (defined as the areas to the north and to the south of the HWIDB which bisects the EfW CHP Facility Site) and Walsoken Substation.

3.2 Construction Phase

3.2.1 During the construction phase, extensive areas of impermeable and/or semi-impermeable areas likely comprising surfaces of gravel, tarmacadam or other hardcore material will need to be positivity drained. Losses (of runoff) are likely to occur through depression storage and evaporation in such areas. Since the local soil type from WRAP soils map yielded a soil Class of 2.0 and a Soil Index of 0.3, this is likely to result in a lower Volumetric Coefficient (C_V). Standard models suggest a C_V of between 0.33 and 0.65, therefore a value of 0.5 was chosen for this analysis, which is also in-line with the value appropriate for a light industrialised area.

3.2.2 The time-area diagram for the model for the northern and southern parts of the EfW CHP Facility takes into account the proposed flow route of runoff through the site to the discharge location. In the northern part of the EfW CHP Facility Site (where the main EfW CHP Facility buildings will be located), flows are indicated as being collected into a perimeter drainage channel which is then pumped to the southern area. A series of settlement basins/ponds will be provided in the southern area of the EfW CHP Facility Site, before discharge into the HWIDB drainage network, at the greenfield equivalent rate of 2 l/s/ha. The time estimated for flows to drain into the ditch is based on a velocity of 0.03m/s based on the drainage rate of water through gravel media. A Time Area Diagram (TAD) was developed, which estimated that runoff would be collected into the ditch over a 60-minute time frame.

3.2.3 The surface of TTC(i) is expected to be tarmacked with a high level of impermeable area and a fast runoff response. Therefore, it was assumed that in this situation collection time would be faster and the runoff would be collected over a 10-minute timeframe. Runoff will be collected in a piped collection system draining into an underground geo-cellular tank, settlement pond/basin or other suitable/similar storage structure. Due to the topography in this area, flows from the underground attenuation tank will need to be pumped into the HWIDB drain.

3.2.4 The EfW CHP Facility, TCC(i), TCC(ii) and Walsoken Substation construction phase areas are shown in- Table 3.1.Error! Reference source not found..

Table 3.1 Table 3.1 Construction Phase Areas for the Proposed Development

	Total Area (ha)	Estimated Impermeable Area (ha)
Northern area of EfW CHP Facility Site	3.010	0.752
Southern area of EfW CHP Facility Site including TCC(ii)	1.510	0.378
TCC(i)	1.500	1.080
Walsoken substation	0.068	0.014

Notes: TCC(i) & TCC(ii) would only be used during the construction phase and would be restored to its previous use for the operational phase.

3.3 Operational Phase

3.3.1 The post-development impermeable areas of the EfW CHP Facility Site were estimated from the operational site masterplan. These were assumed to have standard Volumetric Coefficients (C_V) of 0.75 for summer events and 0.84 for winter events. The eastern area does not form part of the post development, therefore a post development drainage assessment for this will not be required.

3.3.2 The high-level conceptual drainage strategy for the operational phase (developed by the designers for the wider project) provides an estimate of the volume of storage which is required for the anticipated Q_{BAR} discharge rates. Due to spatial constraints, attenuation storage will be provided in underground geo-cellular tanks or other suitable/similar storage structures. Discharge will be into the local HWIBD drains at the greenfield equivalent rate of 2 l/s/ha. It is anticipated that the collection system will be a traditional pipe and manhole/gully network.

3.3.3 The Proposed Development operational phase areas are shown in Table 3.2 ~~Table~~ .

Table 3.2 ~~Table 3.2~~ Operational Phase Areas for the Proposed Development

	Total Area (ha)	Impermeable Area (ha)
Northern Area of EfW CHP Facility	2.750	2.750
North Eastern Area of EfW CHP Facility (Administration Building and car park)	0.260	0.200
Southern Area of EfW CHP Facility	0.62	0.467
Walsoken substation	0.068	0.040

4. Results

4.1.1 Modelling has been undertaken using the Source Control module and Innovyze MicroDrainage software Version 2018. Initial drainage models for both the construction and operational phases of the EfW CHP Facility have been run with a range of durations from 15 minutes up to 10,080 minutes, or 7 days. This is checked to ensure that the critical duration event is included within the analysis.

4.1.2 The attenuation structures have been designed to ensure that there is no flooding for rainfall events up to and including the 1% AEP event, including the appropriate allowances for climate change (20% for construction and 40% for operational phases).

4.1.3 The attenuation calculations for both the construction phase and post-development phase are provided in **Attachment B**.

4.1 Construction Phase

4.1.1 During the construction phase, all surface water runoff collected from the northern and southern areas will be attenuated in a settlement pond/basin system located in the southern area.

4.1.2 For the construction phase, a 20% increase in rainfall intensity due to climate change for the 1% AEP storm event has been included as recommended in the Environment Agency's Climate Change Allowances Guidance for Flood Risk Assessments[1]. The half drain-down time of the eastern area is greater than 24-hours, as indicated in **Table 4.1** ~~**Table**~~ below. However, because of the temporary nature of these works (construction period of up to 3 years) the half drain-down times stated in **Table 4.1** ~~**Table**~~ are considered acceptable.

4.1.3 Results from the MicroDrainage attenuation calculations for the construction phase are shown in **Table 4.1,** ~~**Table** ,~~ along with initial details which indicate how the required attenuation volumes could be provided.

4.1.4 The Walsoken Substation will be constructed approximately 3km to the north-east of the EfW CHP Facility Site and is the connection point which provides electrical supplies to the site, and has an approximate total area of 675m^2 (equivalent impermeable area of 140m^2). A surface water attenuation volume of approximately 2.5m^3 has been calculated based on a discharge rate of 4 litres/sec subject to agreement with KLIDB and NCC. KLIDB indicated at meeting dated 10/01/23 that a discharge rate above Q_{BAR} may be acceptable given the temporary nature (2 months) of the discharge and subject to confirmation of the capacity of the receiving drain. Calculations are also provided for a discharge rate at Q_{BAR} of 2 litres/sec (**Table 4.1**). The attenuation will be provided in the form of a small 1m deep

[1] Guidance Flood risk assessments: climate change allowances (published on 19 February 2016, last updated 27 May 2022) https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#peak-rainfall-intensity-allowance

detention basin, from which point flows will be discharged into an adjacent drainage ditch. Refer to **Table 4.11** below.

Table 4.1 Table 4.1 Construction Phase Attenuation Requirements for EfW CHP Facility Site, TCC(i),TCC(ii) and Walsoken Substation with 20% climate change allowance

Catchment	Storm Event AEP	Attenuation Volume (m³)	Discharge Rate (l/s)	Half Drain Down Time (hrs)	Indicative Attenuation Details*
Northern Area of EfW CHP Facility Site	1%	326	2.00	21.2	Three attenuation basins in the southern area of the site will receive flows from the perimeter swales (gravity fed from southern area and pumped from northern area) prior to discharge into the HWIDB drainage network. Note that the volume of the three attenuation basins has been increased by 30m³ to account for groundwater pumping in the northern area, primarily from the waste bunker.
	3.33%	200	2.00	14.3	
Southern Area of EfW CHP Facility Site including TCC(ii)	1%	126	2.00	9.4	
	3.33%	24	2.00	1.8	
Walsoken substation	1%	5.00 2.5	2.00 4.00	0.1 0.1	Runoff will be collected in a single attenuation basin prior to discharge into the KLIDB drainage network. Calculations are provided for two discharge rate scenarios to be agreed with KLIDB and NCC.
TCC(i)	1%	463	2.16	29.8	Runoff will be collected in swales and attenuated in an underground tank prior to discharge into the HWIDB drainage network.
	3.33%	318	2.16	20.4	

Notes: * Further details on locations, dimensions and any requirement for pumping for the attenuation structures will be confirmed at Detailed Design Stage.

4.2 Operational phase

4.2.1 All runoff collected from the northern and southern areas of the EfW CHP Facility Site are to be attenuated in below ground storage structures, such as geocellular tanks or other suitable/similar storage structures. These attenuation structures have been modelled (and will be designed) to ensure that there is no flooding for rainfall events up to and including the 1% AEP event, including a 40% increase in rainfall intensity due to climate change, as recommended in the Environment Agency's Climate Change Allowances Guidance for Flood Risk Assessments[2].

[2] Guidance Flood risk assessments: climate change allowances (published on 19 February 2016, last updated 27 May 2022) https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#peak-rainfall-intensity-allowance

4.2.2 Results from the MicroDrainage attenuation calculations for the operational phase are shown in **Table 4.21.**

Table 4.2 Operational Phase Attenuation Requirements for the Proposed Development with 40% climate change allowance for 1% AEP Storm Events and 35% climate change allowance for 3.33% AEP Storm Events

~~**Table 4.1.**~~

~~**Table 4.1 Operational Phase Attenuation Requirements for the Proposed Development with 40% climate change allowance for 1% AEP Storm Events and 35% climate change allowance for 3.33% AEP Storm Events**~~

Catchment	Storm Event AEP	Attenuation Vol (m^3)#	Discharge Rate (l/s)	Attenuation Details
Northern Area of EfW CHP Facility Site	1%	3159	5.50	Runoff to be attenuated in underground storage tanks located beneath the northern and southern development areas.
	3.33%	1863	5.50	
North Eastern Area of EfW CHP Facility Site (Administration Building and car park)	1%	134	2.00	Runoff to be attenuated beneath the impermeable paved area, before discharging into HWIDB Drain.
	3.33%	139	2.00	
Southern Area of EfW CHP Facility Site	1%	383	2.00	Runoff to be conveyed into underground storage structure located beneath the EfW site access road.
	3.33%	417	2.00	
Walsoken substation	1%	18	2.00	The proposed drainage solution for the operational phase to be confirmed post DCO Consent following the completion of Infiltration testing and the assessment of the test results to determine whether soakaways will be a suitable method of discharging surface water. If it is proven that soakaways are not feasible, then it is proposed to discharge surface water into an adjacent drainage ditch/watercourse with attenuation and a discharge rate of 2 litres/sec.

Notes: # Volumes exclude any storage within the upstream drainage network.

~~4.2.3~~ Analysis resulted in half drain-down time in excess of 24-hours for the north and south areas and additional checks were undertaken to test against a subsequent storm. The proposed storage volume was tested against a critical 1% AEP event

(2880 minute and 960 minute durations respectively) (plus 40% climate change), followed by 24-hours drain down and then followed by a critical 10% AEP event (2160 minute and 960 minute durations respectively). This has resulted in a 15% increase in the required design attenuation volume for the north area and a 0.8% increase for the south area, with the final attenuation volumes shown in **Table 4.2**.

4.2.44.2.3 **Table** 4.1.

4.3 Summary

4.3.1 During the construction phase, the EfW CHP Facility Site will require attenuation in the northern area for 296m^3 and 126m^3 for the southern area and the TCC(i) will require 463m^3. It is proposed that surface water from the northern area is pumped into the southern area which, combined with direct runoff from the southern area, will be attenuated in three basins located there. Each basin will be 1m deep, 151m^3 in volume and will result in a combined top area of 660m^2. From these basins, flows will be discharged into the HWIDB drain at the Q_{BAR} equivalent rate of 4 l/s.

4.3.2 It is anticipated that runoff from TCC(i) will be attenuated in an underground geo-cellular tank. This storage structure will discharge into the local HWIDB drainage network at the Q_{BAR} equivalent rate of 2.16 l/s. For a return period of 1% AEP the attenuation volume required is 463m^3.

4.3.3 The combined system is anticipated to be sufficient to retain the 1% AEP event (plus 20% climate change allowance) and discharge at the Greenfield equivalent 2l/s/ha rate. Pumped groundwater from the excavations will also be discharged into the HWIDB network via the attenuation basins.

4.3.4 For the operational phase, the northern area of the EfW CHP Facility Site will require 3159m^3 of attenuation storage, at a Q_{BAR} equivalent discharge rate of 5.5 l/s while the southern area will require 383m^3 of attenuation storage, discharged at the Q_{BAR} rate of 2 l/s. The north-eastern area (Administration Building and car park) will require 134m^3 of attenuation storage, discharged at the Q_{BAR} rate of 2 l/s. All attenuation structures will discharge into the local HWIDB drainage network. No post development attenuation is required in TCC(i).

4.3.5 The drainage strategy and attenuation requirements for Walsoken Substation will be confirmed following the completion of infiltration testing and a topographical and ditch connectivity/walkover survey post DCO Consent, and further consultation with NCC and KLIDB. This will be secured via a DCO requirement. The preferred method of surface water discharge is via infiltration, and if this solution is not feasible then it is proposed to discharge surface water into an adjacent ditch/watercourse with attenuation and a discharge rate of 2 litres/sec.

5. Conclusions

5.1.1 This document provides initial estimations of the surface water runoff attenuation volumes required for the Proposed Development for both the construction and operational phases, to ensure discharge to the HWIDB drainage network at the Q_{BAR} equivalent greenfield rate. It also provides an indication as to how the identified attenuation could be provided and the likely discharge locations. The 1% AEP plus climate change storms for the critical storm durations have been considered (climate change allowances of 20% during construction and 40% for the operational phase). In addition, a check has been carried out for the operational phase to ensure there is sufficient storage to allow protection against flooding from an additional 10% AEP event (1 in 10 year) following 24-hours drain down.

5.1.2 It is concluded that it will be possible to deliver sufficient surface water management measures as part of the Proposed Development to meet the requirements of the Flood Risk Assessment to not increase flood risk elsewhere, and where possible reduce flood risk overall.

5.1.3 This document is based on the high-level conceptual drainage strategies for the construction and operational phases which were set out by the design team for the wider project. It is anticipated that further work will be undertaken at detailed design stage which will cover the required drainage considerations (such as SuDS selection, water quality considerations), in sufficient detail to enable CCC, NCC, and HWIDB and KLIDB to undertake their role as consultees for surface water drainage.

Attachment A
Greenfield Runoff Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	SAAR (mm)	562	Urban	0.000
Area (ha)	1.000	Soil	0.300	Region Number	Region 5

Results l/s

QBAR Rural	1.4
QBAR Urban	1.4
Q100 years	5.0
Q1 year	1.2
Q30 years	3.4
Q100 years	5.0

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	SAAR (mm)	568	Urban	0.000
Area (ha)	1.000	Soil	0.300	Region Number	Region 5

Results l/s

QBAR Rural	1.4
QBAR Urban	1.4
Q100 years	5.1
Q1 year	1.2
Q30 years	3.4
Q100 years	5.1

Attachment B
Attenuation Volumes

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 1271 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	99.761	0.361	0.0	2.0	2.0	164.1	O K
30 min Summer	99.807	0.407	0.0	2.0	2.0	188.0	O K
60 min Summer	99.856	0.456	0.0	2.0	2.0	214.3	O K
120 min Summer	99.907	0.507	0.0	2.0	2.0	242.0	O K
180 min Summer	99.935	0.535	0.0	2.0	2.0	257.9	O K
240 min Summer	99.953	0.553	0.0	2.0	2.0	268.4	O K
360 min Summer	99.976	0.576	0.0	2.0	2.0	281.3	O K
480 min Summer	99.988	0.588	0.0	2.0	2.0	288.3	O K
600 min Summer	99.994	0.594	0.0	2.0	2.0	291.9	O K
720 min Summer	99.996	0.596	0.0	2.0	2.0	293.3	O K
960 min Summer	99.996	0.596	0.0	2.0	2.0	293.2	O K
1440 min Summer	99.983	0.583	0.0	2.0	2.0	285.5	O K
2160 min Summer	99.961	0.561	0.0	2.0	2.0	272.8	O K
2880 min Summer	99.939	0.539	0.0	2.0	2.0	260.2	O K
4320 min Summer	99.884	0.484	0.0	2.0	2.0	229.6	O K
5760 min Summer	99.833	0.433	0.0	2.0	2.0	201.8	O K
7200 min Summer	99.776	0.376	0.0	2.0	2.0	172.2	O K
8640 min Summer	99.723	0.323	0.0	2.0	2.0	145.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	181.812	0.0	153.8	73
30 min Summer	104.019	0.0	161.3	87
60 min Summer	59.511	0.0	219.0	114
120 min Summer	34.048	0.0	249.6	170
180 min Summer	24.560	0.0	268.8	226
240 min Summer	19.480	0.0	282.6	282
360 min Summer	14.051	0.0	300.8	396
480 min Summer	11.145	0.0	309.2	510
600 min Summer	9.311	0.0	310.0	624
720 min Summer	8.039	0.0	307.7	738
960 min Summer	6.402	0.0	302.3	966
1440 min Summer	4.644	0.0	290.7	1252
2160 min Summer	3.369	0.0	452.5	1628
2880 min Summer	2.683	0.0	479.3	2032
4320 min Summer	1.910	0.0	503.7	2860
5760 min Summer	1.501	0.0	540.9	3688
7200 min Summer	1.245	0.0	560.7	4472
8640 min Summer	1.069	0.0	577.1	5184

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Σ Max Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	99.678	0.278	0.0	2.0	2.0	122.7	O K
15 min Winter	99.761	0.361	0.0	2.0	2.0	164.1	O K
30 min Winter	99.807	0.407	0.0	2.0	2.0	188.0	O K
60 min Winter	99.856	0.456	0.0	2.0	2.0	214.4	O K
120 min Winter	99.907	0.507	0.0	2.0	2.0	242.1	O K
180 min Winter	99.935	0.535	0.0	2.0	2.0	258.1	O K
240 min Winter	99.954	0.554	0.0	2.0	2.0	268.8	O K
360 min Winter	99.977	0.577	0.0	2.0	2.0	282.1	O K
480 min Winter	99.989	0.589	0.0	2.0	2.0	289.4	O K
600 min Winter	99.996	0.596	0.0	2.0	2.0	293.3	O K
720 min Winter	99.999	0.599	0.0	2.0	2.0	295.0	O K
960 min Winter	100.000	0.600	0.0	2.0	2.0	295.5	O K
1440 min Winter	99.985	0.585	0.0	2.0	2.0	287.1	O K
2160 min Winter	99.957	0.557	0.0	2.0	2.0	270.9	O K
2880 min Winter	99.928	0.528	0.0	2.0	2.0	253.8	O K
4320 min Winter	99.850	0.450	0.0	2.0	2.0	211.1	O K
5760 min Winter	99.762	0.362	0.0	2.0	2.0	164.8	O K
7200 min Winter	99.681	0.281	0.0	2.0	2.0	124.5	O K
8640 min Winter	99.614	0.214	0.0	2.0	2.0	92.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.940	0.0	590.5	5880
15 min Winter	181.812	0.0	153.8	73
30 min Winter	104.019	0.0	161.3	87
60 min Winter	59.511	0.0	219.0	114
120 min Winter	34.048	0.0	249.6	168
180 min Winter	24.560	0.0	268.8	224
240 min Winter	19.480	0.0	282.6	280
360 min Winter	14.051	0.0	300.8	390
480 min Winter	11.145	0.0	309.2	502
600 min Winter	9.311	0.0	309.9	614
720 min Winter	8.039	0.0	307.6	724
960 min Winter	6.402	0.0	302.1	948
1440 min Winter	4.644	0.0	290.8	1362
2160 min Winter	3.369	0.0	452.5	1696
2880 min Winter	2.683	0.0	479.4	2160
4320 min Winter	1.910	0.0	505.7	3076
5760 min Winter	1.501	0.0	540.9	3896
7200 min Winter	1.245	0.0	560.7	4592
8640 min Winter	1.069	0.0	577.2	5272

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	99.562	0.162	0.0	2.0	2.0	68.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.940	0.0	590.7	5872

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 545350 307750 TF 45350 07750
C (1km)	-0.026
D1 (1km)	0.314
D2 (1km)	0.328
D3 (1km)	0.282
E (1km)	0.318
F (1km)	2.441
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.500
Cv (Winter)	0.500
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.752

Time From:	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**
0	5	0.063	15	20	0.063	30	35	0.063	45	50	0.063
5	10	0.063	20	25	0.063	35	40	0.063	50	55	0.063
10	15	0.063	25	30	0.063	40	45	0.063	55	60	0.059

Model Details

Storage is Online Cover Level (m) 100.000

Infiltration Basin Structure

Invert Level (m)	99.400	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	1.00
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	**Area (m²)**	**Depth (m)**	**Area (m²)**
0.000	401.5	0.600	590.1

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0073-2000-0600-2000
Design Head (m)	0.600
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	73
Invert Level (m)	99.400
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	0.600	2.0	Kick-Flo®	0.397	1.7
Flush-Flo™	0.177	2.0	Mean Flow over Head Range	-	1.7

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)**
0.100	1.9	1.200	2.7	3.000	4.2	7.000	6.3
0.200	2.0	1.400	2.9	3.500	4.5	7.500	6.5
0.300	1.9	1.600	3.1	4.000	4.8	8.000	6.7
0.400	1.7	1.800	3.3	4.500	5.1	8.500	6.9
0.500	1.8	2.000	3.5	5.000	5.3	9.000	7.1
0.600	2.0	2.200	3.6	5.500	5.6	9.500	7.3
0.800	2.3	2.400	3.8	6.000	5.8		
1.000	2.5	2.600	3.9	6.500	6.0		

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 173 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	99.888	0.488	0.0	2.0	2.0	28.4	O K
30 min Summer	99.936	0.536	0.0	2.0	2.0	32.7	O K
60 min Summer	99.977	0.577	0.0	2.0	2.0	36.7	O K
120 min Summer	100.000	0.600	0.0	2.0	2.0	39.0	O K
180 min Summer	99.996	0.596	0.0	2.0	2.0	38.6	O K
240 min Summer	99.983	0.583	0.0	2.0	2.0	37.3	O K
360 min Summer	99.956	0.556	0.0	2.0	2.0	34.7	O K
480 min Summer	99.931	0.531	0.0	2.0	2.0	32.3	O K
600 min Summer	99.908	0.508	0.0	2.0	2.0	30.2	O K
720 min Summer	99.885	0.485	0.0	2.0	2.0	28.1	O K
960 min Summer	99.841	0.441	0.0	2.0	2.0	24.5	O K
1440 min Summer	99.735	0.335	0.0	2.0	2.0	16.7	O K
2160 min Summer	99.605	0.205	0.0	2.0	2.0	8.8	O K
2880 min Summer	99.526	0.126	0.0	2.0	2.0	4.9	O K
4320 min Summer	99.477	0.077	0.0	1.6	1.6	2.9	O K
5760 min Summer	99.463	0.063	0.0	1.3	1.3	2.3	O K
7200 min Summer	99.455	0.055	0.0	1.1	1.1	2.0	O K
8640 min Summer	99.450	0.050	0.0	0.9	0.9	1.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	181.812	0.0	35.2	69
30 min Summer	104.019	0.0	40.3	79
60 min Summer	59.511	0.0	46.1	100
120 min Summer	34.048	0.0	52.8	142
180 min Summer	24.560	0.0	57.1	186
240 min Summer	19.480	0.0	60.4	224
360 min Summer	14.051	0.0	65.3	290
480 min Summer	11.145	0.0	69.1	358
600 min Summer	9.311	0.0	72.1	426
720 min Summer	8.039	0.0	74.7	494
960 min Summer	6.402	0.0	79.4	630
1440 min Summer	4.644	0.0	86.4	874
2160 min Summer	3.369	0.0	94.0	1208
2880 min Summer	2.683	0.0	99.8	1532
4320 min Summer	1.910	0.0	106.6	2216
5760 min Summer	1.501	0.0	111.7	2936
7200 min Summer	1.245	0.0	115.8	3664
8640 min Summer	1.069	0.0	119.3	4384

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	99.446	0.046	0.0	0.8	0.8	1.6	O K
15 min Winter	99.888	0.488	0.0	2.0	2.0	28.4	O K
30 min Winter	99.935	0.535	0.0	2.0	2.0	32.7	O K
60 min Winter	99.976	0.576	0.0	2.0	2.0	36.6	O K
120 min Winter	100.000	0.600	0.0	2.0	2.0	39.0	O K
180 min Winter	99.997	0.597	0.0	2.0	2.0	38.7	O K
240 min Winter	99.983	0.583	0.0	2.0	2.0	37.3	O K
360 min Winter	99.949	0.549	0.0	2.0	2.0	34.0	O K
480 min Winter	99.915	0.515	0.0	2.0	2.0	30.8	O K
600 min Winter	99.880	0.480	0.0	2.0	2.0	27.8	O K
720 min Winter	99.843	0.443	0.0	2.0	2.0	24.7	O K
960 min Winter	99.756	0.356	0.0	2.0	2.0	18.1	O K
1440 min Winter	99.596	0.196	0.0	2.0	2.0	8.4	O K
2160 min Winter	99.489	0.089	0.0	1.8	1.8	3.4	O K
2880 min Winter	99.471	0.071	0.0	1.4	1.4	2.6	O K
4320 min Winter	99.454	0.054	0.0	1.0	1.0	2.0	O K
5760 min Winter	99.447	0.047	0.0	0.8	0.8	1.7	O K
7200 min Winter	99.442	0.042	0.0	0.7	0.7	1.5	O K
8640 min Winter	99.438	0.038	0.0	0.6	0.6	1.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.940	0.0	122.3	5112
15 min Winter	181.812	0.0	35.2	70
30 min Winter	104.019	0.0	40.3	80
60 min Winter	59.511	0.0	46.1	102
120 min Winter	34.048	0.0	52.8	144
180 min Winter	24.560	0.0	57.1	188
240 min Winter	19.480	0.0	60.4	234
360 min Winter	14.051	0.0	65.3	304
480 min Winter	11.145	0.0	69.1	378
600 min Winter	9.311	0.0	72.1	452
720 min Winter	8.039	0.0	74.7	526
960 min Winter	6.402	0.0	79.4	656
1440 min Winter	4.644	0.0	86.4	870
2160 min Winter	3.369	0.0	94.0	1144
2880 min Winter	2.683	0.0	99.8	1504
4320 min Winter	1.910	0.0	106.6	2208
5760 min Winter	1.501	0.0	111.7	2928
7200 min Winter	1.245	0.0	115.8	3632
8640 min Winter	1.069	0.0	119.3	4416

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	99.435	0.035	0.0	0.5	0.5	1.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.940	0.0	122.3	5040

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 545350 307750 TF 45350 07750
C (1km)	-0.026
D1 (1km)	0.314
D2 (1km)	0.328
D3 (1km)	0.282
E (1km)	0.318
F (1km)	2.441
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.500
Cv (Winter)	0.500
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.155

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	5	0.013	15	20	0.013	30	35	0.013	45	50	0.013
5	10	0.013	20	25	0.013	35	40	0.013	50	55	0.013
10	15	0.013	25	30	0.013	40	45	0.013	55	60	0.012

Model Details

Storage is Online Cover Level (m) 100.000

Infiltration Basin Structure

Invert Level (m) 99.400 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	33.8	0.600	102.6

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0073-2000-0600-2000
Design Head (m)	0.600
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	73
Invert Level (m)	99.400
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.600	2.0	Kick-Flo®	0.397	1.7
Flush-Flo™	0.177	2.0	Mean Flow over Head Range	-	1.7

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)
0.100	1.9	1.200	2.7	3.000	4.2	7.000	6.3
0.200	2.0	1.400	2.9	3.500	4.5	7.500	6.5
0.300	1.9	1.600	3.1	4.000	4.8	8.000	6.7
0.400	1.7	1.800	3.3	4.500	5.1	8.500	6.9
0.500	1.8	2.000	3.5	5.000	5.3	9.000	7.1
0.600	2.0	2.200	3.6	5.500	5.6	9.500	7.3
0.800	2.3	2.400	3.8	6.000	5.8		
1.000	2.5	2.600	3.9	6.500	6.0		

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 1785 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	99.715	0.315	0.0	2.2	2.2	243.3	O K
30 min Summer	99.760	0.360	0.0	2.2	2.2	277.5	O K
60 min Summer	99.809	0.409	0.0	2.2	2.2	315.5	O K
120 min Summer	99.862	0.462	0.0	2.2	2.2	356.4	O K
180 min Summer	99.894	0.494	0.0	2.2	2.2	380.9	O K
240 min Summer	99.916	0.516	0.0	2.2	2.2	397.9	O K
360 min Summer	99.945	0.545	0.0	2.2	2.2	420.5	O K
480 min Summer	99.963	0.563	0.0	2.2	2.2	434.5	O K
600 min Summer	99.975	0.575	0.0	2.2	2.2	443.6	O K
720 min Summer	99.983	0.583	0.0	2.2	2.2	449.5	O K
960 min Summer	99.992	0.592	0.0	2.2	2.2	456.9	O K
1440 min Summer	99.992	0.592	0.0	2.2	2.2	456.4	O K
2160 min Summer	99.976	0.576	0.0	2.2	2.2	444.6	O K
2880 min Summer	99.960	0.560	0.0	2.2	2.2	431.9	O K
4320 min Summer	99.913	0.513	0.0	2.2	2.2	395.8	O K
5760 min Summer	99.870	0.470	0.0	2.2	2.2	362.4	O K
7200 min Summer	99.829	0.429	0.0	2.2	2.2	330.6	O K
8640 min Summer	99.784	0.384	0.0	2.2	2.2	296.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	181.812	0.0	183.9	25
30 min Summer	104.019	0.0	183.6	40
60 min Summer	59.511	0.0	300.2	70
120 min Summer	34.048	0.0	333.5	128
180 min Summer	24.560	0.0	346.3	188
240 min Summer	19.480	0.0	348.5	248
360 min Summer	14.051	0.0	344.6	366
480 min Summer	11.145	0.0	340.6	486
600 min Summer	9.311	0.0	336.9	606
720 min Summer	8.039	0.0	333.5	724
960 min Summer	6.402	0.0	327.6	962
1440 min Summer	4.644	0.0	317.5	1440
2160 min Summer	3.369	0.0	627.9	1796
2880 min Summer	2.683	0.0	639.2	2164
4320 min Summer	1.910	0.0	582.1	2980
5760 min Summer	1.501	0.0	773.6	3808
7200 min Summer	1.245	0.0	801.5	4616
8640 min Summer	1.069	0.0	824.6	5448

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	99.742	0.342	0.0	2.2	2.2	264.1	O K
15 min Winter	99.715	0.315	0.0	2.2	2.2	243.3	O K
30 min Winter	99.760	0.360	0.0	2.2	2.2	277.5	O K
60 min Winter	99.809	0.409	0.0	2.2	2.2	315.5	O K
120 min Winter	99.862	0.462	0.0	2.2	2.2	356.4	O K
180 min Winter	99.894	0.494	0.0	2.2	2.2	380.9	O K
240 min Winter	99.916	0.516	0.0	2.2	2.2	398.0	O K
360 min Winter	99.946	0.546	0.0	2.2	2.2	420.8	O K
480 min Winter	99.964	0.564	0.0	2.2	2.2	435.0	O K
600 min Winter	99.976	0.576	0.0	2.2	2.2	444.3	O K
720 min Winter	99.984	0.584	0.0	2.2	2.2	450.4	O K
960 min Winter	99.994	0.594	0.0	2.2	2.2	458.4	O K
1440 min Winter	99.996	0.596	0.0	2.2	2.2	459.6	O K
2160 min Winter	99.977	0.577	0.0	2.2	2.2	444.9	O K
2880 min Winter	99.956	0.556	0.0	2.2	2.2	428.7	O K
4320 min Winter	99.896	0.496	0.0	2.2	2.2	382.2	O K
5760 min Winter	99.834	0.434	0.0	2.2	2.2	335.0	O K
7200 min Winter	99.765	0.365	0.0	2.2	2.2	281.7	O K
8640 min Winter	99.704	0.304	0.0	2.2	2.2	234.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.940	0.0	842.6	6152
15 min Winter	181.812	0.0	183.9	25
30 min Winter	104.019	0.0	183.6	39
60 min Winter	59.511	0.0	300.3	68
120 min Winter	34.048	0.0	333.6	126
180 min Winter	24.560	0.0	346.5	186
240 min Winter	19.480	0.0	348.7	244
360 min Winter	14.051	0.0	344.9	360
480 min Winter	11.145	0.0	340.9	478
600 min Winter	9.311	0.0	337.2	594
720 min Winter	8.039	0.0	333.9	710
960 min Winter	6.402	0.0	328.0	938
1440 min Winter	4.644	0.0	317.9	1384
2160 min Winter	3.369	0.0	628.2	1988
2880 min Winter	2.683	0.0	641.0	2248
4320 min Winter	1.910	0.0	589.8	3164
5760 min Winter	1.501	0.0	773.7	4096
7200 min Winter	1.245	0.0	801.9	4904
8640 min Winter	1.069	0.0	825.2	5624

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	99.652	0.252	0.0	2.2	2.2	194.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.940	0.0	843.4	6352

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 545350 307750 TF 45350 07750
C (1km)	-0.026
D1 (1km)	0.314
D2 (1km)	0.328
D3 (1km)	0.282
E (1km)	0.318
F (1km)	2.441
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.500
Cv (Winter)	0.500
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+20

Time Area Diagram

Total Area (ha) 1.080

Time From:	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**
0	2	0.216	4	6	0.216	8	10	0.216
2	4	0.216	6	8	0.216			

Model Details

Storage is Online Cover Level (m) 100.000

Infiltration Basin Structure

Invert Level (m)	99.400	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	1.00
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	**Area (m²)**	**Depth (m)**	**Area (m²)**
0.000	771.3	0.600	771.3

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0076-2200-0600-2200
Design Head (m)	0.600
Design Flow (l/s)	2.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	76
Invert Level (m)	99.400
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	0.600	2.2	Kick-Flo®	0.401	1.8
Flush-Flo™	0.179	2.2	Mean Flow over Head Range	-	1.9

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)**
0.100	2.1	1.200	3.0	3.000	4.6	7.000	6.9
0.200	2.2	1.400	3.2	3.500	5.0	7.500	7.1
0.300	2.1	1.600	3.4	4.000	5.3	8.000	7.4
0.400	1.8	1.800	3.6	4.500	5.6	8.500	7.6
0.500	2.0	2.000	3.8	5.000	5.9	9.000	7.8
0.600	2.2	2.200	4.0	5.500	6.1	9.500	8.0
0.800	2.5	2.400	4.2	6.000	6.4		
1.000	2.8	2.600	4.3	6.500	6.6		

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 4273 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	99.396	0.396	0.0	5.5	5.5	1088.4	O K
30 min Summer	99.453	0.453	0.0	5.5	5.5	1243.0	O K
60 min Summer	99.516	0.516	0.0	5.5	5.5	1416.9	O K
120 min Summer	99.586	0.586	0.0	5.5	5.5	1610.0	O K
180 min Summer	99.631	0.631	0.0	5.5	5.5	1731.2	O K
240 min Summer	99.663	0.663	0.0	5.5	5.5	1820.1	O K
360 min Summer	99.709	0.709	0.0	5.5	5.5	1946.9	O K
480 min Summer	99.741	0.741	0.0	5.5	5.5	2035.6	O K
600 min Summer	99.766	0.766	0.0	5.5	5.5	2102.1	O K
720 min Summer	99.785	0.785	0.0	5.5	5.5	2154.0	O K
960 min Summer	99.815	0.815	0.0	5.5	5.5	2238.5	O K
1440 min Summer	99.851	0.851	0.0	5.5	5.5	2336.4	O K
2160 min Summer	99.872	0.872	0.0	5.5	5.5	2392.7	O K
2880 min Summer	99.872	0.872	0.0	5.5	5.5	2394.1	O K
4320 min Summer	99.832	0.832	0.0	5.5	5.5	2283.7	O K
5760 min Summer	99.795	0.795	0.0	5.5	5.5	2182.6	O K
7200 min Summer	99.760	0.760	0.0	5.5	5.5	2087.6	O K
8640 min Summer	99.727	0.727	0.0	5.5	5.5	1996.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	212.114	0.0	470.2	25
30 min Summer	121.355	0.0	466.0	40
60 min Summer	69.430	0.0	927.0	70
120 min Summer	39.722	0.0	908.1	130
180 min Summer	28.653	0.0	883.4	190
240 min Summer	22.726	0.0	858.4	248
360 min Summer	16.393	0.0	824.7	368
480 min Summer	13.002	0.0	803.5	488
600 min Summer	10.863	0.0	789.0	608
720 min Summer	9.379	0.0	778.9	728
960 min Summer	7.469	0.0	768.6	966
1440 min Summer	5.418	0.0	765.3	1444
2160 min Summer	3.931	0.0	1578.6	2164
2880 min Summer	3.130	0.0	1535.1	2880
4320 min Summer	2.229	0.0	1458.7	3720
5760 min Summer	1.752	0.0	3134.5	4448
7200 min Summer	1.453	0.0	3004.2	5200
8640 min Summer	1.247	0.0	2849.1	6056

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	99.695	0.695	0.0	5.5	5.5	1908.1	O K
15 min Winter	99.444	0.444	0.0	5.5	5.5	1219.6	O K
30 min Winter	99.507	0.507	0.0	5.5	5.5	1393.0	O K
60 min Winter	99.579	0.579	0.0	5.5	5.5	1588.5	O K
120 min Winter	99.658	0.658	0.0	5.5	5.5	1806.9	O K
180 min Winter	99.708	0.708	0.0	5.5	5.5	1943.8	O K
240 min Winter	99.745	0.745	0.0	5.5	5.5	2044.1	O K
360 min Winter	99.797	0.797	0.0	5.5	5.5	2187.5	O K
480 min Winter	99.834	0.834	0.0	5.5	5.5	2288.8	O K
600 min Winter	99.862	0.862	0.0	5.5	5.5	2365.5	O K
720 min Winter	99.884	0.884	0.0	5.5	5.5	2425.9	O K
960 min Winter	99.920	0.920	0.0	5.5	5.5	2525.5	O K
1440 min Winter	99.964	0.964	0.0	5.5	5.5	2645.4	O K
2160 min Winter	99.993	0.993	0.0	5.5	5.5	2725.0	O K
2880 min Winter	99.999	0.999	0.0	5.5	5.5	2743.8	O K
4320 min Winter	99.960	0.960	0.0	5.5	5.5	2635.2	O K
5760 min Winter	99.911	0.911	0.0	5.5	5.5	2501.6	O K
7200 min Winter	99.869	0.869	0.0	5.5	5.5	2385.7	O K
8640 min Winter	99.826	0.826	0.0	5.5	5.5	2267.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.096	0.0	2705.4	6864
15 min Winter	212.114	0.0	468.5	25
30 min Winter	121.355	0.0	460.4	40
60 min Winter	69.430	0.0	917.1	70
120 min Winter	39.722	0.0	874.2	128
180 min Winter	28.653	0.0	843.7	186
240 min Winter	22.726	0.0	825.4	246
360 min Winter	16.393	0.0	806.0	364
480 min Winter	13.002	0.0	798.5	482
600 min Winter	10.863	0.0	798.3	600
720 min Winter	9.379	0.0	802.9	718
960 min Winter	7.469	0.0	810.6	952
1440 min Winter	5.418	0.0	808.9	1418
2160 min Winter	3.931	0.0	1619.9	2104
2880 min Winter	3.130	0.0	1612.0	2776
4320 min Winter	2.229	0.0	1549.3	4064
5760 min Winter	1.752	0.0	3210.2	4664
7200 min Winter	1.453	0.0	3081.1	5552
8640 min Winter	1.247	0.0	2946.2	6488

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	99.783	0.783	0.0	5.5	5.5	2149.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	1.096	0.0	2810.7	7456

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 545350 307750 TF 45350 07750
C (1km)	-0.026
D1 (1km)	0.314
D2 (1km)	0.328
D3 (1km)	0.282
E (1km)	0.318
F (1km)	2.441
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 2.750

Time From:	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**
0	2	0.550	4	6	0.550	8	10	0.550
2	4	0.550	6	8	0.550			

Model Details

Storage is Online Cover Level (m) 100.000

Infiltration Basin Structure

Invert Level (m) 99.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2745.3	1.000	2745.3

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0110-5500-1000-5500
Design Head (m)	1.000
Design Flow (l/s)	5.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	110
Invert Level (m)	99.000
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)	1.000	5.5	Kick-Flo®	0.645	4.5
Flush-Flo™	0.298	5.5	Mean Flow over Head Range	-	4.8

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)
0.100	3.8	1.200	6.0	3.000	9.2	7.000	13.8
0.200	5.4	1.400	6.4	3.500	9.9	7.500	14.2
0.300	5.5	1.600	6.8	4.000	10.5	8.000	14.7
0.400	5.4	1.800	7.2	4.500	11.2	8.500	15.1
0.500	5.2	2.000	7.6	5.000	11.7	9.000	15.5
0.600	4.8	2.200	7.9	5.500	12.3	9.500	15.9
0.800	5.0	2.400	8.3	6.000	12.8		
1.000	5.5	2.600	8.6	6.500	13.3		

Summary of Results for Rainfall Profile

Half Drain Time : 4879 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
Rainfall Profile	99.998	0.598	0.0	5.5	5.5	3150.4	O K

Storm Event	Duration (mins)	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
Rainfall Profile	6384	1.972	0.0	3310.7	5920

Rainfall Profile

Cv 0.840 Climate Change % +0

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
1	0.104	43	0.402	85	0.650	127	1.011	169	1.135	211	1.296
2	0.104	44	0.402	86	0.650	128	1.011	170	1.135	212	1.296
3	0.104	45	0.402	87	0.770	129	1.011	171	1.135	213	1.296
4	0.104	46	0.402	88	0.850	130	1.011	172	1.135	214	1.296
5	0.104	47	0.402	89	0.850	131	1.011	173	1.154	215	1.296
6	0.104	48	0.402	90	0.850	132	1.011	174	1.229	216	1.296
7	0.104	49	0.402	91	0.850	133	1.011	175	1.229	217	1.296
8	0.104	50	0.402	92	0.850	134	1.011	176	1.229	218	1.296
9	0.104	51	0.402	93	0.850	135	1.011	177	1.229	219	1.296
10	0.104	52	0.402	94	0.850	136	1.011	178	1.229	220	1.296
11	0.104	53	0.402	95	0.850	137	1.011	179	1.229	221	1.296
12	0.104	54	0.402	96	0.850	138	1.011	180	1.229	222	1.296
13	0.104	55	0.402	97	0.850	139	1.011	181	1.229	223	1.296
14	0.104	56	0.402	98	0.850	140	1.011	182	1.229	224	1.296
15	0.104	57	0.402	99	0.850	141	1.011	183	1.229	225	1.296
16	0.104	58	0.501	100	0.850	142	1.011	184	1.229	226	1.296
17	0.104	59	0.650	101	0.850	143	1.011	185	1.229	227	1.296
18	0.104	60	0.650	102	0.850	144	1.011	186	1.229	228	1.296
19	0.104	61	0.650	103	0.850	145	1.135	187	1.229	229	1.296
20	0.104	62	0.650	104	0.850	146	1.135	188	1.229	230	1.296
21	0.104	63	0.650	105	0.850	147	1.135	189	1.229	231	1.324
22	0.104	64	0.650	106	0.850	148	1.135	190	1.229	232	1.344
23	0.104	65	0.650	107	0.850	149	1.135	191	1.229	233	1.344
24	0.104	66	0.650	108	0.850	150	1.135	192	1.229	234	1.344
25	0.104	67	0.650	109	0.850	151	1.135	193	1.229	235	1.344
26	0.104	68	0.650	110	0.850	152	1.135	194	1.229	236	1.344
27	0.104	69	0.650	111	0.850	153	1.135	195	1.229	237	1.344
28	0.104	70	0.650	112	0.850	154	1.135	196	1.229	238	1.344
29	0.162	71	0.650	113	0.850	155	1.135	197	1.229	239	1.344
30	0.402	72	0.650	114	0.850	156	1.135	198	1.229	240	1.344
31	0.402	73	0.650	115	0.850	157	1.135	199	1.229	241	1.344
32	0.402	74	0.650	116	0.979	158	1.135	200	1.229	242	1.344
33	0.402	75	0.650	117	1.011	159	1.135	201	1.229	243	1.344
34	0.402	76	0.650	118	1.011	160	1.135	202	1.256	244	1.344
35	0.402	77	0.650	119	1.011	161	1.135	203	1.296	245	1.344
36	0.402	78	0.650	120	1.011	162	1.135	204	1.296	246	1.344
37	0.402	79	0.650	121	1.011	163	1.135	205	1.296	247	1.344
38	0.402	80	0.650	122	1.011	164	1.135	206	1.296	248	1.344
39	0.402	81	0.650	123	1.011	165	1.135	207	1.296	249	1.344
40	0.402	82	0.650	124	1.011	166	1.135	208	1.296	250	1.344
41	0.402	83	0.650	125	1.011	167	1.135	209	1.296	251	1.344
42	0.402	84	0.650	126	1.011	168	1.135	210	1.296	252	1.344

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
253	1.344	298	1.389	343	1.394	388	1.393	433	1.393	478	1.400
254	1.344	299	1.389	344	1.394	389	1.393	434	1.393	479	1.400
255	1.344	300	1.389	345	1.394	390	1.393	435	1.393	480	1.400
256	1.344	301	1.389	346	1.396	391	1.393	436	1.393	481	1.400
257	1.344	302	1.389	347	1.396	392	1.393	437	1.393	482	1.400
258	1.344	303	1.389	348	1.396	393	1.393	438	1.393	483	1.400
259	1.344	304	1.389	349	1.396	394	1.393	439	1.393	484	1.400
260	1.366	305	1.389	350	1.396	395	1.393	440	1.393	485	1.400
261	1.372	306	1.389	351	1.396	396	1.393	441	1.393	486	1.400
262	1.372	307	1.389	352	1.396	397	1.393	442	1.393	487	1.400
263	1.372	308	1.389	353	1.396	398	1.393	443	1.393	488	1.400
264	1.372	309	1.389	354	1.396	399	1.393	444	1.393	489	1.400
265	1.372	310	1.389	355	1.396	400	1.393	445	1.393	490	1.406
266	1.372	311	1.389	356	1.396	401	1.393	446	1.393	491	1.414
267	1.372	312	1.389	357	1.396	402	1.393	447	1.393	492	1.414
268	1.372	313	1.389	358	1.396	403	1.393	448	1.393	493	1.414
269	1.372	314	1.389	359	1.396	404	1.392	449	1.393	494	1.414
270	1.372	315	1.389	360	1.396	405	1.392	450	1.393	495	1.414
271	1.372	316	1.389	361	1.396	406	1.392	451	1.393	496	1.414
272	1.372	317	1.390	362	1.396	407	1.392	452	1.393	497	1.414
273	1.372	318	1.394	363	1.396	408	1.392	453	1.393	498	1.414
274	1.372	319	1.394	364	1.396	409	1.392	454	1.393	499	1.414
275	1.372	320	1.394	365	1.396	410	1.392	455	1.393	500	1.414
276	1.372	321	1.394	366	1.396	411	1.392	456	1.393	501	1.414
277	1.372	322	1.394	367	1.396	412	1.392	457	1.393	502	1.414
278	1.372	323	1.394	368	1.396	413	1.392	458	1.393	503	1.414
279	1.372	324	1.394	369	1.396	414	1.392	459	1.393	504	1.414
280	1.372	325	1.394	370	1.396	415	1.392	460	1.393	505	1.414
281	1.372	326	1.394	371	1.396	416	1.392	461	1.394	506	1.414
282	1.372	327	1.394	372	1.396	417	1.392	462	1.400	507	1.414
283	1.372	328	1.394	373	1.396	418	1.392	463	1.400	508	1.414
284	1.372	329	1.394	374	1.396	419	1.392	464	1.400	509	1.414
285	1.372	330	1.394	375	1.394	420	1.392	465	1.400	510	1.414
286	1.372	331	1.394	376	1.393	421	1.392	466	1.400	511	1.414
287	1.372	332	1.394	377	1.393	422	1.392	467	1.400	512	1.414
288	1.372	333	1.394	378	1.393	423	1.392	468	1.400	513	1.414
289	1.389	334	1.394	379	1.393	424	1.392	469	1.400	514	1.414
290	1.389	335	1.394	380	1.393	425	1.392	470	1.400	515	1.414
291	1.389	336	1.394	381	1.393	426	1.392	471	1.400	516	1.414
292	1.389	337	1.394	382	1.393	427	1.392	472	1.400	517	1.414
293	1.389	338	1.394	383	1.393	428	1.392	473	1.400	518	1.414
294	1.389	339	1.394	384	1.393	429	1.392	474	1.400	519	1.429
295	1.389	340	1.394	385	1.393	430	1.392	475	1.400	520	1.439
296	1.389	341	1.394	386	1.393	431	1.392	476	1.400	521	1.439
297	1.389	342	1.394	387	1.393	432	1.392	477	1.400	522	1.439

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
523	1.439	568	1.477	613	1.593	658	1.676	703	1.893	748	2.030
524	1.439	569	1.477	614	1.593	659	1.676	704	1.893	749	2.061
525	1.439	570	1.477	615	1.593	660	1.676	705	1.893	750	2.184
526	1.439	571	1.477	616	1.593	661	1.676	706	1.893	751	2.184
527	1.439	572	1.477	617	1.593	662	1.676	707	1.893	752	2.184
528	1.439	573	1.477	618	1.593	663	1.736	708	1.893	753	2.184
529	1.439	574	1.477	619	1.593	664	1.775	709	1.893	754	2.184
530	1.439	575	1.477	620	1.593	665	1.775	710	1.893	755	2.184
531	1.439	576	1.477	621	1.593	666	1.775	711	1.893	756	2.184
532	1.439	577	1.527	622	1.593	667	1.775	712	1.893	757	2.184
533	1.439	578	1.527	623	1.593	668	1.775	713	1.893	758	2.184
534	1.439	579	1.527	624	1.593	669	1.775	714	1.893	759	2.184
535	1.439	580	1.527	625	1.593	670	1.775	715	1.893	760	2.184
536	1.439	581	1.527	626	1.593	671	1.775	716	1.893	761	2.184
537	1.439	582	1.527	627	1.593	672	1.775	717	1.893	762	2.184
538	1.439	583	1.527	628	1.593	673	1.775	718	1.893	763	2.184
539	1.439	584	1.527	629	1.593	674	1.775	719	1.893	764	2.184
540	1.439	585	1.527	630	1.593	675	1.775	720	1.893	765	2.184
541	1.439	586	1.527	631	1.593	676	1.775	721	2.030	766	2.184
542	1.439	587	1.527	632	1.593	677	1.775	722	2.030	767	2.184
543	1.439	588	1.527	633	1.593	678	1.775	723	2.030	768	2.184
544	1.439	589	1.527	634	1.627	679	1.775	724	2.030	769	2.184
545	1.439	590	1.527	635	1.676	680	1.775	725	2.030	770	2.184
546	1.439	591	1.527	636	1.676	681	1.775	726	2.030	771	2.184
547	1.439	592	1.527	637	1.676	682	1.775	727	2.030	772	2.184
548	1.470	593	1.527	638	1.676	683	1.775	728	2.030	773	2.184
549	1.477	594	1.527	639	1.676	684	1.775	729	2.030	774	2.184
550	1.477	595	1.527	640	1.676	685	1.775	730	2.030	775	2.184
551	1.477	596	1.527	641	1.676	686	1.775	731	2.030	776	2.184
552	1.477	597	1.527	642	1.676	687	1.775	732	2.030	777	2.184
553	1.477	598	1.527	643	1.676	688	1.775	733	2.030	778	2.254
554	1.477	599	1.527	644	1.676	689	1.775	734	2.030	779	2.358
555	1.477	600	1.527	645	1.676	690	1.775	735	2.030	780	2.358
556	1.477	601	1.527	646	1.676	691	1.775	736	2.030	781	2.358
557	1.477	602	1.527	647	1.676	692	1.870	737	2.030	782	2.358
558	1.477	603	1.527	648	1.676	693	1.893	738	2.030	783	2.358
559	1.477	604	1.527	649	1.676	694	1.893	739	2.030	784	2.358
560	1.477	605	1.541	650	1.676	695	1.893	740	2.030	785	2.358
561	1.477	606	1.593	651	1.676	696	1.893	741	2.030	786	2.358
562	1.477	607	1.593	652	1.676	697	1.893	742	2.030	787	2.358
563	1.477	608	1.593	653	1.676	698	1.893	743	2.030	788	2.358
564	1.477	609	1.593	654	1.676	699	1.893	744	2.030	789	2.358
565	1.477	610	1.593	655	1.676	700	1.893	745	2.030	790	2.358
566	1.477	611	1.593	656	1.676	701	1.893	746	2.030	791	2.358
567	1.477	612	1.593	657	1.676	702	1.893	747	2.030	792	2.358

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
793	2.358	838	2.758	883	2.986	928	3.487	973	3.759	1018	4.337
794	2.358	839	2.758	884	2.986	929	3.487	974	3.759	1019	4.337
795	2.358	840	2.758	885	2.986	930	3.487	975	3.759	1020	4.337
796	2.358	841	2.758	886	2.986	931	3.487	976	3.759	1021	4.337
797	2.358	842	2.758	887	2.986	932	3.487	977	3.759	1022	4.337
798	2.358	843	2.758	888	2.986	933	3.487	978	3.759	1023	4.337
799	2.358	844	2.758	889	2.986	934	3.487	979	3.759	1024	4.337
800	2.358	845	2.758	890	2.986	935	3.487	980	3.986	1025	4.337
801	2.358	846	2.758	891	2.986	936	3.487	981	4.043	1026	4.337
802	2.358	847	2.758	892	2.986	937	3.487	982	4.043	1027	4.337
803	2.358	848	2.758	893	3.034	938	3.487	983	4.043	1028	4.337
804	2.358	849	2.758	894	3.228	939	3.487	984	4.043	1029	4.337
805	2.358	850	2.758	895	3.228	940	3.487	985	4.043	1030	4.337
806	2.358	851	2.758	896	3.228	941	3.487	986	4.043	1031	4.337
807	2.472	852	2.758	897	3.228	942	3.487	987	4.043	1032	4.337
808	2.549	853	2.758	898	3.228	943	3.487	988	4.043	1033	4.337
809	2.549	854	2.758	899	3.228	944	3.487	989	4.043	1034	4.337
810	2.549	855	2.758	900	3.228	945	3.487	990	4.043	1035	4.337
811	2.549	856	2.758	901	3.228	946	3.487	991	4.043	1036	4.337
812	2.549	857	2.758	902	3.228	947	3.487	992	4.043	1037	4.397
813	2.549	858	2.758	903	3.228	948	3.487	993	4.043	1038	4.640
814	2.549	859	2.758	904	3.228	949	3.487	994	4.043	1039	4.640
815	2.549	860	2.758	905	3.228	950	3.487	995	4.043	1040	4.640
816	2.549	861	2.758	906	3.228	951	3.650	996	4.043	1041	4.640
817	2.549	862	2.758	907	3.228	952	3.759	997	4.043	1042	4.640
818	2.549	863	2.758	908	3.228	953	3.759	998	4.043	1043	4.640
819	2.549	864	2.758	909	3.228	954	3.759	999	4.043	1044	4.640
820	2.549	865	2.986	910	3.228	955	3.759	1000	4.043	1045	4.640
821	2.549	866	2.986	911	3.228	956	3.759	1001	4.043	1046	4.640
822	2.549	867	2.986	912	3.228	957	3.759	1002	4.043	1047	4.640
823	2.549	868	2.986	913	3.228	958	3.759	1003	4.043	1048	4.640
824	2.549	869	2.986	914	3.228	959	3.759	1004	4.043	1049	4.640
825	2.549	870	2.986	915	3.228	960	3.759	1005	4.043	1050	4.640
826	2.549	871	2.986	916	3.228	961	3.759	1006	4.043	1051	4.640
827	2.549	872	2.986	917	3.228	962	3.759	1007	4.043	1052	4.640
828	2.549	873	2.986	918	3.228	963	3.759	1008	4.043	1053	4.640
829	2.549	874	2.986	919	3.228	964	3.759	1009	4.337	1054	4.640
830	2.549	875	2.986	920	3.228	965	3.759	1010	4.337	1055	4.640
831	2.549	876	2.986	921	3.228	966	3.759	1011	4.337	1056	4.640
832	2.549	877	2.986	922	3.332	967	3.759	1012	4.337	1057	4.640
833	2.549	878	2.986	923	3.487	968	3.759	1013	4.337	1058	4.640
834	2.549	879	2.986	924	3.487	969	3.759	1014	4.337	1059	4.640
835	2.549	880	2.986	925	3.487	970	3.759	1015	4.337	1060	4.640
836	2.717	881	2.986	926	3.487	971	3.759	1016	4.337	1061	4.640
837	2.758	882	2.986	927	3.487	972	3.759	1017	4.337	1062	4.640

Rainfall Profile

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1063	4.640	1108	5.258	1153	5.879	1198	6.182	1243	6.755	1288	7.018
1064	4.640	1109	5.258	1154	5.879	1199	6.182	1244	6.755	1289	7.018
1065	4.640	1110	5.258	1155	5.879	1200	6.182	1245	6.755	1290	7.018
1066	4.763	1111	5.258	1156	5.879	1201	6.182	1246	6.755	1291	7.018
1067	4.948	1112	5.258	1157	5.879	1202	6.182	1247	6.755	1292	7.018
1068	4.948	1113	5.258	1158	5.879	1203	6.182	1248	6.755	1293	7.018
1069	4.948	1114	5.258	1159	5.879	1204	6.182	1249	6.755	1294	7.018
1070	4.948	1115	5.258	1160	5.879	1205	6.182	1250	6.755	1295	7.018
1071	4.948	1116	5.258	1161	5.879	1206	6.182	1251	6.755	1296	7.018
1072	4.948	1117	5.258	1162	5.879	1207	6.182	1252	6.755	1297	7.259
1073	4.948	1118	5.258	1163	5.879	1208	6.182	1253	6.755	1298	7.259
1074	4.948	1119	5.258	1164	5.879	1209	6.182	1254	6.755	1299	7.259
1075	4.948	1120	5.258	1165	5.879	1210	6.300	1255	6.755	1300	7.259
1076	4.948	1121	5.258	1166	5.879	1211	6.475	1256	6.755	1301	7.259
1077	4.948	1122	5.258	1167	5.879	1212	6.475	1257	6.755	1302	7.259
1078	4.948	1123	5.258	1168	5.879	1213	6.475	1258	6.755	1303	7.259
1079	4.948	1124	5.508	1169	5.879	1214	6.475	1259	6.755	1304	7.259
1080	4.948	1125	5.571	1170	5.879	1215	6.475	1260	6.755	1305	7.259
1081	4.948	1126	5.571	1171	5.879	1216	6.475	1261	6.755	1306	7.259
1082	4.948	1127	5.571	1172	5.879	1217	6.475	1262	6.755	1307	7.259
1083	4.948	1128	5.571	1173	5.879	1218	6.475	1263	6.755	1308	7.259
1084	4.948	1129	5.571	1174	5.879	1219	6.475	1264	6.755	1309	7.259
1085	4.948	1130	5.571	1175	5.879	1220	6.475	1265	6.755	1310	7.259
1086	4.948	1131	5.571	1176	5.879	1221	6.475	1266	6.755	1311	7.259
1087	4.948	1132	5.571	1177	5.879	1222	6.475	1267	6.755	1312	7.259
1088	4.948	1133	5.571	1178	5.879	1223	6.475	1268	6.965	1313	7.259
1089	4.948	1134	5.571	1179	5.879	1224	6.475	1269	7.018	1314	7.259
1090	4.948	1135	5.571	1180	5.879	1225	6.475	1270	7.018	1315	7.259
1091	4.948	1136	5.571	1181	5.940	1226	6.475	1271	7.018	1316	7.259
1092	4.948	1137	5.571	1182	6.182	1227	6.475	1272	7.018	1317	7.259
1093	4.948	1138	5.571	1183	6.182	1228	6.475	1273	7.018	1318	7.259
1094	4.948	1139	5.571	1184	6.182	1229	6.475	1274	7.018	1319	7.259
1095	5.134	1140	5.571	1185	6.182	1230	6.475	1275	7.018	1320	7.259
1096	5.258	1141	5.571	1186	6.182	1231	6.475	1276	7.018	1321	7.259
1097	5.258	1142	5.571	1187	6.182	1232	6.475	1277	7.018	1322	7.259
1098	5.258	1143	5.571	1188	6.182	1233	6.475	1278	7.018	1323	7.259
1099	5.258	1144	5.571	1189	6.182	1234	6.475	1279	7.018	1324	7.259
1100	5.258	1145	5.571	1190	6.182	1235	6.475	1280	7.018	1325	7.302
1101	5.258	1146	5.571	1191	6.182	1236	6.475	1281	7.018	1326	7.475
1102	5.258	1147	5.571	1192	6.182	1237	6.475	1282	7.018	1327	7.475
1103	5.258	1148	5.571	1193	6.182	1238	6.475	1283	7.018	1328	7.475
1104	5.258	1149	5.571	1194	6.182	1239	6.643	1284	7.018	1329	7.475
1105	5.258	1150	5.571	1195	6.182	1240	6.755	1285	7.018	1330	7.475
1106	5.258	1151	5.571	1196	6.182	1241	6.755	1286	7.018	1331	7.475
1107	5.258	1152	5.571	1197	6.182	1242	6.755	1287	7.018	1332	7.475

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
1333	7.475	1378	7.659	1423	7.917	1468	7.917	1513	7.659	1558	7.259
1334	7.475	1379	7.659	1424	7.917	1469	7.895	1514	7.659	1559	7.259
1335	7.475	1380	7.659	1425	7.917	1470	7.808	1515	7.659	1560	7.259
1336	7.475	1381	7.659	1426	7.917	1471	7.808	1516	7.659	1561	7.259
1337	7.475	1382	7.659	1427	7.917	1472	7.808	1517	7.659	1562	7.259
1338	7.475	1383	7.749	1428	7.917	1473	7.808	1518	7.659	1563	7.259
1339	7.475	1384	7.808	1429	7.917	1474	7.808	1519	7.659	1564	7.259
1340	7.475	1385	7.808	1430	7.917	1475	7.808	1520	7.659	1565	7.259
1341	7.475	1386	7.808	1431	7.917	1476	7.808	1521	7.659	1566	7.259
1342	7.475	1387	7.808	1432	7.917	1477	7.808	1522	7.659	1567	7.259
1343	7.475	1388	7.808	1433	7.917	1478	7.808	1523	7.659	1568	7.259
1344	7.475	1389	7.808	1434	7.917	1479	7.808	1524	7.659	1569	7.259
1345	7.475	1390	7.808	1435	7.917	1480	7.808	1525	7.659	1570	7.259
1346	7.475	1391	7.808	1436	7.917	1481	7.808	1526	7.659	1571	7.259
1347	7.475	1392	7.808	1437	7.917	1482	7.808	1527	7.549	1572	7.259
1348	7.475	1393	7.808	1438	7.917	1483	7.808	1528	7.475	1573	7.259
1349	7.475	1394	7.808	1439	7.917	1484	7.808	1529	7.475	1574	7.259
1350	7.475	1395	7.808	1440	7.917	1485	7.808	1530	7.475	1575	7.259
1351	7.475	1396	7.808	1441	7.917	1486	7.808	1531	7.475	1576	7.259
1352	7.475	1397	7.808	1442	7.917	1487	7.808	1532	7.475	1577	7.259
1353	7.475	1398	7.808	1443	7.917	1488	7.808	1533	7.475	1578	7.259
1354	7.549	1399	7.808	1444	7.917	1489	7.808	1534	7.475	1579	7.259
1355	7.659	1400	7.808	1445	7.917	1490	7.808	1535	7.475	1580	7.259
1356	7.659	1401	7.808	1446	7.917	1491	7.808	1536	7.475	1581	7.259
1357	7.659	1402	7.808	1447	7.917	1492	7.808	1537	7.475	1582	7.259
1358	7.659	1403	7.808	1448	7.917	1493	7.808	1538	7.475	1583	7.259
1359	7.659	1404	7.808	1449	7.917	1494	7.808	1539	7.475	1584	7.259
1360	7.659	1405	7.808	1450	7.917	1495	7.808	1540	7.475	1585	7.018
1361	7.659	1406	7.808	1451	7.917	1496	7.808	1541	7.475	1586	7.018
1362	7.659	1407	7.808	1452	7.917	1497	7.808	1542	7.475	1587	7.018
1363	7.659	1408	7.808	1453	7.917	1498	7.749	1543	7.475	1588	7.018
1364	7.659	1409	7.808	1454	7.917	1499	7.659	1544	7.475	1589	7.018
1365	7.659	1410	7.808	1455	7.917	1500	7.659	1545	7.475	1590	7.018
1366	7.659	1411	7.808	1456	7.917	1501	7.659	1546	7.475	1591	7.018
1367	7.659	1412	7.895	1457	7.917	1502	7.659	1547	7.475	1592	7.018
1368	7.659	1413	7.917	1458	7.917	1503	7.659	1548	7.475	1593	7.018
1369	7.659	1414	7.917	1459	7.917	1504	7.659	1549	7.475	1594	7.018
1370	7.659	1415	7.917	1460	7.917	1505	7.659	1550	7.475	1595	7.018
1371	7.659	1416	7.917	1461	7.917	1506	7.659	1551	7.475	1596	7.018
1372	7.659	1417	7.917	1462	7.917	1507	7.659	1552	7.475	1597	7.018
1373	7.659	1418	7.917	1463	7.917	1508	7.659	1553	7.475	1598	7.018
1374	7.659	1419	7.917	1464	7.917	1509	7.659	1554	7.475	1599	7.018
1375	7.659	1420	7.917	1465	7.917	1510	7.659	1555	7.475	1600	7.018
1376	7.659	1421	7.917	1466	7.917	1511	7.659	1556	7.302	1601	7.018
1377	7.659	1422	7.917	1467	7.917	1512	7.659	1557	7.259	1602	7.018

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
1603	7.018	1648	6.475	1693	6.182	1738	5.571	1783	5.258	1828	4.640
1604	7.018	1649	6.475	1694	6.182	1739	5.571	1784	5.258	1829	4.640
1605	7.018	1650	6.475	1695	6.182	1740	5.571	1785	5.258	1830	4.640
1606	7.018	1651	6.475	1696	6.182	1741	5.571	1786	5.134	1831	4.640
1607	7.018	1652	6.475	1697	6.182	1742	5.571	1787	4.948	1832	4.640
1608	7.018	1653	6.475	1698	6.182	1743	5.571	1788	4.948	1833	4.640
1609	7.018	1654	6.475	1699	6.182	1744	5.571	1789	4.948	1834	4.640
1610	7.018	1655	6.475	1700	5.940	1745	5.571	1790	4.948	1835	4.640
1611	7.018	1656	6.475	1701	5.879	1746	5.571	1791	4.948	1836	4.640
1612	7.018	1657	6.475	1702	5.879	1747	5.571	1792	4.948	1837	4.640
1613	6.965	1658	6.475	1703	5.879	1748	5.571	1793	4.948	1838	4.640
1614	6.755	1659	6.475	1704	5.879	1749	5.571	1794	4.948	1839	4.640
1615	6.755	1660	6.475	1705	5.879	1750	5.571	1795	4.948	1840	4.640
1616	6.755	1661	6.475	1706	5.879	1751	5.571	1796	4.948	1841	4.640
1617	6.755	1662	6.475	1707	5.879	1752	5.571	1797	4.948	1842	4.640
1618	6.755	1663	6.475	1708	5.879	1753	5.571	1798	4.948	1843	4.640
1619	6.755	1664	6.475	1709	5.879	1754	5.571	1799	4.948	1844	4.397
1620	6.755	1665	6.475	1710	5.879	1755	5.571	1800	4.948	1845	4.337
1621	6.755	1666	6.475	1711	5.879	1756	5.571	1801	4.948	1846	4.337
1622	6.755	1667	6.475	1712	5.879	1757	5.508	1802	4.948	1847	4.337
1623	6.755	1668	6.475	1713	5.879	1758	5.258	1803	4.948	1848	4.337
1624	6.755	1669	6.475	1714	5.879	1759	5.258	1804	4.948	1849	4.337
1625	6.755	1670	6.475	1715	5.879	1760	5.258	1805	4.948	1850	4.337
1626	6.755	1671	6.300	1716	5.879	1761	5.258	1806	4.948	1851	4.337
1627	6.755	1672	6.182	1717	5.879	1762	5.258	1807	4.948	1852	4.337
1628	6.755	1673	6.182	1718	5.879	1763	5.258	1808	4.948	1853	4.337
1629	6.755	1674	6.182	1719	5.879	1764	5.258	1809	4.948	1854	4.337
1630	6.755	1675	6.182	1720	5.879	1765	5.258	1810	4.948	1855	4.337
1631	6.755	1676	6.182	1721	5.879	1766	5.258	1811	4.948	1856	4.337
1632	6.755	1677	6.182	1722	5.879	1767	5.258	1812	4.948	1857	4.337
1633	6.755	1678	6.182	1723	5.879	1768	5.258	1813	4.948	1858	4.337
1634	6.755	1679	6.182	1724	5.879	1769	5.258	1814	4.948	1859	4.337
1635	6.755	1680	6.182	1725	5.879	1770	5.258	1815	4.763	1860	4.337
1636	6.755	1681	6.182	1726	5.879	1771	5.258	1816	4.640	1861	4.337
1637	6.755	1682	6.182	1727	5.879	1772	5.258	1817	4.640	1862	4.337
1638	6.755	1683	6.182	1728	5.879	1773	5.258	1818	4.640	1863	4.337
1639	6.755	1684	6.182	1729	5.571	1774	5.258	1819	4.640	1864	4.337
1640	6.755	1685	6.182	1730	5.571	1775	5.258	1820	4.640	1865	4.337
1641	6.755	1686	6.182	1731	5.571	1776	5.258	1821	4.640	1866	4.337
1642	6.643	1687	6.182	1732	5.571	1777	5.258	1822	4.640	1867	4.337
1643	6.475	1688	6.182	1733	5.571	1778	5.258	1823	4.640	1868	4.337
1644	6.475	1689	6.182	1734	5.571	1779	5.258	1824	4.640	1869	4.337
1645	6.475	1690	6.182	1735	5.571	1780	5.258	1825	4.640	1870	4.337
1646	6.475	1691	6.182	1736	5.571	1781	5.258	1826	4.640	1871	4.337
1647	6.475	1692	6.182	1737	5.571	1782	5.258	1827	4.640	1872	4.337

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
1873	4.043	1918	3.759	1963	3.228	2008	2.986	2053	2.549	2098	2.358
1874	4.043	1919	3.759	1964	3.228	2009	2.986	2054	2.549	2099	2.358
1875	4.043	1920	3.759	1965	3.228	2010	2.986	2055	2.549	2100	2.358
1876	4.043	1921	3.759	1966	3.228	2011	2.986	2056	2.549	2101	2.358
1877	4.043	1922	3.759	1967	3.228	2012	2.986	2057	2.549	2102	2.358
1878	4.043	1923	3.759	1968	3.228	2013	2.986	2058	2.549	2103	2.254
1879	4.043	1924	3.759	1969	3.228	2014	2.986	2059	2.549	2104	2.184
1880	4.043	1925	3.759	1970	3.228	2015	2.986	2060	2.549	2105	2.184
1881	4.043	1926	3.759	1971	3.228	2016	2.986	2061	2.549	2106	2.184
1882	4.043	1927	3.759	1972	3.228	2017	2.758	2062	2.549	2107	2.184
1883	4.043	1928	3.759	1973	3.228	2018	2.758	2063	2.549	2108	2.184
1884	4.043	1929	3.759	1974	3.228	2019	2.758	2064	2.549	2109	2.184
1885	4.043	1930	3.650	1975	3.228	2020	2.758	2065	2.549	2110	2.184
1886	4.043	1931	3.487	1976	3.228	2021	2.758	2066	2.549	2111	2.184
1887	4.043	1932	3.487	1977	3.228	2022	2.758	2067	2.549	2112	2.184
1888	4.043	1933	3.487	1978	3.228	2023	2.758	2068	2.549	2113	2.184
1889	4.043	1934	3.487	1979	3.228	2024	2.758	2069	2.549	2114	2.184
1890	4.043	1935	3.487	1980	3.228	2025	2.758	2070	2.549	2115	2.184
1891	4.043	1936	3.487	1981	3.228	2026	2.758	2071	2.549	2116	2.184
1892	4.043	1937	3.487	1982	3.228	2027	2.758	2072	2.549	2117	2.184
1893	4.043	1938	3.487	1983	3.228	2028	2.758	2073	2.549	2118	2.184
1894	4.043	1939	3.487	1984	3.228	2029	2.758	2074	2.472	2119	2.184
1895	4.043	1940	3.487	1985	3.228	2030	2.758	2075	2.358	2120	2.184
1896	4.043	1941	3.487	1986	3.228	2031	2.758	2076	2.358	2121	2.184
1897	4.043	1942	3.487	1987	3.228	2032	2.758	2077	2.358	2122	2.184
1898	4.043	1943	3.487	1988	3.034	2033	2.758	2078	2.358	2123	2.184
1899	4.043	1944	3.487	1989	2.986	2034	2.758	2079	2.358	2124	2.184
1900	4.043	1945	3.487	1990	2.986	2035	2.758	2080	2.358	2125	2.184
1901	3.986	1946	3.487	1991	2.986	2036	2.758	2081	2.358	2126	2.184
1902	3.759	1947	3.487	1992	2.986	2037	2.758	2082	2.358	2127	2.184
1903	3.759	1948	3.487	1993	2.986	2038	2.758	2083	2.358	2128	2.184
1904	3.759	1949	3.487	1994	2.986	2039	2.758	2084	2.358	2129	2.184
1905	3.759	1950	3.487	1995	2.986	2040	2.758	2085	2.358	2130	2.184
1906	3.759	1951	3.487	1996	2.986	2041	2.758	2086	2.358	2131	2.184
1907	3.759	1952	3.487	1997	2.986	2042	2.758	2087	2.358	2132	2.061
1908	3.759	1953	3.487	1998	2.986	2043	2.758	2088	2.358	2133	2.030
1909	3.759	1954	3.487	1999	2.986	2044	2.758	2089	2.358	2134	2.030
1910	3.759	1955	3.487	2000	2.986	2045	2.717	2090	2.358	2135	2.030
1911	3.759	1956	3.487	2001	2.986	2046	2.549	2091	2.358	2136	2.030
1912	3.759	1957	3.487	2002	2.986	2047	2.549	2092	2.358	2137	2.030
1913	3.759	1958	3.487	2003	2.986	2048	2.549	2093	2.358	2138	2.030
1914	3.759	1959	3.332	2004	2.986	2049	2.549	2094	2.358	2139	2.030
1915	3.759	1960	3.228	2005	2.986	2050	2.549	2095	2.358	2140	2.030
1916	3.759	1961	3.228	2006	2.986	2051	2.549	2096	2.358	2141	2.030
1917	3.759	1962	3.228	2007	2.986	2052	2.549	2097	2.358	2142	2.030

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
2143	2.030	2188	1.893	2233	1.676	2278	1.527	2323	1.477	2368	1.414
2144	2.030	2189	1.870	2234	1.676	2279	1.527	2324	1.477	2369	1.414
2145	2.030	2190	1.775	2235	1.676	2280	1.527	2325	1.477	2370	1.414
2146	2.030	2191	1.775	2236	1.676	2281	1.527	2326	1.477	2371	1.414
2147	2.030	2192	1.775	2237	1.676	2282	1.527	2327	1.477	2372	1.414
2148	2.030	2193	1.775	2238	1.676	2283	1.527	2328	1.477	2373	1.414
2149	2.030	2194	1.775	2239	1.676	2284	1.527	2329	1.477	2374	1.414
2150	2.030	2195	1.775	2240	1.676	2285	1.527	2330	1.477	2375	1.414
2151	2.030	2196	1.775	2241	1.676	2286	1.527	2331	1.477	2376	1.414
2152	2.030	2197	1.775	2242	1.676	2287	1.527	2332	1.477	2377	1.414
2153	2.030	2198	1.775	2243	1.676	2288	1.527	2333	1.470	2378	1.414
2154	2.030	2199	1.775	2244	1.676	2289	1.527	2334	1.439	2379	1.414
2155	2.030	2200	1.775	2245	1.676	2290	1.527	2335	1.439	2380	1.414
2156	2.030	2201	1.775	2246	1.676	2291	1.527	2336	1.439	2381	1.414
2157	2.030	2202	1.775	2247	1.627	2292	1.527	2337	1.439	2382	1.414
2158	2.030	2203	1.775	2248	1.593	2293	1.527	2338	1.439	2383	1.414
2159	2.030	2204	1.775	2249	1.593	2294	1.527	2339	1.439	2384	1.414
2160	2.030	2205	1.775	2250	1.593	2295	1.527	2340	1.439	2385	1.414
2161	1.893	2206	1.775	2251	1.593	2296	1.527	2341	1.439	2386	1.414
2162	1.893	2207	1.775	2252	1.593	2297	1.527	2342	1.439	2387	1.414
2163	1.893	2208	1.775	2253	1.593	2298	1.527	2343	1.439	2388	1.414
2164	1.893	2209	1.775	2254	1.593	2299	1.527	2344	1.439	2389	1.414
2165	1.893	2210	1.775	2255	1.593	2300	1.527	2345	1.439	2390	1.414
2166	1.893	2211	1.775	2256	1.593	2301	1.527	2346	1.439	2391	1.406
2167	1.893	2212	1.775	2257	1.593	2302	1.527	2347	1.439	2392	1.400
2168	1.893	2213	1.775	2258	1.593	2303	1.527	2348	1.439	2393	1.400
2169	1.893	2214	1.775	2259	1.593	2304	1.527	2349	1.439	2394	1.400
2170	1.893	2215	1.775	2260	1.593	2305	1.477	2350	1.439	2395	1.400
2171	1.893	2216	1.775	2261	1.593	2306	1.477	2351	1.439	2396	1.400
2172	1.893	2217	1.775	2262	1.593	2307	1.477	2352	1.439	2397	1.400
2173	1.893	2218	1.736	2263	1.593	2308	1.477	2353	1.439	2398	1.400
2174	1.893	2219	1.676	2264	1.593	2309	1.477	2354	1.439	2399	1.400
2175	1.893	2220	1.676	2265	1.593	2310	1.477	2355	1.439	2400	1.400
2176	1.893	2221	1.676	2266	1.593	2311	1.477	2356	1.439	2401	1.400
2177	1.893	2222	1.676	2267	1.593	2312	1.477	2357	1.439	2402	1.400
2178	1.893	2223	1.676	2268	1.593	2313	1.477	2358	1.439	2403	1.400
2179	1.893	2224	1.676	2269	1.593	2314	1.477	2359	1.439	2404	1.400
2180	1.893	2225	1.676	2270	1.593	2315	1.477	2360	1.439	2405	1.400
2181	1.893	2226	1.676	2271	1.593	2316	1.477	2361	1.439	2406	1.400
2182	1.893	2227	1.676	2272	1.593	2317	1.477	2362	1.429	2407	1.400
2183	1.893	2228	1.676	2273	1.593	2318	1.477	2363	1.414	2408	1.400
2184	1.893	2229	1.676	2274	1.593	2319	1.477	2364	1.414	2409	1.400
2185	1.893	2230	1.676	2275	1.593	2320	1.477	2365	1.414	2410	1.400
2186	1.893	2231	1.676	2276	1.541	2321	1.477	2366	1.414	2411	1.400
2187	1.893	2232	1.676	2277	1.527	2322	1.477	2367	1.414	2412	1.400

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
2413	1.400	2458	1.392	2503	1.393	2548	1.394	2593	1.372	2638	1.344
2414	1.400	2459	1.392	2504	1.393	2549	1.394	2594	1.372	2639	1.344
2415	1.400	2460	1.392	2505	1.393	2550	1.394	2595	1.372	2640	1.344
2416	1.400	2461	1.392	2506	1.394	2551	1.394	2596	1.372	2641	1.344
2417	1.400	2462	1.392	2507	1.396	2552	1.394	2597	1.372	2642	1.344
2418	1.400	2463	1.392	2508	1.396	2553	1.394	2598	1.372	2643	1.344
2419	1.400	2464	1.392	2509	1.396	2554	1.394	2599	1.372	2644	1.344
2420	1.394	2465	1.392	2510	1.396	2555	1.394	2600	1.372	2645	1.344
2421	1.393	2466	1.392	2511	1.396	2556	1.394	2601	1.372	2646	1.344
2422	1.393	2467	1.392	2512	1.396	2557	1.394	2602	1.372	2647	1.344
2423	1.393	2468	1.392	2513	1.396	2558	1.394	2603	1.372	2648	1.344
2424	1.393	2469	1.392	2514	1.396	2559	1.394	2604	1.372	2649	1.344
2425	1.393	2470	1.392	2515	1.396	2560	1.394	2605	1.372	2650	1.324
2426	1.393	2471	1.392	2516	1.396	2561	1.394	2606	1.372	2651	1.296
2427	1.393	2472	1.392	2517	1.396	2562	1.394	2607	1.372	2652	1.296
2428	1.393	2473	1.392	2518	1.396	2563	1.394	2608	1.372	2653	1.296
2429	1.393	2474	1.392	2519	1.396	2564	1.390	2609	1.372	2654	1.296
2430	1.393	2475	1.392	2520	1.396	2565	1.389	2610	1.372	2655	1.296
2431	1.393	2476	1.392	2521	1.396	2566	1.389	2611	1.372	2656	1.296
2432	1.393	2477	1.392	2522	1.396	2567	1.389	2612	1.372	2657	1.296
2433	1.393	2478	1.393	2523	1.396	2568	1.389	2613	1.372	2658	1.296
2434	1.393	2479	1.393	2524	1.396	2569	1.389	2614	1.372	2659	1.296
2435	1.393	2480	1.393	2525	1.396	2570	1.389	2615	1.372	2660	1.296
2436	1.393	2481	1.393	2526	1.396	2571	1.389	2616	1.372	2661	1.296
2437	1.393	2482	1.393	2527	1.396	2572	1.389	2617	1.372	2662	1.296
2438	1.393	2483	1.393	2528	1.396	2573	1.389	2618	1.372	2663	1.296
2439	1.393	2484	1.393	2529	1.396	2574	1.389	2619	1.372	2664	1.296
2440	1.393	2485	1.393	2530	1.396	2575	1.389	2620	1.372	2665	1.296
2441	1.393	2486	1.393	2531	1.396	2576	1.389	2621	1.366	2666	1.296
2442	1.393	2487	1.393	2532	1.396	2577	1.389	2622	1.344	2667	1.296
2443	1.393	2488	1.393	2533	1.396	2578	1.389	2623	1.344	2668	1.296
2444	1.393	2489	1.393	2534	1.396	2579	1.389	2624	1.344	2669	1.296
2445	1.393	2490	1.393	2535	1.396	2580	1.389	2625	1.344	2670	1.296
2446	1.393	2491	1.393	2536	1.394	2581	1.389	2626	1.344	2671	1.296
2447	1.393	2492	1.393	2537	1.394	2582	1.389	2627	1.344	2672	1.296
2448	1.393	2493	1.393	2538	1.394	2583	1.389	2628	1.344	2673	1.296
2449	1.392	2494	1.393	2539	1.394	2584	1.389	2629	1.344	2674	1.296
2450	1.392	2495	1.393	2540	1.394	2585	1.389	2630	1.344	2675	1.296
2451	1.392	2496	1.393	2541	1.394	2586	1.389	2631	1.344	2676	1.296
2452	1.392	2497	1.393	2542	1.394	2587	1.389	2632	1.344	2677	1.296
2453	1.392	2498	1.393	2543	1.394	2588	1.389	2633	1.344	2678	1.296
2454	1.392	2499	1.393	2544	1.394	2589	1.389	2634	1.344	2679	1.256
2455	1.392	2500	1.393	2545	1.394	2590	1.389	2635	1.344	2680	1.229
2456	1.392	2501	1.393	2546	1.394	2591	1.389	2636	1.344	2681	1.229
2457	1.392	2502	1.393	2547	1.394	2592	1.389	2637	1.344	2682	1.229

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
2683	1.229	2728	1.135	2773	0.850	2818	0.650	2863	0.104	2908	0.000
2684	1.229	2729	1.135	2774	0.850	2819	0.650	2864	0.104	2909	0.000
2685	1.229	2730	1.135	2775	0.850	2820	0.650	2865	0.104	2910	0.000
2686	1.229	2731	1.135	2776	0.850	2821	0.650	2866	0.104	2911	0.000
2687	1.229	2732	1.135	2777	0.850	2822	0.650	2867	0.104	2912	0.000
2688	1.229	2733	1.135	2778	0.850	2823	0.501	2868	0.104	2913	0.000
2689	1.229	2734	1.135	2779	0.850	2824	0.402	2869	0.104	2914	0.000
2690	1.229	2735	1.135	2780	0.850	2825	0.402	2870	0.104	2915	0.000
2691	1.229	2736	1.135	2781	0.850	2826	0.402	2871	0.104	2916	0.000
2692	1.229	2737	1.011	2782	0.850	2827	0.402	2872	0.104	2917	0.000
2693	1.229	2738	1.011	2783	0.850	2828	0.402	2873	0.104	2918	0.000
2694	1.229	2739	1.011	2784	0.850	2829	0.402	2874	0.104	2919	0.000
2695	1.229	2740	1.011	2785	0.850	2830	0.402	2875	0.104	2920	0.000
2696	1.229	2741	1.011	2786	0.850	2831	0.402	2876	0.104	2921	0.000
2697	1.229	2742	1.011	2787	0.850	2832	0.402	2877	0.104	2922	0.000
2698	1.229	2743	1.011	2788	0.850	2833	0.402	2878	0.104	2923	0.000
2699	1.229	2744	1.011	2789	0.850	2834	0.402	2879	0.104	2924	0.000
2700	1.229	2745	1.011	2790	0.850	2835	0.402	2880	0.104	2925	0.000
2701	1.229	2746	1.011	2791	0.850	2836	0.402	2881	0.000	2926	0.000
2702	1.229	2747	1.011	2792	0.850	2837	0.402	2882	0.000	2927	0.000
2703	1.229	2748	1.011	2793	0.850	2838	0.402	2883	0.000	2928	0.000
2704	1.229	2749	1.011	2794	0.770	2839	0.402	2884	0.000	2929	0.000
2705	1.229	2750	1.011	2795	0.650	2840	0.402	2885	0.000	2930	0.000
2706	1.229	2751	1.011	2796	0.650	2841	0.402	2886	0.000	2931	0.000
2707	1.229	2752	1.011	2797	0.650	2842	0.402	2887	0.000	2932	0.000
2708	1.154	2753	1.011	2798	0.650	2843	0.402	2888	0.000	2933	0.000
2709	1.135	2754	1.011	2799	0.650	2844	0.402	2889	0.000	2934	0.000
2710	1.135	2755	1.011	2800	0.650	2845	0.402	2890	0.000	2935	0.000
2711	1.135	2756	1.011	2801	0.650	2846	0.402	2891	0.000	2936	0.000
2712	1.135	2757	1.011	2802	0.650	2847	0.402	2892	0.000	2937	0.000
2713	1.135	2758	1.011	2803	0.650	2848	0.402	2893	0.000	2938	0.000
2714	1.135	2759	1.011	2804	0.650	2849	0.402	2894	0.000	2939	0.000
2715	1.135	2760	1.011	2805	0.650	2850	0.402	2895	0.000	2940	0.000
2716	1.135	2761	1.011	2806	0.650	2851	0.402	2896	0.000	2941	0.000
2717	1.135	2762	1.011	2807	0.650	2852	0.162	2897	0.000	2942	0.000
2718	1.135	2763	1.011	2808	0.650	2853	0.104	2898	0.000	2943	0.000
2719	1.135	2764	1.011	2809	0.650	2854	0.104	2899	0.000	2944	0.000
2720	1.135	2765	0.979	2810	0.650	2855	0.104	2900	0.000	2945	0.000
2721	1.135	2766	0.850	2811	0.650	2856	0.104	2901	0.000	2946	0.000
2722	1.135	2767	0.850	2812	0.650	2857	0.104	2902	0.000	2947	0.000
2723	1.135	2768	0.850	2813	0.650	2858	0.104	2903	0.000	2948	0.000
2724	1.135	2769	0.850	2814	0.650	2859	0.104	2904	0.000	2949	0.000
2725	1.135	2770	0.850	2815	0.650	2860	0.104	2905	0.000	2950	0.000
2726	1.135	2771	0.850	2816	0.650	2861	0.104	2906	0.000	2951	0.000
2727	1.135	2772	0.850	2817	0.650	2862	0.104	2907	0.000	2952	0.000

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
2953	0.000	2998	0.000	3043	0.000	3088	0.000	3133	0.000	3178	0.000
2954	0.000	2999	0.000	3044	0.000	3089	0.000	3134	0.000	3179	0.000
2955	0.000	3000	0.000	3045	0.000	3090	0.000	3135	0.000	3180	0.000
2956	0.000	3001	0.000	3046	0.000	3091	0.000	3136	0.000	3181	0.000
2957	0.000	3002	0.000	3047	0.000	3092	0.000	3137	0.000	3182	0.000
2958	0.000	3003	0.000	3048	0.000	3093	0.000	3138	0.000	3183	0.000
2959	0.000	3004	0.000	3049	0.000	3094	0.000	3139	0.000	3184	0.000
2960	0.000	3005	0.000	3050	0.000	3095	0.000	3140	0.000	3185	0.000
2961	0.000	3006	0.000	3051	0.000	3096	0.000	3141	0.000	3186	0.000
2962	0.000	3007	0.000	3052	0.000	3097	0.000	3142	0.000	3187	0.000
2963	0.000	3008	0.000	3053	0.000	3098	0.000	3143	0.000	3188	0.000
2964	0.000	3009	0.000	3054	0.000	3099	0.000	3144	0.000	3189	0.000
2965	0.000	3010	0.000	3055	0.000	3100	0.000	3145	0.000	3190	0.000
2966	0.000	3011	0.000	3056	0.000	3101	0.000	3146	0.000	3191	0.000
2967	0.000	3012	0.000	3057	0.000	3102	0.000	3147	0.000	3192	0.000
2968	0.000	3013	0.000	3058	0.000	3103	0.000	3148	0.000	3193	0.000
2969	0.000	3014	0.000	3059	0.000	3104	0.000	3149	0.000	3194	0.000
2970	0.000	3015	0.000	3060	0.000	3105	0.000	3150	0.000	3195	0.000
2971	0.000	3016	0.000	3061	0.000	3106	0.000	3151	0.000	3196	0.000
2972	0.000	3017	0.000	3062	0.000	3107	0.000	3152	0.000	3197	0.000
2973	0.000	3018	0.000	3063	0.000	3108	0.000	3153	0.000	3198	0.000
2974	0.000	3019	0.000	3064	0.000	3109	0.000	3154	0.000	3199	0.000
2975	0.000	3020	0.000	3065	0.000	3110	0.000	3155	0.000	3200	0.000
2976	0.000	3021	0.000	3066	0.000	3111	0.000	3156	0.000	3201	0.000
2977	0.000	3022	0.000	3067	0.000	3112	0.000	3157	0.000	3202	0.000
2978	0.000	3023	0.000	3068	0.000	3113	0.000	3158	0.000	3203	0.000
2979	0.000	3024	0.000	3069	0.000	3114	0.000	3159	0.000	3204	0.000
2980	0.000	3025	0.000	3070	0.000	3115	0.000	3160	0.000	3205	0.000
2981	0.000	3026	0.000	3071	0.000	3116	0.000	3161	0.000	3206	0.000
2982	0.000	3027	0.000	3072	0.000	3117	0.000	3162	0.000	3207	0.000
2983	0.000	3028	0.000	3073	0.000	3118	0.000	3163	0.000	3208	0.000
2984	0.000	3029	0.000	3074	0.000	3119	0.000	3164	0.000	3209	0.000
2985	0.000	3030	0.000	3075	0.000	3120	0.000	3165	0.000	3210	0.000
2986	0.000	3031	0.000	3076	0.000	3121	0.000	3166	0.000	3211	0.000
2987	0.000	3032	0.000	3077	0.000	3122	0.000	3167	0.000	3212	0.000
2988	0.000	3033	0.000	3078	0.000	3123	0.000	3168	0.000	3213	0.000
2989	0.000	3034	0.000	3079	0.000	3124	0.000	3169	0.000	3214	0.000
2990	0.000	3035	0.000	3080	0.000	3125	0.000	3170	0.000	3215	0.000
2991	0.000	3036	0.000	3081	0.000	3126	0.000	3171	0.000	3216	0.000
2992	0.000	3037	0.000	3082	0.000	3127	0.000	3172	0.000	3217	0.000
2993	0.000	3038	0.000	3083	0.000	3128	0.000	3173	0.000	3218	0.000
2994	0.000	3039	0.000	3084	0.000	3129	0.000	3174	0.000	3219	0.000
2995	0.000	3040	0.000	3085	0.000	3130	0.000	3175	0.000	3220	0.000
2996	0.000	3041	0.000	3086	0.000	3131	0.000	3176	0.000	3221	0.000
2997	0.000	3042	0.000	3087	0.000	3132	0.000	3177	0.000	3222	0.000

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
3223	0.000	3268	0.000	3313	0.000	3358	0.000	3403	0.000	3448	0.000
3224	0.000	3269	0.000	3314	0.000	3359	0.000	3404	0.000	3449	0.000
3225	0.000	3270	0.000	3315	0.000	3360	0.000	3405	0.000	3450	0.000
3226	0.000	3271	0.000	3316	0.000	3361	0.000	3406	0.000	3451	0.000
3227	0.000	3272	0.000	3317	0.000	3362	0.000	3407	0.000	3452	0.000
3228	0.000	3273	0.000	3318	0.000	3363	0.000	3408	0.000	3453	0.000
3229	0.000	3274	0.000	3319	0.000	3364	0.000	3409	0.000	3454	0.000
3230	0.000	3275	0.000	3320	0.000	3365	0.000	3410	0.000	3455	0.000
3231	0.000	3276	0.000	3321	0.000	3366	0.000	3411	0.000	3456	0.000
3232	0.000	3277	0.000	3322	0.000	3367	0.000	3412	0.000	3457	0.000
3233	0.000	3278	0.000	3323	0.000	3368	0.000	3413	0.000	3458	0.000
3234	0.000	3279	0.000	3324	0.000	3369	0.000	3414	0.000	3459	0.000
3235	0.000	3280	0.000	3325	0.000	3370	0.000	3415	0.000	3460	0.000
3236	0.000	3281	0.000	3326	0.000	3371	0.000	3416	0.000	3461	0.000
3237	0.000	3282	0.000	3327	0.000	3372	0.000	3417	0.000	3462	0.000
3238	0.000	3283	0.000	3328	0.000	3373	0.000	3418	0.000	3463	0.000
3239	0.000	3284	0.000	3329	0.000	3374	0.000	3419	0.000	3464	0.000
3240	0.000	3285	0.000	3330	0.000	3375	0.000	3420	0.000	3465	0.000
3241	0.000	3286	0.000	3331	0.000	3376	0.000	3421	0.000	3466	0.000
3242	0.000	3287	0.000	3332	0.000	3377	0.000	3422	0.000	3467	0.000
3243	0.000	3288	0.000	3333	0.000	3378	0.000	3423	0.000	3468	0.000
3244	0.000	3289	0.000	3334	0.000	3379	0.000	3424	0.000	3469	0.000
3245	0.000	3290	0.000	3335	0.000	3380	0.000	3425	0.000	3470	0.000
3246	0.000	3291	0.000	3336	0.000	3381	0.000	3426	0.000	3471	0.000
3247	0.000	3292	0.000	3337	0.000	3382	0.000	3427	0.000	3472	0.000
3248	0.000	3293	0.000	3338	0.000	3383	0.000	3428	0.000	3473	0.000
3249	0.000	3294	0.000	3339	0.000	3384	0.000	3429	0.000	3474	0.000
3250	0.000	3295	0.000	3340	0.000	3385	0.000	3430	0.000	3475	0.000
3251	0.000	3296	0.000	3341	0.000	3386	0.000	3431	0.000	3476	0.000
3252	0.000	3297	0.000	3342	0.000	3387	0.000	3432	0.000	3477	0.000
3253	0.000	3298	0.000	3343	0.000	3388	0.000	3433	0.000	3478	0.000
3254	0.000	3299	0.000	3344	0.000	3389	0.000	3434	0.000	3479	0.000
3255	0.000	3300	0.000	3345	0.000	3390	0.000	3435	0.000	3480	0.000
3256	0.000	3301	0.000	3346	0.000	3391	0.000	3436	0.000	3481	0.000
3257	0.000	3302	0.000	3347	0.000	3392	0.000	3437	0.000	3482	0.000
3258	0.000	3303	0.000	3348	0.000	3393	0.000	3438	0.000	3483	0.000
3259	0.000	3304	0.000	3349	0.000	3394	0.000	3439	0.000	3484	0.000
3260	0.000	3305	0.000	3350	0.000	3395	0.000	3440	0.000	3485	0.000
3261	0.000	3306	0.000	3351	0.000	3396	0.000	3441	0.000	3486	0.000
3262	0.000	3307	0.000	3352	0.000	3397	0.000	3442	0.000	3487	0.000
3263	0.000	3308	0.000	3353	0.000	3398	0.000	3443	0.000	3488	0.000
3264	0.000	3309	0.000	3354	0.000	3399	0.000	3444	0.000	3489	0.000
3265	0.000	3310	0.000	3355	0.000	3400	0.000	3445	0.000	3490	0.000
3266	0.000	3311	0.000	3356	0.000	3401	0.000	3446	0.000	3491	0.000
3267	0.000	3312	0.000	3357	0.000	3402	0.000	3447	0.000	3492	0.000

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
3493	0.000	3538	0.000	3583	0.000	3628	0.000	3673	0.000	3718	0.000
3494	0.000	3539	0.000	3584	0.000	3629	0.000	3674	0.000	3719	0.000
3495	0.000	3540	0.000	3585	0.000	3630	0.000	3675	0.000	3720	0.000
3496	0.000	3541	0.000	3586	0.000	3631	0.000	3676	0.000	3721	0.000
3497	0.000	3542	0.000	3587	0.000	3632	0.000	3677	0.000	3722	0.000
3498	0.000	3543	0.000	3588	0.000	3633	0.000	3678	0.000	3723	0.000
3499	0.000	3544	0.000	3589	0.000	3634	0.000	3679	0.000	3724	0.000
3500	0.000	3545	0.000	3590	0.000	3635	0.000	3680	0.000	3725	0.000
3501	0.000	3546	0.000	3591	0.000	3636	0.000	3681	0.000	3726	0.000
3502	0.000	3547	0.000	3592	0.000	3637	0.000	3682	0.000	3727	0.000
3503	0.000	3548	0.000	3593	0.000	3638	0.000	3683	0.000	3728	0.000
3504	0.000	3549	0.000	3594	0.000	3639	0.000	3684	0.000	3729	0.000
3505	0.000	3550	0.000	3595	0.000	3640	0.000	3685	0.000	3730	0.000
3506	0.000	3551	0.000	3596	0.000	3641	0.000	3686	0.000	3731	0.000
3507	0.000	3552	0.000	3597	0.000	3642	0.000	3687	0.000	3732	0.000
3508	0.000	3553	0.000	3598	0.000	3643	0.000	3688	0.000	3733	0.000
3509	0.000	3554	0.000	3599	0.000	3644	0.000	3689	0.000	3734	0.000
3510	0.000	3555	0.000	3600	0.000	3645	0.000	3690	0.000	3735	0.000
3511	0.000	3556	0.000	3601	0.000	3646	0.000	3691	0.000	3736	0.000
3512	0.000	3557	0.000	3602	0.000	3647	0.000	3692	0.000	3737	0.000
3513	0.000	3558	0.000	3603	0.000	3648	0.000	3693	0.000	3738	0.000
3514	0.000	3559	0.000	3604	0.000	3649	0.000	3694	0.000	3739	0.000
3515	0.000	3560	0.000	3605	0.000	3650	0.000	3695	0.000	3740	0.000
3516	0.000	3561	0.000	3606	0.000	3651	0.000	3696	0.000	3741	0.000
3517	0.000	3562	0.000	3607	0.000	3652	0.000	3697	0.000	3742	0.000
3518	0.000	3563	0.000	3608	0.000	3653	0.000	3698	0.000	3743	0.000
3519	0.000	3564	0.000	3609	0.000	3654	0.000	3699	0.000	3744	0.000
3520	0.000	3565	0.000	3610	0.000	3655	0.000	3700	0.000	3745	0.000
3521	0.000	3566	0.000	3611	0.000	3656	0.000	3701	0.000	3746	0.000
3522	0.000	3567	0.000	3612	0.000	3657	0.000	3702	0.000	3747	0.000
3523	0.000	3568	0.000	3613	0.000	3658	0.000	3703	0.000	3748	0.000
3524	0.000	3569	0.000	3614	0.000	3659	0.000	3704	0.000	3749	0.000
3525	0.000	3570	0.000	3615	0.000	3660	0.000	3705	0.000	3750	0.000
3526	0.000	3571	0.000	3616	0.000	3661	0.000	3706	0.000	3751	0.000
3527	0.000	3572	0.000	3617	0.000	3662	0.000	3707	0.000	3752	0.000
3528	0.000	3573	0.000	3618	0.000	3663	0.000	3708	0.000	3753	0.000
3529	0.000	3574	0.000	3619	0.000	3664	0.000	3709	0.000	3754	0.000
3530	0.000	3575	0.000	3620	0.000	3665	0.000	3710	0.000	3755	0.000
3531	0.000	3576	0.000	3621	0.000	3666	0.000	3711	0.000	3756	0.000
3532	0.000	3577	0.000	3622	0.000	3667	0.000	3712	0.000	3757	0.000
3533	0.000	3578	0.000	3623	0.000	3668	0.000	3713	0.000	3758	0.000
3534	0.000	3579	0.000	3624	0.000	3669	0.000	3714	0.000	3759	0.000
3535	0.000	3580	0.000	3625	0.000	3670	0.000	3715	0.000	3760	0.000
3536	0.000	3581	0.000	3626	0.000	3671	0.000	3716	0.000	3761	0.000
3537	0.000	3582	0.000	3627	0.000	3672	0.000	3717	0.000	3762	0.000

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
3763	0.000	3808	0.000	3853	0.000	3898	0.000	3943	0.000	3988	0.000
3764	0.000	3809	0.000	3854	0.000	3899	0.000	3944	0.000	3989	0.000
3765	0.000	3810	0.000	3855	0.000	3900	0.000	3945	0.000	3990	0.000
3766	0.000	3811	0.000	3856	0.000	3901	0.000	3946	0.000	3991	0.000
3767	0.000	3812	0.000	3857	0.000	3902	0.000	3947	0.000	3992	0.000
3768	0.000	3813	0.000	3858	0.000	3903	0.000	3948	0.000	3993	0.000
3769	0.000	3814	0.000	3859	0.000	3904	0.000	3949	0.000	3994	0.000
3770	0.000	3815	0.000	3860	0.000	3905	0.000	3950	0.000	3995	0.000
3771	0.000	3816	0.000	3861	0.000	3906	0.000	3951	0.000	3996	0.000
3772	0.000	3817	0.000	3862	0.000	3907	0.000	3952	0.000	3997	0.000
3773	0.000	3818	0.000	3863	0.000	3908	0.000	3953	0.000	3998	0.000
3774	0.000	3819	0.000	3864	0.000	3909	0.000	3954	0.000	3999	0.000
3775	0.000	3820	0.000	3865	0.000	3910	0.000	3955	0.000	4000	0.000
3776	0.000	3821	0.000	3866	0.000	3911	0.000	3956	0.000	4001	0.000
3777	0.000	3822	0.000	3867	0.000	3912	0.000	3957	0.000	4002	0.000
3778	0.000	3823	0.000	3868	0.000	3913	0.000	3958	0.000	4003	0.000
3779	0.000	3824	0.000	3869	0.000	3914	0.000	3959	0.000	4004	0.000
3780	0.000	3825	0.000	3870	0.000	3915	0.000	3960	0.000	4005	0.000
3781	0.000	3826	0.000	3871	0.000	3916	0.000	3961	0.000	4006	0.000
3782	0.000	3827	0.000	3872	0.000	3917	0.000	3962	0.000	4007	0.000
3783	0.000	3828	0.000	3873	0.000	3918	0.000	3963	0.000	4008	0.000
3784	0.000	3829	0.000	3874	0.000	3919	0.000	3964	0.000	4009	0.000
3785	0.000	3830	0.000	3875	0.000	3920	0.000	3965	0.000	4010	0.000
3786	0.000	3831	0.000	3876	0.000	3921	0.000	3966	0.000	4011	0.000
3787	0.000	3832	0.000	3877	0.000	3922	0.000	3967	0.000	4012	0.000
3788	0.000	3833	0.000	3878	0.000	3923	0.000	3968	0.000	4013	0.000
3789	0.000	3834	0.000	3879	0.000	3924	0.000	3969	0.000	4014	0.000
3790	0.000	3835	0.000	3880	0.000	3925	0.000	3970	0.000	4015	0.000
3791	0.000	3836	0.000	3881	0.000	3926	0.000	3971	0.000	4016	0.000
3792	0.000	3837	0.000	3882	0.000	3927	0.000	3972	0.000	4017	0.000
3793	0.000	3838	0.000	3883	0.000	3928	0.000	3973	0.000	4018	0.000
3794	0.000	3839	0.000	3884	0.000	3929	0.000	3974	0.000	4019	0.000
3795	0.000	3840	0.000	3885	0.000	3930	0.000	3975	0.000	4020	0.000
3796	0.000	3841	0.000	3886	0.000	3931	0.000	3976	0.000	4021	0.000
3797	0.000	3842	0.000	3887	0.000	3932	0.000	3977	0.000	4022	0.000
3798	0.000	3843	0.000	3888	0.000	3933	0.000	3978	0.000	4023	0.000
3799	0.000	3844	0.000	3889	0.000	3934	0.000	3979	0.000	4024	0.000
3800	0.000	3845	0.000	3890	0.000	3935	0.000	3980	0.000	4025	0.000
3801	0.000	3846	0.000	3891	0.000	3936	0.000	3981	0.000	4026	0.000
3802	0.000	3847	0.000	3892	0.000	3937	0.000	3982	0.000	4027	0.000
3803	0.000	3848	0.000	3893	0.000	3938	0.000	3983	0.000	4028	0.000
3804	0.000	3849	0.000	3894	0.000	3939	0.000	3984	0.000	4029	0.000
3805	0.000	3850	0.000	3895	0.000	3940	0.000	3985	0.000	4030	0.000
3806	0.000	3851	0.000	3896	0.000	3941	0.000	3986	0.000	4031	0.000
3807	0.000	3852	0.000	3897	0.000	3942	0.000	3987	0.000	4032	0.000

Rainfall Profile

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
4033	0.000	4078	0.000	4123	0.000	4168	0.000	4213	0.000	4258	0.213
4034	0.000	4079	0.000	4124	0.000	4169	0.000	4214	0.000	4259	0.213
4035	0.000	4080	0.000	4125	0.000	4170	0.000	4215	0.000	4260	0.213
4036	0.000	4081	0.000	4126	0.000	4171	0.000	4216	0.000	4261	0.213
4037	0.000	4082	0.000	4127	0.000	4172	0.000	4217	0.000	4262	0.213
4038	0.000	4083	0.000	4128	0.000	4173	0.000	4218	0.000	4263	0.213
4039	0.000	4084	0.000	4129	0.000	4174	0.000	4219	0.000	4264	0.213
4040	0.000	4085	0.000	4130	0.000	4175	0.000	4220	0.000	4265	0.213
4041	0.000	4086	0.000	4131	0.000	4176	0.000	4221	0.000	4266	0.213
4042	0.000	4087	0.000	4132	0.000	4177	0.000	4222	0.000	4267	0.213
4043	0.000	4088	0.000	4133	0.000	4178	0.000	4223	0.000	4268	0.317
4044	0.000	4089	0.000	4134	0.000	4179	0.000	4224	0.000	4269	0.343
4045	0.000	4090	0.000	4135	0.000	4180	0.000	4225	0.054	4270	0.343
4046	0.000	4091	0.000	4136	0.000	4181	0.000	4226	0.054	4271	0.343
4047	0.000	4092	0.000	4137	0.000	4182	0.000	4227	0.054	4272	0.343
4048	0.000	4093	0.000	4138	0.000	4183	0.000	4228	0.054	4273	0.343
4049	0.000	4094	0.000	4139	0.000	4184	0.000	4229	0.054	4274	0.343
4050	0.000	4095	0.000	4140	0.000	4185	0.000	4230	0.054	4275	0.343
4051	0.000	4096	0.000	4141	0.000	4186	0.000	4231	0.054	4276	0.343
4052	0.000	4097	0.000	4142	0.000	4187	0.000	4232	0.054	4277	0.343
4053	0.000	4098	0.000	4143	0.000	4188	0.000	4233	0.054	4278	0.343
4054	0.000	4099	0.000	4144	0.000	4189	0.000	4234	0.054	4279	0.343
4055	0.000	4100	0.000	4145	0.000	4190	0.000	4235	0.054	4280	0.343
4056	0.000	4101	0.000	4146	0.000	4191	0.000	4236	0.054	4281	0.343
4057	0.000	4102	0.000	4147	0.000	4192	0.000	4237	0.054	4282	0.343
4058	0.000	4103	0.000	4148	0.000	4193	0.000	4238	0.054	4283	0.343
4059	0.000	4104	0.000	4149	0.000	4194	0.000	4239	0.054	4284	0.343
4060	0.000	4105	0.000	4150	0.000	4195	0.000	4240	0.054	4285	0.343
4061	0.000	4106	0.000	4151	0.000	4196	0.000	4241	0.054	4286	0.343
4062	0.000	4107	0.000	4152	0.000	4197	0.000	4242	0.054	4287	0.343
4063	0.000	4108	0.000	4153	0.000	4198	0.000	4243	0.054	4288	0.343
4064	0.000	4109	0.000	4154	0.000	4199	0.000	4244	0.054	4289	0.364
4065	0.000	4110	0.000	4155	0.000	4200	0.000	4245	0.054	4290	0.450
4066	0.000	4111	0.000	4156	0.000	4201	0.000	4246	0.118	4291	0.450
4067	0.000	4112	0.000	4157	0.000	4202	0.000	4247	0.213	4292	0.450
4068	0.000	4113	0.000	4158	0.000	4203	0.000	4248	0.213	4293	0.450
4069	0.000	4114	0.000	4159	0.000	4204	0.000	4249	0.213	4294	0.450
4070	0.000	4115	0.000	4160	0.000	4205	0.000	4250	0.213	4295	0.450
4071	0.000	4116	0.000	4161	0.000	4206	0.000	4251	0.213	4296	0.450
4072	0.000	4117	0.000	4162	0.000	4207	0.000	4252	0.213	4297	0.450
4073	0.000	4118	0.000	4163	0.000	4208	0.000	4253	0.213	4298	0.450
4074	0.000	4119	0.000	4164	0.000	4209	0.000	4254	0.213	4299	0.450
4075	0.000	4120	0.000	4165	0.000	4210	0.000	4255	0.213	4300	0.450
4076	0.000	4121	0.000	4166	0.000	4211	0.000	4256	0.213	4301	0.450
4077	0.000	4122	0.000	4167	0.000	4212	0.000	4257	0.213	4302	0.450

Rainfall Profile

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
4303	0.450	4348	0.600	4393	0.686	4438	0.726	4483	0.738	4528	0.736
4304	0.450	4349	0.600	4394	0.686	4439	0.726	4484	0.738	4529	0.736
4305	0.450	4350	0.600	4395	0.686	4440	0.726	4485	0.738	4530	0.736
4306	0.450	4351	0.600	4396	0.686	4441	0.734	4486	0.738	4531	0.736
4307	0.450	4352	0.600	4397	0.691	4442	0.734	4487	0.738	4532	0.736
4308	0.450	4353	0.600	4398	0.710	4443	0.734	4488	0.738	4533	0.736
4309	0.450	4354	0.620	4399	0.710	4444	0.734	4489	0.738	4534	0.736
4310	0.450	4355	0.650	4400	0.710	4445	0.734	4490	0.738	4535	0.736
4311	0.500	4356	0.650	4401	0.710	4446	0.734	4491	0.738	4536	0.736
4312	0.534	4357	0.650	4402	0.710	4447	0.734	4492	0.738	4537	0.736
4313	0.534	4358	0.650	4403	0.710	4448	0.734	4493	0.738	4538	0.736
4314	0.534	4359	0.650	4404	0.710	4449	0.734	4494	0.738	4539	0.736
4315	0.534	4360	0.650	4405	0.710	4450	0.734	4495	0.738	4540	0.736
4316	0.534	4361	0.650	4406	0.710	4451	0.734	4496	0.738	4541	0.736
4317	0.534	4362	0.650	4407	0.710	4452	0.734	4497	0.738	4542	0.736
4318	0.534	4363	0.650	4408	0.710	4453	0.734	4498	0.738	4543	0.736
4319	0.534	4364	0.650	4409	0.710	4454	0.734	4499	0.738	4544	0.736
4320	0.534	4365	0.650	4410	0.710	4455	0.734	4500	0.738	4545	0.736
4321	0.534	4366	0.650	4411	0.710	4456	0.734	4501	0.738	4546	0.736
4322	0.534	4367	0.650	4412	0.710	4457	0.734	4502	0.738	4547	0.736
4323	0.534	4368	0.650	4413	0.710	4458	0.734	4503	0.738	4548	0.736
4324	0.534	4369	0.650	4414	0.710	4459	0.734	4504	0.738	4549	0.736
4325	0.534	4370	0.650	4415	0.710	4460	0.734	4505	0.738	4550	0.736
4326	0.534	4371	0.650	4416	0.710	4461	0.734	4506	0.737	4551	0.736
4327	0.534	4372	0.650	4417	0.710	4462	0.736	4507	0.737	4552	0.736
4328	0.534	4373	0.650	4418	0.710	4463	0.738	4508	0.737	4553	0.736
4329	0.534	4374	0.650	4419	0.720	4464	0.738	4509	0.737	4554	0.736
4330	0.534	4375	0.650	4420	0.726	4465	0.738	4510	0.737	4555	0.736
4331	0.534	4376	0.679	4421	0.726	4466	0.738	4511	0.737	4556	0.736
4332	0.534	4377	0.686	4422	0.726	4467	0.738	4512	0.737	4557	0.736
4333	0.600	4378	0.686	4423	0.726	4468	0.738	4513	0.737	4558	0.736
4334	0.600	4379	0.686	4424	0.726	4469	0.738	4514	0.737	4559	0.736
4335	0.600	4380	0.686	4425	0.726	4470	0.738	4515	0.737	4560	0.736
4336	0.600	4381	0.686	4426	0.726	4471	0.738	4516	0.737	4561	0.736
4337	0.600	4382	0.686	4427	0.726	4472	0.738	4517	0.737	4562	0.736
4338	0.600	4383	0.686	4428	0.726	4473	0.738	4518	0.737	4563	0.736
4339	0.600	4384	0.686	4429	0.726	4474	0.738	4519	0.737	4564	0.736
4340	0.600	4385	0.686	4430	0.726	4475	0.738	4520	0.737	4565	0.736
4341	0.600	4386	0.686	4431	0.726	4476	0.738	4521	0.737	4566	0.736
4342	0.600	4387	0.686	4432	0.726	4477	0.738	4522	0.737	4567	0.736
4343	0.600	4388	0.686	4433	0.726	4478	0.738	4523	0.737	4568	0.736
4344	0.600	4389	0.686	4434	0.726	4479	0.738	4524	0.737	4569	0.736
4345	0.600	4390	0.686	4435	0.726	4480	0.738	4525	0.737	4570	0.738
4346	0.600	4391	0.686	4436	0.726	4481	0.738	4526	0.737	4571	0.740
4347	0.600	4392	0.686	4437	0.726	4482	0.738	4527	0.736	4572	0.740

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
4573	0.740	4618	0.761	4663	0.808	4708	0.886	4753	1.001	4798	1.155
4574	0.740	4619	0.761	4664	0.808	4709	0.886	4754	1.001	4799	1.155
4575	0.740	4620	0.761	4665	0.808	4710	0.886	4755	1.001	4800	1.155
4576	0.740	4621	0.761	4666	0.808	4711	0.886	4756	1.001	4801	1.155
4577	0.740	4622	0.761	4667	0.808	4712	0.886	4757	1.001	4802	1.155
4578	0.740	4623	0.761	4668	0.808	4713	0.886	4758	1.001	4803	1.155
4579	0.740	4624	0.761	4669	0.808	4714	0.886	4759	1.001	4804	1.155
4580	0.740	4625	0.761	4670	0.808	4715	0.886	4760	1.001	4805	1.155
4581	0.740	4626	0.761	4671	0.808	4716	0.886	4761	1.001	4806	1.155
4582	0.740	4627	0.761	4672	0.808	4717	0.886	4762	1.001	4807	1.155
4583	0.740	4628	0.761	4673	0.808	4718	0.886	4763	1.001	4808	1.228
4584	0.740	4629	0.761	4674	0.808	4719	0.886	4764	1.001	4809	1.247
4585	0.740	4630	0.761	4675	0.808	4720	0.886	4765	1.073	4810	1.247
4586	0.740	4631	0.761	4676	0.808	4721	0.897	4766	1.073	4811	1.247
4587	0.740	4632	0.761	4677	0.808	4722	0.939	4767	1.073	4812	1.247
4588	0.740	4633	0.761	4678	0.822	4723	0.939	4768	1.073	4813	1.247
4589	0.740	4634	0.761	4679	0.843	4724	0.939	4769	1.073	4814	1.247
4590	0.740	4635	0.773	4680	0.843	4725	0.939	4770	1.073	4815	1.247
4591	0.740	4636	0.781	4681	0.843	4726	0.939	4771	1.073	4816	1.247
4592	0.746	4637	0.781	4682	0.843	4727	0.939	4772	1.073	4817	1.247
4593	0.748	4638	0.781	4683	0.843	4728	0.939	4773	1.073	4818	1.247
4594	0.748	4639	0.781	4684	0.843	4729	0.939	4774	1.073	4819	1.247
4595	0.748	4640	0.781	4685	0.843	4730	0.939	4775	1.073	4820	1.247
4596	0.748	4641	0.781	4686	0.843	4731	0.939	4776	1.073	4821	1.247
4597	0.748	4642	0.781	4687	0.843	4732	0.939	4777	1.073	4822	1.247
4598	0.748	4643	0.781	4688	0.843	4733	0.939	4778	1.073	4823	1.247
4599	0.748	4644	0.781	4689	0.843	4734	0.939	4779	1.073	4824	1.247
4600	0.748	4645	0.781	4690	0.843	4735	0.939	4780	1.073	4825	1.247
4601	0.748	4646	0.781	4691	0.843	4736	0.939	4781	1.073	4826	1.247
4602	0.748	4647	0.781	4692	0.843	4737	0.939	4782	1.073	4827	1.247
4603	0.748	4648	0.781	4693	0.843	4738	0.939	4783	1.073	4828	1.247
4604	0.748	4649	0.781	4694	0.843	4739	0.939	4784	1.073	4829	1.267
4605	0.748	4650	0.781	4695	0.843	4740	0.939	4785	1.073	4830	1.348
4606	0.748	4651	0.781	4696	0.843	4741	0.939	4786	1.106	4831	1.348
4607	0.748	4652	0.781	4697	0.843	4742	0.939	4787	1.155	4832	1.348
4608	0.748	4653	0.781	4698	0.843	4743	0.977	4788	1.155	4833	1.348
4609	0.748	4654	0.781	4699	0.843	4744	1.001	4789	1.155	4834	1.348
4610	0.748	4655	0.781	4700	0.878	4745	1.001	4790	1.155	4835	1.348
4611	0.748	4656	0.781	4701	0.886	4746	1.001	4791	1.155	4836	1.348
4612	0.748	4657	0.808	4702	0.886	4747	1.001	4792	1.155	4837	1.348
4613	0.751	4658	0.808	4703	0.886	4748	1.001	4793	1.155	4838	1.348
4614	0.761	4659	0.808	4704	0.886	4749	1.001	4794	1.155	4839	1.348
4615	0.761	4660	0.808	4705	0.886	4750	1.001	4795	1.155	4840	1.348
4616	0.761	4661	0.808	4706	0.886	4751	1.001	4796	1.155	4841	1.348
4617	0.761	4662	0.808	4707	0.886	4752	1.001	4797	1.155	4842	1.348

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
4843	1.348	4888	1.579	4933	1.844	4978	2.138	5023	2.454	5068	2.946
4844	1.348	4889	1.579	4934	1.844	4979	2.138	5024	2.584	5069	2.946
4845	1.348	4890	1.579	4935	1.844	4980	2.138	5025	2.617	5070	2.946
4846	1.348	4891	1.579	4936	1.844	4981	2.294	5026	2.617	5071	2.946
4847	1.348	4892	1.579	4937	1.873	4982	2.294	5027	2.617	5072	2.946
4848	1.348	4893	1.579	4938	1.988	4983	2.294	5028	2.617	5073	2.946
4849	1.348	4894	1.630	4939	1.988	4984	2.294	5029	2.617	5074	2.946
4850	1.348	4895	1.707	4940	1.988	4985	2.294	5030	2.617	5075	2.946
4851	1.415	4896	1.707	4941	1.988	4986	2.294	5031	2.617	5076	2.946
4852	1.459	4897	1.707	4942	1.988	4987	2.294	5032	2.617	5077	2.946
4853	1.459	4898	1.707	4943	1.988	4988	2.294	5033	2.617	5078	2.946
4854	1.459	4899	1.707	4944	1.988	4989	2.294	5034	2.617	5079	2.946
4855	1.459	4900	1.707	4945	1.988	4990	2.294	5035	2.617	5080	2.946
4856	1.459	4901	1.707	4946	1.988	4991	2.294	5036	2.617	5081	2.946
4857	1.459	4902	1.707	4947	1.988	4992	2.294	5037	2.617	5082	2.946
4858	1.459	4903	1.707	4948	1.988	4993	2.294	5038	2.617	5083	2.946
4859	1.459	4904	1.707	4949	1.988	4994	2.294	5039	2.617	5084	2.946
4860	1.459	4905	1.707	4950	1.988	4995	2.294	5040	2.617	5085	2.946
4861	1.459	4906	1.707	4951	1.988	4996	2.294	5041	2.617	5086	2.946
4862	1.459	4907	1.707	4952	1.988	4997	2.294	5042	2.617	5087	2.946
4863	1.459	4908	1.707	4953	1.988	4998	2.294	5043	2.617	5088	2.946
4864	1.459	4909	1.707	4954	1.988	4999	2.294	5044	2.617	5089	3.109
4865	1.459	4910	1.707	4955	1.988	5000	2.294	5045	2.649	5090	3.109
4866	1.459	4911	1.707	4956	1.988	5001	2.294	5046	2.781	5091	3.109
4867	1.459	4912	1.707	4957	1.988	5002	2.358	5047	2.781	5092	3.109
4868	1.459	4913	1.707	4958	1.988	5003	2.454	5048	2.781	5093	3.109
4869	1.459	4914	1.707	4959	2.078	5004	2.454	5049	2.781	5094	3.109
4870	1.459	4915	1.707	4960	2.138	5005	2.454	5050	2.781	5095	3.109
4871	1.459	4916	1.817	4961	2.138	5006	2.454	5051	2.781	5096	3.109
4872	1.459	4917	1.844	4962	2.138	5007	2.454	5052	2.781	5097	3.109
4873	1.579	4918	1.844	4963	2.138	5008	2.454	5053	2.781	5098	3.109
4874	1.579	4919	1.844	4964	2.138	5009	2.454	5054	2.781	5099	3.109
4875	1.579	4920	1.844	4965	2.138	5010	2.454	5055	2.781	5100	3.109
4876	1.579	4921	1.844	4966	2.138	5011	2.454	5056	2.781	5101	3.109
4877	1.579	4922	1.844	4967	2.138	5012	2.454	5057	2.781	5102	3.109
4878	1.579	4923	1.844	4968	2.138	5013	2.454	5058	2.781	5103	3.109
4879	1.579	4924	1.844	4969	2.138	5014	2.454	5059	2.781	5104	3.109
4880	1.579	4925	1.844	4970	2.138	5015	2.454	5060	2.781	5105	3.109
4881	1.579	4926	1.844	4971	2.138	5016	2.454	5061	2.781	5106	3.109
4882	1.579	4927	1.844	4972	2.138	5017	2.454	5062	2.781	5107	3.109
4883	1.579	4928	1.844	4973	2.138	5018	2.454	5063	2.781	5108	3.109
4884	1.579	4929	1.844	4974	2.138	5019	2.454	5064	2.781	5109	3.109
4885	1.579	4930	1.844	4975	2.138	5020	2.454	5065	2.781	5110	3.173
4886	1.579	4931	1.844	4976	2.138	5021	2.454	5066	2.781	5111	3.269
4887	1.579	4932	1.844	4977	2.138	5022	2.454	5067	2.880	5112	3.269

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
5113	3.269	5158	3.573	5203	3.839	5248	4.051	5293	4.187	5338	4.129
5114	3.269	5159	3.573	5204	3.839	5249	4.051	5294	4.187	5339	4.129
5115	3.269	5160	3.573	5205	3.839	5250	4.051	5295	4.187	5340	4.129
5116	3.269	5161	3.573	5206	3.839	5251	4.051	5296	4.187	5341	4.129
5117	3.269	5162	3.573	5207	3.839	5252	4.051	5297	4.187	5342	4.129
5118	3.269	5163	3.573	5208	3.839	5253	4.051	5298	4.187	5343	4.129
5119	3.269	5164	3.573	5209	3.839	5254	4.051	5299	4.187	5344	4.129
5120	3.269	5165	3.573	5210	3.839	5255	4.051	5300	4.187	5345	4.129
5121	3.269	5166	3.573	5211	3.839	5256	4.051	5301	4.187	5346	4.129
5122	3.269	5167	3.573	5212	3.839	5257	4.051	5302	4.187	5347	4.129
5123	3.269	5168	3.573	5213	3.839	5258	4.051	5303	4.187	5348	4.066
5124	3.269	5169	3.573	5214	3.839	5259	4.051	5304	4.187	5349	4.051
5125	3.269	5170	3.573	5215	3.839	5260	4.051	5305	4.187	5350	4.051
5126	3.269	5171	3.573	5216	3.839	5261	4.066	5306	4.187	5351	4.051
5127	3.269	5172	3.573	5217	3.839	5262	4.129	5307	4.187	5352	4.051
5128	3.269	5173	3.573	5218	3.885	5263	4.129	5308	4.187	5353	4.051
5129	3.269	5174	3.573	5219	3.953	5264	4.129	5309	4.187	5354	4.051
5130	3.269	5175	3.656	5220	3.953	5265	4.129	5310	4.187	5355	4.051
5131	3.269	5176	3.712	5221	3.953	5266	4.129	5311	4.187	5356	4.051
5132	3.393	5177	3.712	5222	3.953	5267	4.129	5312	4.187	5357	4.051
5133	3.425	5178	3.712	5223	3.953	5268	4.129	5313	4.187	5358	4.051
5134	3.425	5179	3.712	5224	3.953	5269	4.129	5314	4.187	5359	4.051
5135	3.425	5180	3.712	5225	3.953	5270	4.129	5315	4.187	5360	4.051
5136	3.425	5181	3.712	5226	3.953	5271	4.129	5316	4.187	5361	4.051
5137	3.425	5182	3.712	5227	3.953	5272	4.129	5317	4.187	5362	4.051
5138	3.425	5183	3.712	5228	3.953	5273	4.129	5318	4.187	5363	4.051
5139	3.425	5184	3.712	5229	3.953	5274	4.129	5319	4.187	5364	4.051
5140	3.425	5185	3.712	5230	3.953	5275	4.129	5320	4.187	5365	4.051
5141	3.425	5186	3.712	5231	3.953	5276	4.129	5321	4.187	5366	4.051
5142	3.425	5187	3.712	5232	3.953	5277	4.129	5322	4.187	5367	4.051
5143	3.425	5188	3.712	5233	3.953	5278	4.129	5323	4.187	5368	4.051
5144	3.425	5189	3.712	5234	3.953	5279	4.129	5324	4.187	5369	4.031
5145	3.425	5190	3.712	5235	3.953	5280	4.129	5325	4.187	5370	3.953
5146	3.425	5191	3.712	5236	3.953	5281	4.129	5326	4.164	5371	3.953
5147	3.425	5192	3.712	5237	3.953	5282	4.129	5327	4.129	5372	3.953
5148	3.425	5193	3.712	5238	3.953	5283	4.164	5328	4.129	5373	3.953
5149	3.425	5194	3.712	5239	3.953	5284	4.187	5329	4.129	5374	3.953
5150	3.425	5195	3.712	5240	4.031	5285	4.187	5330	4.129	5375	3.953
5151	3.425	5196	3.712	5241	4.051	5286	4.187	5331	4.129	5376	3.953
5152	3.425	5197	3.839	5242	4.051	5287	4.187	5332	4.129	5377	3.953
5153	3.454	5198	3.839	5243	4.051	5288	4.187	5333	4.129	5378	3.953
5154	3.573	5199	3.839	5244	4.051	5289	4.187	5334	4.129	5379	3.953
5155	3.573	5200	3.839	5245	4.051	5290	4.187	5335	4.129	5380	3.953
5156	3.573	5201	3.839	5246	4.051	5291	4.187	5336	4.129	5381	3.953
5157	3.573	5202	3.839	5247	4.051	5292	4.187	5337	4.129	5382	3.953

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
5383	3.953	5428	3.712	5473	3.425	5518	3.109	5563	2.781	5608	2.294
5384	3.953	5429	3.712	5474	3.425	5519	3.109	5564	2.650	5609	2.294
5385	3.953	5430	3.712	5475	3.425	5520	3.109	5565	2.617	5610	2.294
5386	3.953	5431	3.712	5476	3.425	5521	2.946	5566	2.617	5611	2.294
5387	3.953	5432	3.712	5477	3.393	5522	2.946	5567	2.617	5612	2.294
5388	3.953	5433	3.712	5478	3.269	5523	2.946	5568	2.617	5613	2.294
5389	3.953	5434	3.656	5479	3.269	5524	2.946	5569	2.617	5614	2.294
5390	3.953	5435	3.573	5480	3.269	5525	2.946	5570	2.617	5615	2.294
5391	3.885	5436	3.573	5481	3.269	5526	2.946	5571	2.617	5616	2.294
5392	3.839	5437	3.573	5482	3.269	5527	2.946	5572	2.617	5617	2.294
5393	3.839	5438	3.573	5483	3.269	5528	2.946	5573	2.617	5618	2.294
5394	3.839	5439	3.573	5484	3.269	5529	2.946	5574	2.617	5619	2.294
5395	3.839	5440	3.573	5485	3.269	5530	2.946	5575	2.617	5620	2.294
5396	3.839	5441	3.573	5486	3.269	5531	2.946	5576	2.617	5621	2.294
5397	3.839	5442	3.573	5487	3.269	5532	2.946	5577	2.617	5622	2.294
5398	3.839	5443	3.573	5488	3.269	5533	2.946	5578	2.617	5623	2.294
5399	3.839	5444	3.573	5489	3.269	5534	2.946	5579	2.617	5624	2.294
5400	3.839	5445	3.573	5490	3.269	5535	2.946	5580	2.617	5625	2.294
5401	3.839	5446	3.573	5491	3.269	5536	2.946	5581	2.617	5626	2.294
5402	3.839	5447	3.573	5492	3.269	5537	2.946	5582	2.617	5627	2.294
5403	3.839	5448	3.573	5493	3.269	5538	2.946	5583	2.617	5628	2.294
5404	3.839	5449	3.573	5494	3.269	5539	2.946	5584	2.617	5629	2.138
5405	3.839	5450	3.573	5495	3.269	5540	2.946	5585	2.584	5630	2.138
5406	3.839	5451	3.573	5496	3.269	5541	2.946	5586	2.454	5631	2.138
5407	3.839	5452	3.573	5497	3.269	5542	2.880	5587	2.454	5632	2.138
5408	3.839	5453	3.573	5498	3.269	5543	2.781	5588	2.454	5633	2.138
5409	3.839	5454	3.573	5499	3.173	5544	2.781	5589	2.454	5634	2.138
5410	3.839	5455	3.573	5500	3.109	5545	2.781	5590	2.454	5635	2.138
5411	3.839	5456	3.454	5501	3.109	5546	2.781	5591	2.454	5636	2.138
5412	3.839	5457	3.425	5502	3.109	5547	2.781	5592	2.454	5637	2.138
5413	3.712	5458	3.425	5503	3.109	5548	2.781	5593	2.454	5638	2.138
5414	3.712	5459	3.425	5504	3.109	5549	2.781	5594	2.454	5639	2.138
5415	3.712	5460	3.425	5505	3.109	5550	2.781	5595	2.454	5640	2.138
5416	3.712	5461	3.425	5506	3.109	5551	2.781	5596	2.454	5641	2.138
5417	3.712	5462	3.425	5507	3.109	5552	2.781	5597	2.454	5642	2.138
5418	3.712	5463	3.425	5508	3.109	5553	2.781	5598	2.454	5643	2.138
5419	3.712	5464	3.425	5509	3.109	5554	2.781	5599	2.454	5644	2.138
5420	3.712	5465	3.425	5510	3.109	5555	2.781	5600	2.454	5645	2.138
5421	3.712	5466	3.425	5511	3.109	5556	2.781	5601	2.454	5646	2.138
5422	3.712	5467	3.425	5512	3.109	5557	2.781	5602	2.454	5647	2.138
5423	3.712	5468	3.425	5513	3.109	5558	2.781	5603	2.454	5648	2.138
5424	3.712	5469	3.425	5514	3.109	5559	2.781	5604	2.454	5649	2.138
5425	3.712	5470	3.425	5515	3.109	5560	2.781	5605	2.454	5650	2.078
5426	3.712	5471	3.425	5516	3.109	5561	2.781	5606	2.454	5651	1.988
5427	3.712	5472	3.425	5517	3.109	5562	2.781	5607	2.358	5652	1.988

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
5653	1.988	5698	1.707	5743	1.459	5788	1.247	5833	1.073	5878	0.939
5654	1.988	5699	1.707	5744	1.459	5789	1.247	5834	1.073	5879	0.939
5655	1.988	5700	1.707	5745	1.459	5790	1.247	5835	1.073	5880	0.939
5656	1.988	5701	1.707	5746	1.459	5791	1.247	5836	1.073	5881	0.939
5657	1.988	5702	1.707	5747	1.459	5792	1.247	5837	1.073	5882	0.939
5658	1.988	5703	1.707	5748	1.459	5793	1.247	5838	1.073	5883	0.939
5659	1.988	5704	1.707	5749	1.459	5794	1.247	5839	1.073	5884	0.939
5660	1.988	5705	1.707	5750	1.459	5795	1.247	5840	1.073	5885	0.939
5661	1.988	5706	1.707	5751	1.459	5796	1.247	5841	1.073	5886	0.939
5662	1.988	5707	1.707	5752	1.459	5797	1.247	5842	1.073	5887	0.939
5663	1.988	5708	1.707	5753	1.459	5798	1.247	5843	1.073	5888	0.897
5664	1.988	5709	1.707	5754	1.459	5799	1.247	5844	1.073	5889	0.887
5665	1.988	5710	1.707	5755	1.459	5800	1.247	5845	1.001	5890	0.887
5666	1.988	5711	1.707	5756	1.459	5801	1.228	5846	1.001	5891	0.887
5667	1.988	5712	1.707	5757	1.459	5802	1.155	5847	1.001	5892	0.887
5668	1.988	5713	1.707	5758	1.415	5803	1.155	5848	1.001	5893	0.887
5669	1.988	5714	1.707	5759	1.348	5804	1.155	5849	1.001	5894	0.887
5670	1.988	5715	1.630	5760	1.348	5805	1.155	5850	1.001	5895	0.887
5671	1.988	5716	1.579	5761	1.348	5806	1.155	5851	1.001	5896	0.887
5672	1.873	5717	1.579	5762	1.348	5807	1.155	5852	1.001	5897	0.887
5673	1.844	5718	1.579	5763	1.348	5808	1.155	5853	1.001	5898	0.887
5674	1.844	5719	1.579	5764	1.348	5809	1.155	5854	1.001	5899	0.887
5675	1.844	5720	1.579	5765	1.348	5810	1.155	5855	1.001	5900	0.887
5676	1.844	5721	1.579	5766	1.348	5811	1.155	5856	1.001	5901	0.887
5677	1.844	5722	1.579	5767	1.348	5812	1.155	5857	1.001	5902	0.887
5678	1.844	5723	1.579	5768	1.348	5813	1.155	5858	1.001	5903	0.887
5679	1.844	5724	1.579	5769	1.348	5814	1.155	5859	1.001	5904	0.887
5680	1.844	5725	1.579	5770	1.348	5815	1.155	5860	1.001	5905	0.887
5681	1.844	5726	1.579	5771	1.348	5816	1.155	5861	1.001	5906	0.887
5682	1.844	5727	1.579	5772	1.348	5817	1.155	5862	1.001	5907	0.887
5683	1.844	5728	1.579	5773	1.348	5818	1.155	5863	1.001	5908	0.887
5684	1.844	5729	1.579	5774	1.348	5819	1.155	5864	1.001	5909	0.878
5685	1.844	5730	1.579	5775	1.348	5820	1.155	5865	1.001	5910	0.843
5686	1.844	5731	1.579	5776	1.348	5821	1.155	5866	0.976	5911	0.843
5687	1.844	5732	1.579	5777	1.348	5822	1.155	5867	0.939	5912	0.843
5688	1.844	5733	1.579	5778	1.348	5823	1.106	5868	0.939	5913	0.843
5689	1.844	5734	1.579	5779	1.348	5824	1.073	5869	0.939	5914	0.843
5690	1.844	5735	1.579	5780	1.267	5825	1.073	5870	0.939	5915	0.843
5691	1.844	5736	1.579	5781	1.247	5826	1.073	5871	0.939	5916	0.843
5692	1.844	5737	1.459	5782	1.247	5827	1.073	5872	0.939	5917	0.843
5693	1.817	5738	1.459	5783	1.247	5828	1.073	5873	0.939	5918	0.843
5694	1.707	5739	1.459	5784	1.247	5829	1.073	5874	0.939	5919	0.843
5695	1.707	5740	1.459	5785	1.247	5830	1.073	5875	0.939	5920	0.843
5696	1.707	5741	1.459	5786	1.247	5831	1.073	5876	0.939	5921	0.843
5697	1.707	5742	1.459	5787	1.247	5832	1.073	5877	0.939	5922	0.843

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
5923	0.843	5968	0.781	6013	0.748	6058	0.736	6103	0.737	6148	0.734
5924	0.843	5969	0.781	6014	0.748	6059	0.736	6104	0.738	6149	0.734
5925	0.843	5970	0.781	6015	0.748	6060	0.736	6105	0.738	6150	0.734
5926	0.843	5971	0.781	6016	0.748	6061	0.736	6106	0.738	6151	0.734
5927	0.843	5972	0.781	6017	0.746	6062	0.736	6107	0.738	6152	0.734
5928	0.843	5973	0.781	6018	0.740	6063	0.736	6108	0.738	6153	0.734
5929	0.843	5974	0.773	6019	0.740	6064	0.736	6109	0.738	6154	0.734
5930	0.843	5975	0.761	6020	0.740	6065	0.736	6110	0.738	6155	0.734
5931	0.822	5976	0.761	6021	0.740	6066	0.736	6111	0.738	6156	0.734
5932	0.808	5977	0.761	6022	0.740	6067	0.736	6112	0.738	6157	0.734
5933	0.808	5978	0.761	6023	0.740	6068	0.736	6113	0.738	6158	0.734
5934	0.808	5979	0.761	6024	0.740	6069	0.736	6114	0.738	6159	0.734
5935	0.808	5980	0.761	6025	0.740	6070	0.736	6115	0.738	6160	0.734
5936	0.808	5981	0.761	6026	0.740	6071	0.736	6116	0.738	6161	0.734
5937	0.808	5982	0.761	6027	0.740	6072	0.736	6117	0.738	6162	0.734
5938	0.808	5983	0.761	6028	0.740	6073	0.736	6118	0.738	6163	0.734
5939	0.808	5984	0.761	6029	0.740	6074	0.736	6119	0.738	6164	0.734
5940	0.808	5985	0.761	6030	0.740	6075	0.736	6120	0.738	6165	0.734
5941	0.808	5986	0.761	6031	0.740	6076	0.736	6121	0.738	6166	0.734
5942	0.808	5987	0.761	6032	0.740	6077	0.736	6122	0.738	6167	0.734
5943	0.808	5988	0.761	6033	0.740	6078	0.736	6123	0.738	6168	0.734
5944	0.808	5989	0.761	6034	0.740	6079	0.736	6124	0.738	6169	0.726
5945	0.808	5990	0.761	6035	0.740	6080	0.736	6125	0.738	6170	0.726
5946	0.808	5991	0.761	6036	0.740	6081	0.736	6126	0.738	6171	0.726
5947	0.808	5992	0.761	6037	0.740	6082	0.736	6127	0.738	6172	0.726
5948	0.808	5993	0.761	6038	0.740	6083	0.737	6128	0.738	6173	0.726
5949	0.808	5994	0.761	6039	0.738	6084	0.737	6129	0.738	6174	0.726
5950	0.808	5995	0.761	6040	0.736	6085	0.737	6130	0.738	6175	0.726
5951	0.808	5996	0.751	6041	0.736	6086	0.737	6131	0.738	6176	0.726
5952	0.808	5997	0.748	6042	0.736	6087	0.737	6132	0.738	6177	0.726
5953	0.781	5998	0.748	6043	0.736	6088	0.737	6133	0.738	6178	0.726
5954	0.781	5999	0.748	6044	0.736	6089	0.737	6134	0.738	6179	0.726
5955	0.781	6000	0.748	6045	0.736	6090	0.737	6135	0.738	6180	0.726
5956	0.781	6001	0.748	6046	0.736	6091	0.737	6136	0.738	6181	0.726
5957	0.781	6002	0.748	6047	0.736	6092	0.737	6137	0.738	6182	0.726
5958	0.781	6003	0.748	6048	0.736	6093	0.737	6138	0.738	6183	0.726
5959	0.781	6004	0.748	6049	0.736	6094	0.737	6139	0.738	6184	0.726
5960	0.781	6005	0.748	6050	0.736	6095	0.737	6140	0.738	6185	0.726
5961	0.781	6006	0.748	6051	0.736	6096	0.737	6141	0.738	6186	0.726
5962	0.781	6007	0.748	6052	0.736	6097	0.737	6142	0.738	6187	0.726
5963	0.781	6008	0.748	6053	0.736	6098	0.737	6143	0.738	6188	0.726
5964	0.781	6009	0.748	6054	0.736	6099	0.737	6144	0.738	6189	0.726
5965	0.781	6010	0.748	6055	0.736	6100	0.737	6145	0.738	6190	0.720
5966	0.781	6011	0.748	6056	0.736	6101	0.737	6146	0.738	6191	0.710
5967	0.781	6012	0.748	6057	0.736	6102	0.737	6147	0.736	6192	0.710

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
6193	0.710	6225	0.686	6257	0.600	6289	0.534	6321	0.343	6353	0.213
6194	0.710	6226	0.686	6258	0.600	6290	0.534	6322	0.343	6354	0.213
6195	0.710	6227	0.686	6259	0.600	6291	0.534	6323	0.343	6355	0.213
6196	0.710	6228	0.686	6260	0.600	6292	0.534	6324	0.343	6356	0.213
6197	0.710	6229	0.686	6261	0.600	6293	0.534	6325	0.343	6357	0.213
6198	0.710	6230	0.686	6262	0.600	6294	0.534	6326	0.343	6358	0.213
6199	0.710	6231	0.686	6263	0.600	6295	0.534	6327	0.343	6359	0.213
6200	0.710	6232	0.686	6264	0.600	6296	0.534	6328	0.343	6360	0.213
6201	0.710	6233	0.679	6265	0.600	6297	0.534	6329	0.343	6361	0.213
6202	0.710	6234	0.650	6266	0.600	6298	0.500	6330	0.343	6362	0.213
6203	0.710	6235	0.650	6267	0.600	6299	0.450	6331	0.343	6363	0.118
6204	0.710	6236	0.650	6268	0.600	6300	0.450	6332	0.343	6364	0.054
6205	0.710	6237	0.650	6269	0.600	6301	0.450	6333	0.343	6365	0.054
6206	0.710	6238	0.650	6270	0.600	6302	0.450	6334	0.343	6366	0.054
6207	0.710	6239	0.650	6271	0.600	6303	0.450	6335	0.343	6367	0.054
6208	0.710	6240	0.650	6272	0.600	6304	0.450	6336	0.343	6368	0.054
6209	0.710	6241	0.650	6273	0.600	6305	0.450	6337	0.343	6369	0.054
6210	0.710	6242	0.650	6274	0.600	6306	0.450	6338	0.343	6370	0.054
6211	0.710	6243	0.650	6275	0.600	6307	0.450	6339	0.343	6371	0.054
6212	0.691	6244	0.650	6276	0.600	6308	0.450	6340	0.343	6372	0.054
6213	0.686	6245	0.650	6277	0.534	6309	0.450	6341	0.317	6373	0.054
6214	0.686	6246	0.650	6278	0.534	6310	0.450	6342	0.213	6374	0.054
6215	0.686	6247	0.650	6279	0.534	6311	0.450	6343	0.213	6375	0.054
6216	0.686	6248	0.650	6280	0.534	6312	0.450	6344	0.213	6376	0.054
6217	0.686	6249	0.650	6281	0.534	6313	0.450	6345	0.213	6377	0.054
6218	0.686	6250	0.650	6282	0.534	6314	0.450	6346	0.213	6378	0.054
6219	0.686	6251	0.650	6283	0.534	6315	0.450	6347	0.213	6379	0.054
6220	0.686	6252	0.650	6284	0.534	6316	0.450	6348	0.213	6380	0.054
6221	0.686	6253	0.650	6285	0.534	6317	0.450	6349	0.213	6381	0.054
6222	0.686	6254	0.650	6286	0.534	6318	0.450	6350	0.213	6382	0.054
6223	0.686	6255	0.620	6287	0.534	6319	0.450	6351	0.213	6383	0.054
6224	0.686	6256	0.600	6288	0.534	6320	0.364	6352	0.213	6384	0.054

Time Area Diagram

Total Area (ha) 2.750

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	2	0.550	4	6	0.550	8	10	0.550
2	4	0.550	6	8	0.550			

Model Details

Storage is Online Cover Level (m) 100.000

Infiltration Basin Structure

Invert Level (m) 99.400 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	5264.3	0.600	5264.3

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0116-5500-0600-5500
Design Head (m)	0.600
Design Flow (l/s)	5.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	116
Invert Level (m)	99.400
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)	0.600	5.5	Kick-Flo®	0.431	4.7
Flush-Flo™	0.198	5.5	Mean Flow over Head Range	-	4.6

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)
0.100	4.1	1.200	7.6	3.000	11.7	7.000	17.5
0.200	5.5	1.400	8.2	3.500	12.6	7.500	18.2
0.300	5.3	1.600	8.7	4.000	13.4	8.000	18.8
0.400	5.0	1.800	9.2	4.500	14.2	8.500	19.3
0.500	5.1	2.000	9.7	5.000	14.9	9.000	19.9
0.600	5.5	2.200	10.1	5.500	15.6	9.500	20.5
0.800	6.3	2.400	10.5	6.000	16.3		
1.000	7.0	2.600	10.9	6.500	16.9		

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 577 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	99.748	0.348	0.0	2.0	2.0	77.6	O K
30 min Summer	99.795	0.395	0.0	2.0	2.0	88.1	O K
60 min Summer	99.843	0.443	0.0	2.0	2.0	98.8	O K
120 min Summer	99.888	0.488	0.0	2.0	2.0	108.8	O K
180 min Summer	99.908	0.508	0.0	2.0	2.0	113.3	O K
240 min Summer	99.918	0.518	0.0	2.0	2.0	115.4	O K
360 min Summer	99.921	0.521	0.0	2.0	2.0	116.1	O K
480 min Summer	99.913	0.513	0.0	2.0	2.0	114.3	O K
600 min Summer	99.903	0.503	0.0	2.0	2.0	112.1	O K
720 min Summer	99.893	0.493	0.0	2.0	2.0	109.9	O K
960 min Summer	99.876	0.476	0.0	2.0	2.0	106.0	O K
1440 min Summer	99.839	0.439	0.0	2.0	2.0	97.9	O K
2160 min Summer	99.780	0.380	0.0	2.0	2.0	84.6	O K
2880 min Summer	99.722	0.322	0.0	2.0	2.0	71.9	O K
4320 min Summer	99.622	0.222	0.0	2.0	2.0	49.5	O K
5760 min Summer	99.555	0.155	0.0	2.0	2.0	34.6	O K
7200 min Summer	99.515	0.115	0.0	1.9	1.9	25.7	O K
8640 min Summer	99.493	0.093	0.0	1.9	1.9	20.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	212.114	0.0	77.7	24
30 min Summer	121.355	0.0	88.9	39
60 min Summer	69.430	0.0	103.3	68
120 min Summer	39.722	0.0	118.3	126
180 min Summer	28.653	0.0	128.0	186
240 min Summer	22.726	0.0	135.4	244
360 min Summer	16.393	0.0	146.5	362
480 min Summer	13.002	0.0	154.9	462
600 min Summer	10.863	0.0	161.8	512
720 min Summer	9.379	0.0	167.6	574
960 min Summer	7.469	0.0	177.8	702
1440 min Summer	5.418	0.0	193.2	980
2160 min Summer	3.931	0.0	211.8	1384
2880 min Summer	3.130	0.0	224.8	1760
4320 min Summer	2.229	0.0	239.7	2472
5760 min Summer	1.752	0.0	251.9	3168
7200 min Summer	1.453	0.0	261.2	3816
8640 min Summer	1.247	0.0	268.9	4424

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	99.483	0.083	0.0	1.7	1.7	18.4	O K
15 min Winter	99.791	0.391	0.0	2.0	2.0	87.2	O K
30 min Winter	99.844	0.444	0.0	2.0	2.0	98.9	O K
60 min Winter	99.899	0.499	0.0	2.0	2.0	111.1	O K
120 min Winter	99.950	0.550	0.0	2.0	2.0	122.7	O K
180 min Winter	99.975	0.575	0.0	2.0	2.0	128.3	O K
240 min Winter	99.988	0.588	0.0	2.0	2.0	131.1	O K
360 min Winter	99.996	0.596	0.0	2.0	2.0	132.8	O K
480 min Winter	99.991	0.591	0.0	2.0	2.0	131.6	O K
600 min Winter	99.979	0.579	0.0	2.0	2.0	129.1	O K
720 min Winter	99.965	0.565	0.0	2.0	2.0	125.9	O K
960 min Winter	99.943	0.543	0.0	2.0	2.0	121.0	O K
1440 min Winter	99.893	0.493	0.0	2.0	2.0	109.9	O K
2160 min Winter	99.810	0.410	0.0	2.0	2.0	91.5	O K
2880 min Winter	99.717	0.317	0.0	2.0	2.0	70.7	O K
4320 min Winter	99.575	0.175	0.0	2.0	2.0	39.0	O K
5760 min Winter	99.504	0.104	0.0	1.9	1.9	23.2	O K
7200 min Winter	99.482	0.082	0.0	1.7	1.7	18.3	O K
8640 min Winter	99.471	0.071	0.0	1.4	1.4	15.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.096	0.0	275.3	5152
15 min Winter	212.114	0.0	87.0	24
30 min Winter	121.355	0.0	99.5	38
60 min Winter	69.430	0.0	115.8	68
120 min Winter	39.722	0.0	132.5	124
180 min Winter	28.653	0.0	143.4	182
240 min Winter	22.726	0.0	151.7	240
360 min Winter	16.393	0.0	164.1	352
480 min Winter	13.002	0.0	173.5	462
600 min Winter	10.863	0.0	181.2	566
720 min Winter	9.379	0.0	187.7	646
960 min Winter	7.469	0.0	199.2	746
1440 min Winter	5.418	0.0	216.3	1056
2160 min Winter	3.931	0.0	237.2	1516
2880 min Winter	3.130	0.0	251.8	1884
4320 min Winter	2.229	0.0	268.6	2556
5760 min Winter	1.752	0.0	282.2	3120
7200 min Winter	1.453	0.0	292.6	3752
8640 min Winter	1.247	0.0	301.2	4488

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	99.463	0.063	0.0	1.3	1.3	14.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	1.096	0.0	308.5	5152

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 545350 307750 TF 45350 07750
C (1km)	-0.026
D1 (1km)	0.314
D2 (1km)	0.328
D3 (1km)	0.282
E (1km)	0.318
F (1km)	2.441
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.200

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	2	0.040	4	6	0.040	8	10	0.040
2	4	0.040	6	8	0.040			

Model Details

Storage is Online Cover Level (m) 100.000

Infiltration Basin Structure

Invert Level (m) 99.400 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	222.9	0.600	222.9

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0073-2000-0600-2000
Design Head (m)	0.600
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	73
Invert Level (m)	99.400
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.600	2.0	Kick-Flo®	0.397	1.7
Flush-Flo™	0.177	2.0	Mean Flow over Head Range	-	1.7

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)
0.100	1.9	1.200	2.7	3.000	4.2	7.000	6.3
0.200	2.0	1.400	2.9	3.500	4.5	7.500	6.5
0.300	1.9	1.600	3.1	4.000	4.8	8.000	6.7
0.400	1.7	1.800	3.3	4.500	5.1	8.500	6.9
0.500	1.8	2.000	3.5	5.000	5.3	9.000	7.1
0.600	2.0	2.200	3.6	5.500	5.6	9.500	7.3
0.800	2.3	2.400	3.8	6.000	5.8		
1.000	2.5	2.600	3.9	6.500	6.0		

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1654 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	99.484	0.484	0.0	1.9	1.9	183.8	O K
30 min Summer	99.551	0.551	0.0	1.9	1.9	209.4	O K
60 min Summer	99.626	0.626	0.0	1.9	1.9	237.7	O K
120 min Summer	99.705	0.705	0.0	1.9	1.9	267.7	O K
180 min Summer	99.751	0.751	0.0	1.9	1.9	285.2	O K
240 min Summer	99.782	0.782	0.0	1.9	1.9	297.1	O K
360 min Summer	99.822	0.822	0.0	1.9	1.9	312.2	O K
480 min Summer	99.845	0.845	0.0	1.9	1.9	320.9	O K
600 min Summer	99.858	0.858	0.0	1.9	1.9	325.9	O K
720 min Summer	99.865	0.865	0.0	1.9	1.9	328.5	O K
960 min Summer	99.871	0.871	0.0	1.9	1.9	330.6	O K
1440 min Summer	99.854	0.854	0.0	1.9	1.9	324.5	O K
2160 min Summer	99.821	0.821	0.0	1.9	1.9	311.9	O K
2880 min Summer	99.788	0.788	0.0	1.9	1.9	299.4	O K
4320 min Summer	99.705	0.705	0.0	1.9	1.9	267.9	O K
5760 min Summer	99.628	0.628	0.0	1.9	1.9	238.5	O K
7200 min Summer	99.544	0.544	0.0	1.9	1.9	206.5	O K
8640 min Summer	99.472	0.472	0.0	1.9	1.9	179.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	212.114	0.0	159.0	25
30 min Summer	121.355	0.0	161.7	40
60 min Summer	69.430	0.0	237.6	70
120 min Summer	39.722	0.0	269.6	128
180 min Summer	28.653	0.0	288.0	188
240 min Summer	22.726	0.0	298.7	248
360 min Summer	16.393	0.0	304.3	366
480 min Summer	13.002	0.0	303.2	486
600 min Summer	10.863	0.0	300.8	604
720 min Summer	9.379	0.0	298.0	724
960 min Summer	7.469	0.0	292.2	962
1440 min Summer	5.418	0.0	280.8	1346
2160 min Summer	3.931	0.0	490.8	1708
2880 min Summer	3.130	0.0	518.2	2080
4320 min Summer	2.229	0.0	513.4	2904
5760 min Summer	1.752	0.0	587.9	3752
7200 min Summer	1.453	0.0	609.5	4480
8640 min Summer	1.247	0.0	627.4	5200

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	99.410	0.410	0.0	1.9	1.9	155.7	O K
15 min Winter	99.542	0.542	0.0	1.9	1.9	206.0	O K
30 min Winter	99.619	0.619	0.0	1.9	1.9	235.0	O K
60 min Winter	99.702	0.702	0.0	1.9	1.9	266.8	O K
120 min Winter	99.792	0.792	0.0	1.9	1.9	300.8	O K
180 min Winter	99.845	0.845	0.0	1.9	1.9	320.9	O K
240 min Winter	99.881	0.881	0.0	1.9	1.9	334.7	O K
360 min Winter	99.929	0.929	0.0	1.9	1.9	352.7	O K
480 min Winter	99.957	0.957	0.0	2.0	2.0	363.5	O K
600 min Winter	99.975	0.975	0.0	2.0	2.0	370.2	O K
720 min Winter	99.985	0.985	0.0	2.0	2.0	374.2	O K
960 min Winter	99.997	0.997	0.0	2.0	2.0	378.7	O K
1440 min Winter	99.990	0.990	0.0	2.0	2.0	375.9	O K
2160 min Winter	99.946	0.946	0.0	1.9	1.9	359.4	O K
2880 min Winter	99.906	0.906	0.0	1.9	1.9	344.0	O K
4320 min Winter	99.794	0.794	0.0	1.9	1.9	301.7	O K
5760 min Winter	99.686	0.686	0.0	1.9	1.9	260.7	O K
7200 min Winter	99.565	0.565	0.0	1.9	1.9	214.7	O K
8640 min Winter	99.453	0.453	0.0	1.9	1.9	171.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.096	0.0	642.1	5952
15 min Winter	212.114	0.0	162.1	25
30 min Winter	121.355	0.0	158.4	39
60 min Winter	69.430	0.0	264.5	68
120 min Winter	39.722	0.0	295.8	126
180 min Winter	28.653	0.0	306.6	186
240 min Winter	22.726	0.0	308.2	244
360 min Winter	16.393	0.0	307.1	360
480 min Winter	13.002	0.0	304.8	478
600 min Winter	10.863	0.0	302.5	594
720 min Winter	9.379	0.0	300.3	708
960 min Winter	7.469	0.0	296.4	936
1440 min Winter	5.418	0.0	290.6	1374
2160 min Winter	3.931	0.0	547.4	1780
2880 min Winter	3.130	0.0	570.4	2220
4320 min Winter	2.229	0.0	533.6	3156
5760 min Winter	1.752	0.0	658.4	4048
7200 min Winter	1.453	0.0	682.6	4904
8640 min Winter	1.247	0.0	702.9	5616

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	99.364	0.364	0.0	1.9	1.9	138.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	1.096	0.0	719.7	6256

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 545350 307750 TF 45350 07750
C (1km)	-0.026
D1 (1km)	0.314
D2 (1km)	0.328
D3 (1km)	0.282
E (1km)	0.318
F (1km)	2.441
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.467

Time From:	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**
0	2	0.093	4	6	0.093	8	10	0.095
2	4	0.093	6	8	0.093			

Model Details

Storage is Online Cover Level (m) 100.000

Infiltration Basin Structure

Invert Level (m)	99.000	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	1.00
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	379.8	1.000	379.8

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0067-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	67
Invert Level (m)	99.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.0	Kick-Flo®	0.599	1.6
Flush-Flo™	0.296	1.9	Mean Flow over Head Range	-	1.7

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)
0.100	1.6	1.200	2.2	3.000	3.3	7.000	4.9
0.200	1.9	1.400	2.3	3.500	3.5	7.500	5.1
0.300	1.9	1.600	2.5	4.000	3.8	8.000	5.2
0.400	1.9	1.800	2.6	4.500	4.0	8.500	5.4
0.500	1.8	2.000	2.7	5.000	4.2	9.000	5.5
0.600	1.6	2.200	2.9	5.500	4.4	9.500	5.7
0.800	1.8	2.400	3.0	6.000	4.6		
1.000	2.0	2.600	3.1	6.500	4.7		

Summary of Results for Rainfall Profile

Half Drain Time : 1630 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
Rainfall Profile	99.999	0.599	0.0	2.0	2.0	382.1	O K

Storm Event	Duration (mins)	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
Rainfall Profile	3336	3.011	0.0	615.3	936

Rainfall Profile

Cv 0.840 Climate Change % +0

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
1	0.245	43	2.411	85	3.206	127	3.324	169	3.374	211	3.804
2	0.245	44	2.411	86	3.206	128	3.324	170	3.374	212	3.961
3	0.245	45	2.411	87	3.247	129	3.324	171	3.374	213	4.000
4	0.245	46	2.411	88	3.275	130	3.324	172	3.374	214	4.000
5	0.245	47	2.411	89	3.275	131	3.324	173	3.387	215	4.000
6	0.245	48	2.411	90	3.275	132	3.324	174	3.434	216	4.000
7	0.245	49	2.708	91	3.275	133	3.324	175	3.434	217	4.000
8	0.245	50	2.708	92	3.275	134	3.324	176	3.434	218	4.000
9	0.245	51	2.708	93	3.275	135	3.321	177	3.434	219	4.000
10	0.531	52	2.708	94	3.275	136	3.319	178	3.434	220	4.000
11	0.959	53	2.708	95	3.275	137	3.319	179	3.434	221	4.047
12	0.959	54	2.708	96	3.275	138	3.319	180	3.434	222	4.238
13	0.959	55	2.708	97	3.314	139	3.319	181	3.434	223	4.238
14	0.959	56	2.708	98	3.314	140	3.319	182	3.434	224	4.238
15	0.959	57	2.708	99	3.314	141	3.319	183	3.489	225	4.238
16	0.959	58	2.797	100	3.314	142	3.319	184	3.524	226	4.238
17	0.959	59	2.932	101	3.314	143	3.319	185	3.524	227	4.238
18	0.959	60	2.932	102	3.314	144	3.319	186	3.524	228	4.238
19	0.959	61	2.932	103	3.314	145	3.322	187	3.524	229	4.238
20	1.431	62	2.932	104	3.314	146	3.322	188	3.524	230	4.238
21	1.548	63	2.932	105	3.314	147	3.322	189	3.524	231	4.406
22	1.548	64	2.932	106	3.319	148	3.322	190	3.524	232	4.518
23	1.548	65	2.932	107	3.329	149	3.322	191	3.524	233	4.518
24	1.548	66	2.932	108	3.329	150	3.322	192	3.524	234	4.518
25	1.548	67	2.932	109	3.329	151	3.322	193	3.646	235	4.518
26	1.548	68	3.062	110	3.329	152	3.322	194	3.646	236	4.518
27	1.548	69	3.094	111	3.329	153	3.322	195	3.646	237	4.518
28	1.548	70	3.094	112	3.329	154	3.329	196	3.646	238	4.518
29	1.645	71	3.094	113	3.329	155	3.339	197	3.646	239	4.518
30	2.029	72	3.094	114	3.329	156	3.339	198	3.646	240	4.518
31	2.029	73	3.094	115	3.329	157	3.339	199	3.646	241	4.843
32	2.029	74	3.094	116	3.329	158	3.339	200	3.646	242	4.843
33	2.029	75	3.094	117	3.329	159	3.339	201	3.646	243	4.843
34	2.029	76	3.094	118	3.329	160	3.339	202	3.709	244	4.843
35	2.029	77	3.116	119	3.329	161	3.339	203	3.804	245	4.843
36	2.029	78	3.206	120	3.329	162	3.339	204	3.804	246	4.843
37	2.029	79	3.206	121	3.329	163	3.339	205	3.804	247	4.843
38	2.029	80	3.206	122	3.329	164	3.367	206	3.804	248	4.843
39	2.257	81	3.206	123	3.329	165	3.374	207	3.804	249	4.843
40	2.411	82	3.206	124	3.329	166	3.374	208	3.804	250	4.990
41	2.411	83	3.206	125	3.329	167	3.374	209	3.804	251	5.211
42	2.411	84	3.206	126	3.324	168	3.374	210	3.804	252	5.211

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
253	5.211	298	7.356	343	10.349	388	14.028	433	17.321	478	18.890
254	5.211	299	7.704	344	10.349	389	14.028	434	17.321	479	18.890
255	5.211	300	7.704	345	10.349	390	14.028	435	17.321	480	18.890
256	5.211	301	7.704	346	10.637	391	14.028	436	17.321	481	18.890
257	5.211	302	7.704	347	11.071	392	14.028	437	17.321	482	18.890
258	5.211	303	7.704	348	11.071	393	14.028	438	17.321	483	18.890
259	5.211	304	7.704	349	11.071	394	14.318	439	17.321	484	18.890
260	5.543	305	7.704	350	11.071	395	14.750	440	17.321	485	18.890
261	5.625	306	7.704	351	11.071	396	14.750	441	17.321	486	18.890
262	5.625	307	7.704	352	11.071	397	14.750	442	17.527	487	18.890
263	5.625	308	8.197	353	11.071	398	14.750	443	17.835	488	18.890
264	5.625	309	8.320	354	11.071	399	14.750	444	17.835	489	18.890
265	5.625	310	8.320	355	11.071	400	14.750	445	17.835	490	18.787
266	5.625	311	8.320	356	11.659	401	14.750	446	17.835	491	18.631
267	5.625	312	8.320	357	11.806	402	14.750	447	17.835	492	18.631
268	5.625	313	8.320	358	11.806	403	14.750	448	17.835	493	18.631
269	5.716	314	8.320	359	11.806	404	15.310	449	17.835	494	18.631
270	6.083	315	8.320	360	11.806	405	15.450	450	17.835	495	18.631
271	6.083	316	8.320	361	11.806	406	15.450	451	17.835	496	18.631
272	6.083	317	8.450	362	11.806	407	15.450	452	18.187	497	18.631
273	6.083	318	8.970	363	11.806	408	15.450	453	18.276	498	18.631
274	6.083	319	8.970	364	11.806	409	15.450	454	18.276	499	18.631
275	6.083	320	8.970	365	11.955	410	15.450	455	18.276	500	18.347
276	6.083	321	8.970	366	12.548	411	15.450	456	18.276	501	18.276
277	6.083	322	8.970	367	12.548	412	15.450	457	18.276	502	18.276
278	6.083	323	8.970	368	12.548	413	15.585	458	18.276	503	18.276
279	6.383	324	8.970	369	12.548	414	16.120	459	18.276	504	18.276
280	6.583	325	8.970	370	12.548	415	16.120	460	18.276	505	18.276
281	6.583	326	8.970	371	12.548	416	16.120	461	18.347	506	18.276
282	6.583	327	9.376	372	12.548	417	16.120	462	18.631	507	18.276
283	6.583	328	9.647	373	12.548	418	16.120	463	18.631	508	18.276
284	6.583	329	9.647	374	12.548	419	16.120	464	18.631	509	18.187
285	6.583	330	9.647	375	12.995	420	16.120	465	18.631	510	17.835
286	6.583	331	9.647	376	13.292	421	16.120	466	18.631	511	17.835
287	6.583	332	9.647	377	13.292	422	16.120	467	18.631	512	17.835
288	6.583	333	9.647	378	13.292	423	16.495	468	18.631	513	17.835
289	7.123	334	9.647	379	13.292	424	16.745	469	18.631	514	17.835
290	7.123	335	9.647	380	13.292	425	16.745	470	18.631	515	17.835
291	7.123	336	9.647	381	13.292	426	16.745	471	18.787	516	17.835
292	7.123	337	10.349	382	13.292	427	16.745	472	18.890	517	17.835
293	7.123	338	10.349	383	13.292	428	16.745	473	18.890	518	17.835
294	7.123	339	10.349	384	13.292	429	16.745	474	18.890	519	17.527
295	7.123	340	10.349	385	14.028	430	16.745	475	18.890	520	17.321
296	7.123	341	10.349	386	14.028	431	16.745	476	18.890	521	17.321
297	7.123	342	10.349	387	14.028	432	16.745	477	18.890	522	17.321

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
523	17.321	568	14.028	613	11.071	658	7.704	703	5.211	748	4.000
524	17.321	569	14.028	614	11.071	659	7.704	704	5.211	749	3.961
525	17.321	570	14.028	615	10.637	660	7.704	705	5.211	750	3.804
526	17.321	571	14.028	616	10.349	661	7.704	706	5.211	751	3.804
527	17.321	572	14.028	617	10.349	662	7.704	707	5.211	752	3.804
528	17.321	573	14.028	618	10.349	663	7.356	708	5.211	753	3.804
529	16.745	574	14.028	619	10.349	664	7.123	709	5.211	754	3.804
530	16.745	575	14.028	620	10.349	665	7.123	710	5.211	755	3.804
531	16.745	576	14.028	621	10.349	666	7.123	711	4.990	756	3.804
532	16.745	577	13.292	622	10.349	667	7.123	712	4.843	757	3.804
533	16.745	578	13.292	623	10.349	668	7.123	713	4.843	758	3.804
534	16.745	579	13.292	624	10.349	669	7.123	714	4.843	759	3.709
535	16.745	580	13.292	625	9.647	670	7.123	715	4.843	760	3.646
536	16.745	581	13.292	626	9.647	671	7.123	716	4.843	761	3.646
537	16.745	582	13.292	627	9.647	672	7.123	717	4.843	762	3.646
538	16.495	583	13.292	628	9.647	673	6.583	718	4.843	763	3.646
539	16.120	584	13.292	629	9.647	674	6.583	719	4.843	764	3.646
540	16.120	585	13.292	630	9.647	675	6.583	720	4.843	765	3.646
541	16.120	586	12.995	631	9.647	676	6.583	721	4.518	766	3.646
542	16.120	587	12.548	632	9.647	677	6.583	722	4.518	767	3.646
543	16.120	588	12.548	633	9.647	678	6.583	723	4.518	768	3.646
544	16.120	589	12.548	634	9.376	679	6.583	724	4.518	769	3.524
545	16.120	590	12.548	635	8.970	680	6.583	725	4.518	770	3.524
546	16.120	591	12.548	636	8.970	681	6.583	726	4.518	771	3.524
547	16.120	592	12.548	637	8.970	682	6.383	727	4.518	772	3.524
548	15.585	593	12.548	638	8.970	683	6.083	728	4.518	773	3.524
549	15.450	594	12.548	639	8.970	684	6.083	729	4.518	774	3.524
550	15.450	595	12.548	640	8.970	685	6.083	730	4.406	775	3.524
551	15.450	596	11.955	641	8.970	686	6.083	731	4.238	776	3.524
552	15.450	597	11.806	642	8.970	687	6.083	732	4.238	777	3.524
553	15.450	598	11.806	643	8.970	688	6.083	733	4.238	778	3.489
554	15.450	599	11.806	644	8.450	689	6.083	734	4.238	779	3.434
555	15.450	600	11.806	645	8.320	690	6.083	735	4.238	780	3.434
556	15.450	601	11.806	646	8.320	691	6.083	736	4.238	781	3.434
557	15.310	602	11.806	647	8.320	692	5.716	737	4.238	782	3.434
558	14.750	603	11.806	648	8.320	693	5.625	738	4.238	783	3.434
559	14.750	604	11.806	649	8.320	694	5.625	739	4.238	784	3.434
560	14.750	605	11.659	650	8.320	695	5.625	740	4.047	785	3.434
561	14.750	606	11.071	651	8.320	696	5.625	741	4.000	786	3.434
562	14.750	607	11.071	652	8.320	697	5.625	742	4.000	787	3.434
563	14.750	608	11.071	653	8.197	698	5.625	743	4.000	788	3.387
564	14.750	609	11.071	654	7.704	699	5.625	744	4.000	789	3.374
565	14.750	610	11.071	655	7.704	700	5.625	745	4.000	790	3.374
566	14.750	611	11.071	656	7.704	701	5.543	746	4.000	791	3.374
567	14.318	612	11.071	657	7.704	702	5.211	747	4.000	792	3.374

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
793	3.374	838	3.329	883	3.206	928	2.029	973	0.000	1018	0.000
794	3.374	839	3.329	884	3.116	929	2.029	974	0.000	1019	0.000
795	3.374	840	3.329	885	3.094	930	2.029	975	0.000	1020	0.000
796	3.374	841	3.329	886	3.094	931	2.029	976	0.000	1021	0.000
797	3.367	842	3.329	887	3.094	932	1.645	977	0.000	1022	0.000
798	3.339	843	3.329	888	3.094	933	1.548	978	0.000	1023	0.000
799	3.339	844	3.329	889	3.094	934	1.548	979	0.000	1024	0.000
800	3.339	845	3.329	890	3.094	935	1.548	980	0.000	1025	0.000
801	3.339	846	3.329	891	3.094	936	1.548	981	0.000	1026	0.000
802	3.339	847	3.329	892	3.094	937	1.548	982	0.000	1027	0.000
803	3.339	848	3.329	893	3.062	938	1.548	983	0.000	1028	0.000
804	3.339	849	3.329	894	2.932	939	1.548	984	0.000	1029	0.000
805	3.339	850	3.329	895	2.932	940	1.548	985	0.000	1030	0.000
806	3.339	851	3.329	896	2.932	941	1.431	986	0.000	1031	0.000
807	3.329	852	3.329	897	2.932	942	0.959	987	0.000	1032	0.000
808	3.322	853	3.329	898	2.932	943	0.959	988	0.000	1033	0.000
809	3.322	854	3.329	899	2.932	944	0.959	989	0.000	1034	0.000
810	3.322	855	3.319	900	2.932	945	0.959	990	0.000	1035	0.000
811	3.322	856	3.314	901	2.932	946	0.959	991	0.000	1036	0.000
812	3.322	857	3.314	902	2.932	947	0.959	992	0.000	1037	0.000
813	3.322	858	3.314	903	2.797	948	0.959	993	0.000	1038	0.000
814	3.322	859	3.314	904	2.708	949	0.959	994	0.000	1039	0.000
815	3.322	860	3.314	905	2.708	950	0.959	995	0.000	1040	0.000
816	3.322	861	3.314	906	2.708	951	0.531	996	0.000	1041	0.000
817	3.319	862	3.314	907	2.708	952	0.245	997	0.000	1042	0.000
818	3.319	863	3.314	908	2.708	953	0.245	998	0.000	1043	0.000
819	3.319	864	3.314	909	2.708	954	0.245	999	0.000	1044	0.000
820	3.319	865	3.275	910	2.708	955	0.245	1000	0.000	1045	0.000
821	3.319	866	3.275	911	2.708	956	0.245	1001	0.000	1046	0.000
822	3.319	867	3.275	912	2.708	957	0.245	1002	0.000	1047	0.000
823	3.319	868	3.275	913	2.411	958	0.245	1003	0.000	1048	0.000
824	3.319	869	3.275	914	2.411	959	0.245	1004	0.000	1049	0.000
825	3.319	870	3.275	915	2.411	960	0.245	1005	0.000	1050	0.000
826	3.321	871	3.275	916	2.411	961	0.000	1006	0.000	1051	0.000
827	3.324	872	3.275	917	2.411	962	0.000	1007	0.000	1052	0.000
828	3.324	873	3.275	918	2.411	963	0.000	1008	0.000	1053	0.000
829	3.324	874	3.247	919	2.411	964	0.000	1009	0.000	1054	0.000
830	3.324	875	3.206	920	2.411	965	0.000	1010	0.000	1055	0.000
831	3.324	876	3.206	921	2.411	966	0.000	1011	0.000	1056	0.000
832	3.324	877	3.206	922	2.258	967	0.000	1012	0.000	1057	0.000
833	3.324	878	3.206	923	2.029	968	0.000	1013	0.000	1058	0.000
834	3.324	879	3.206	924	2.029	969	0.000	1014	0.000	1059	0.000
835	3.324	880	3.206	925	2.029	970	0.000	1015	0.000	1060	0.000
836	3.329	881	3.206	926	2.029	971	0.000	1016	0.000	1061	0.000
837	3.329	882	3.206	927	2.029	972	0.000	1017	0.000	1062	0.000

Rainfall Profile

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1063	0.000	1108	0.000	1153	0.000	1198	0.000	1243	0.000	1288	0.000
1064	0.000	1109	0.000	1154	0.000	1199	0.000	1244	0.000	1289	0.000
1065	0.000	1110	0.000	1155	0.000	1200	0.000	1245	0.000	1290	0.000
1066	0.000	1111	0.000	1156	0.000	1201	0.000	1246	0.000	1291	0.000
1067	0.000	1112	0.000	1157	0.000	1202	0.000	1247	0.000	1292	0.000
1068	0.000	1113	0.000	1158	0.000	1203	0.000	1248	0.000	1293	0.000
1069	0.000	1114	0.000	1159	0.000	1204	0.000	1249	0.000	1294	0.000
1070	0.000	1115	0.000	1160	0.000	1205	0.000	1250	0.000	1295	0.000
1071	0.000	1116	0.000	1161	0.000	1206	0.000	1251	0.000	1296	0.000
1072	0.000	1117	0.000	1162	0.000	1207	0.000	1252	0.000	1297	0.000
1073	0.000	1118	0.000	1163	0.000	1208	0.000	1253	0.000	1298	0.000
1074	0.000	1119	0.000	1164	0.000	1209	0.000	1254	0.000	1299	0.000
1075	0.000	1120	0.000	1165	0.000	1210	0.000	1255	0.000	1300	0.000
1076	0.000	1121	0.000	1166	0.000	1211	0.000	1256	0.000	1301	0.000
1077	0.000	1122	0.000	1167	0.000	1212	0.000	1257	0.000	1302	0.000
1078	0.000	1123	0.000	1168	0.000	1213	0.000	1258	0.000	1303	0.000
1079	0.000	1124	0.000	1169	0.000	1214	0.000	1259	0.000	1304	0.000
1080	0.000	1125	0.000	1170	0.000	1215	0.000	1260	0.000	1305	0.000
1081	0.000	1126	0.000	1171	0.000	1216	0.000	1261	0.000	1306	0.000
1082	0.000	1127	0.000	1172	0.000	1217	0.000	1262	0.000	1307	0.000
1083	0.000	1128	0.000	1173	0.000	1218	0.000	1263	0.000	1308	0.000
1084	0.000	1129	0.000	1174	0.000	1219	0.000	1264	0.000	1309	0.000
1085	0.000	1130	0.000	1175	0.000	1220	0.000	1265	0.000	1310	0.000
1086	0.000	1131	0.000	1176	0.000	1221	0.000	1266	0.000	1311	0.000
1087	0.000	1132	0.000	1177	0.000	1222	0.000	1267	0.000	1312	0.000
1088	0.000	1133	0.000	1178	0.000	1223	0.000	1268	0.000	1313	0.000
1089	0.000	1134	0.000	1179	0.000	1224	0.000	1269	0.000	1314	0.000
1090	0.000	1135	0.000	1180	0.000	1225	0.000	1270	0.000	1315	0.000
1091	0.000	1136	0.000	1181	0.000	1226	0.000	1271	0.000	1316	0.000
1092	0.000	1137	0.000	1182	0.000	1227	0.000	1272	0.000	1317	0.000
1093	0.000	1138	0.000	1183	0.000	1228	0.000	1273	0.000	1318	0.000
1094	0.000	1139	0.000	1184	0.000	1229	0.000	1274	0.000	1319	0.000
1095	0.000	1140	0.000	1185	0.000	1230	0.000	1275	0.000	1320	0.000
1096	0.000	1141	0.000	1186	0.000	1231	0.000	1276	0.000	1321	0.000
1097	0.000	1142	0.000	1187	0.000	1232	0.000	1277	0.000	1322	0.000
1098	0.000	1143	0.000	1188	0.000	1233	0.000	1278	0.000	1323	0.000
1099	0.000	1144	0.000	1189	0.000	1234	0.000	1279	0.000	1324	0.000
1100	0.000	1145	0.000	1190	0.000	1235	0.000	1280	0.000	1325	0.000
1101	0.000	1146	0.000	1191	0.000	1236	0.000	1281	0.000	1326	0.000
1102	0.000	1147	0.000	1192	0.000	1237	0.000	1282	0.000	1327	0.000
1103	0.000	1148	0.000	1193	0.000	1238	0.000	1283	0.000	1328	0.000
1104	0.000	1149	0.000	1194	0.000	1239	0.000	1284	0.000	1329	0.000
1105	0.000	1150	0.000	1195	0.000	1240	0.000	1285	0.000	1330	0.000
1106	0.000	1151	0.000	1196	0.000	1241	0.000	1286	0.000	1331	0.000
1107	0.000	1152	0.000	1197	0.000	1242	0.000	1287	0.000	1332	0.000

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
1333	0.000	1378	0.000	1423	0.000	1468	0.000	1513	0.000	1558	0.000
1334	0.000	1379	0.000	1424	0.000	1469	0.000	1514	0.000	1559	0.000
1335	0.000	1380	0.000	1425	0.000	1470	0.000	1515	0.000	1560	0.000
1336	0.000	1381	0.000	1426	0.000	1471	0.000	1516	0.000	1561	0.000
1337	0.000	1382	0.000	1427	0.000	1472	0.000	1517	0.000	1562	0.000
1338	0.000	1383	0.000	1428	0.000	1473	0.000	1518	0.000	1563	0.000
1339	0.000	1384	0.000	1429	0.000	1474	0.000	1519	0.000	1564	0.000
1340	0.000	1385	0.000	1430	0.000	1475	0.000	1520	0.000	1565	0.000
1341	0.000	1386	0.000	1431	0.000	1476	0.000	1521	0.000	1566	0.000
1342	0.000	1387	0.000	1432	0.000	1477	0.000	1522	0.000	1567	0.000
1343	0.000	1388	0.000	1433	0.000	1478	0.000	1523	0.000	1568	0.000
1344	0.000	1389	0.000	1434	0.000	1479	0.000	1524	0.000	1569	0.000
1345	0.000	1390	0.000	1435	0.000	1480	0.000	1525	0.000	1570	0.000
1346	0.000	1391	0.000	1436	0.000	1481	0.000	1526	0.000	1571	0.000
1347	0.000	1392	0.000	1437	0.000	1482	0.000	1527	0.000	1572	0.000
1348	0.000	1393	0.000	1438	0.000	1483	0.000	1528	0.000	1573	0.000
1349	0.000	1394	0.000	1439	0.000	1484	0.000	1529	0.000	1574	0.000
1350	0.000	1395	0.000	1440	0.000	1485	0.000	1530	0.000	1575	0.000
1351	0.000	1396	0.000	1441	0.000	1486	0.000	1531	0.000	1576	0.000
1352	0.000	1397	0.000	1442	0.000	1487	0.000	1532	0.000	1577	0.000
1353	0.000	1398	0.000	1443	0.000	1488	0.000	1533	0.000	1578	0.000
1354	0.000	1399	0.000	1444	0.000	1489	0.000	1534	0.000	1579	0.000
1355	0.000	1400	0.000	1445	0.000	1490	0.000	1535	0.000	1580	0.000
1356	0.000	1401	0.000	1446	0.000	1491	0.000	1536	0.000	1581	0.000
1357	0.000	1402	0.000	1447	0.000	1492	0.000	1537	0.000	1582	0.000
1358	0.000	1403	0.000	1448	0.000	1493	0.000	1538	0.000	1583	0.000
1359	0.000	1404	0.000	1449	0.000	1494	0.000	1539	0.000	1584	0.000
1360	0.000	1405	0.000	1450	0.000	1495	0.000	1540	0.000	1585	0.000
1361	0.000	1406	0.000	1451	0.000	1496	0.000	1541	0.000	1586	0.000
1362	0.000	1407	0.000	1452	0.000	1497	0.000	1542	0.000	1587	0.000
1363	0.000	1408	0.000	1453	0.000	1498	0.000	1543	0.000	1588	0.000
1364	0.000	1409	0.000	1454	0.000	1499	0.000	1544	0.000	1589	0.000
1365	0.000	1410	0.000	1455	0.000	1500	0.000	1545	0.000	1590	0.000
1366	0.000	1411	0.000	1456	0.000	1501	0.000	1546	0.000	1591	0.000
1367	0.000	1412	0.000	1457	0.000	1502	0.000	1547	0.000	1592	0.000
1368	0.000	1413	0.000	1458	0.000	1503	0.000	1548	0.000	1593	0.000
1369	0.000	1414	0.000	1459	0.000	1504	0.000	1549	0.000	1594	0.000
1370	0.000	1415	0.000	1460	0.000	1505	0.000	1550	0.000	1595	0.000
1371	0.000	1416	0.000	1461	0.000	1506	0.000	1551	0.000	1596	0.000
1372	0.000	1417	0.000	1462	0.000	1507	0.000	1552	0.000	1597	0.000
1373	0.000	1418	0.000	1463	0.000	1508	0.000	1553	0.000	1598	0.000
1374	0.000	1419	0.000	1464	0.000	1509	0.000	1554	0.000	1599	0.000
1375	0.000	1420	0.000	1465	0.000	1510	0.000	1555	0.000	1600	0.000
1376	0.000	1421	0.000	1466	0.000	1511	0.000	1556	0.000	1601	0.000
1377	0.000	1422	0.000	1467	0.000	1512	0.000	1557	0.000	1602	0.000

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
1603	0.000	1648	0.000	1693	0.000	1738	0.000	1783	0.000	1828	0.000
1604	0.000	1649	0.000	1694	0.000	1739	0.000	1784	0.000	1829	0.000
1605	0.000	1650	0.000	1695	0.000	1740	0.000	1785	0.000	1830	0.000
1606	0.000	1651	0.000	1696	0.000	1741	0.000	1786	0.000	1831	0.000
1607	0.000	1652	0.000	1697	0.000	1742	0.000	1787	0.000	1832	0.000
1608	0.000	1653	0.000	1698	0.000	1743	0.000	1788	0.000	1833	0.000
1609	0.000	1654	0.000	1699	0.000	1744	0.000	1789	0.000	1834	0.000
1610	0.000	1655	0.000	1700	0.000	1745	0.000	1790	0.000	1835	0.000
1611	0.000	1656	0.000	1701	0.000	1746	0.000	1791	0.000	1836	0.000
1612	0.000	1657	0.000	1702	0.000	1747	0.000	1792	0.000	1837	0.000
1613	0.000	1658	0.000	1703	0.000	1748	0.000	1793	0.000	1838	0.000
1614	0.000	1659	0.000	1704	0.000	1749	0.000	1794	0.000	1839	0.000
1615	0.000	1660	0.000	1705	0.000	1750	0.000	1795	0.000	1840	0.000
1616	0.000	1661	0.000	1706	0.000	1751	0.000	1796	0.000	1841	0.000
1617	0.000	1662	0.000	1707	0.000	1752	0.000	1797	0.000	1842	0.000
1618	0.000	1663	0.000	1708	0.000	1753	0.000	1798	0.000	1843	0.000
1619	0.000	1664	0.000	1709	0.000	1754	0.000	1799	0.000	1844	0.000
1620	0.000	1665	0.000	1710	0.000	1755	0.000	1800	0.000	1845	0.000
1621	0.000	1666	0.000	1711	0.000	1756	0.000	1801	0.000	1846	0.000
1622	0.000	1667	0.000	1712	0.000	1757	0.000	1802	0.000	1847	0.000
1623	0.000	1668	0.000	1713	0.000	1758	0.000	1803	0.000	1848	0.000
1624	0.000	1669	0.000	1714	0.000	1759	0.000	1804	0.000	1849	0.000
1625	0.000	1670	0.000	1715	0.000	1760	0.000	1805	0.000	1850	0.000
1626	0.000	1671	0.000	1716	0.000	1761	0.000	1806	0.000	1851	0.000
1627	0.000	1672	0.000	1717	0.000	1762	0.000	1807	0.000	1852	0.000
1628	0.000	1673	0.000	1718	0.000	1763	0.000	1808	0.000	1853	0.000
1629	0.000	1674	0.000	1719	0.000	1764	0.000	1809	0.000	1854	0.000
1630	0.000	1675	0.000	1720	0.000	1765	0.000	1810	0.000	1855	0.000
1631	0.000	1676	0.000	1721	0.000	1766	0.000	1811	0.000	1856	0.000
1632	0.000	1677	0.000	1722	0.000	1767	0.000	1812	0.000	1857	0.000
1633	0.000	1678	0.000	1723	0.000	1768	0.000	1813	0.000	1858	0.000
1634	0.000	1679	0.000	1724	0.000	1769	0.000	1814	0.000	1859	0.000
1635	0.000	1680	0.000	1725	0.000	1770	0.000	1815	0.000	1860	0.000
1636	0.000	1681	0.000	1726	0.000	1771	0.000	1816	0.000	1861	0.000
1637	0.000	1682	0.000	1727	0.000	1772	0.000	1817	0.000	1862	0.000
1638	0.000	1683	0.000	1728	0.000	1773	0.000	1818	0.000	1863	0.000
1639	0.000	1684	0.000	1729	0.000	1774	0.000	1819	0.000	1864	0.000
1640	0.000	1685	0.000	1730	0.000	1775	0.000	1820	0.000	1865	0.000
1641	0.000	1686	0.000	1731	0.000	1776	0.000	1821	0.000	1866	0.000
1642	0.000	1687	0.000	1732	0.000	1777	0.000	1822	0.000	1867	0.000
1643	0.000	1688	0.000	1733	0.000	1778	0.000	1823	0.000	1868	0.000
1644	0.000	1689	0.000	1734	0.000	1779	0.000	1824	0.000	1869	0.000
1645	0.000	1690	0.000	1735	0.000	1780	0.000	1825	0.000	1870	0.000
1646	0.000	1691	0.000	1736	0.000	1781	0.000	1826	0.000	1871	0.000
1647	0.000	1692	0.000	1737	0.000	1782	0.000	1827	0.000	1872	0.000

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
1873	0.000	1918	0.000	1963	0.000	2008	0.000	2053	0.000	2098	0.000
1874	0.000	1919	0.000	1964	0.000	2009	0.000	2054	0.000	2099	0.000
1875	0.000	1920	0.000	1965	0.000	2010	0.000	2055	0.000	2100	0.000
1876	0.000	1921	0.000	1966	0.000	2011	0.000	2056	0.000	2101	0.000
1877	0.000	1922	0.000	1967	0.000	2012	0.000	2057	0.000	2102	0.000
1878	0.000	1923	0.000	1968	0.000	2013	0.000	2058	0.000	2103	0.000
1879	0.000	1924	0.000	1969	0.000	2014	0.000	2059	0.000	2104	0.000
1880	0.000	1925	0.000	1970	0.000	2015	0.000	2060	0.000	2105	0.000
1881	0.000	1926	0.000	1971	0.000	2016	0.000	2061	0.000	2106	0.000
1882	0.000	1927	0.000	1972	0.000	2017	0.000	2062	0.000	2107	0.000
1883	0.000	1928	0.000	1973	0.000	2018	0.000	2063	0.000	2108	0.000
1884	0.000	1929	0.000	1974	0.000	2019	0.000	2064	0.000	2109	0.000
1885	0.000	1930	0.000	1975	0.000	2020	0.000	2065	0.000	2110	0.000
1886	0.000	1931	0.000	1976	0.000	2021	0.000	2066	0.000	2111	0.000
1887	0.000	1932	0.000	1977	0.000	2022	0.000	2067	0.000	2112	0.000
1888	0.000	1933	0.000	1978	0.000	2023	0.000	2068	0.000	2113	0.000
1889	0.000	1934	0.000	1979	0.000	2024	0.000	2069	0.000	2114	0.000
1890	0.000	1935	0.000	1980	0.000	2025	0.000	2070	0.000	2115	0.000
1891	0.000	1936	0.000	1981	0.000	2026	0.000	2071	0.000	2116	0.000
1892	0.000	1937	0.000	1982	0.000	2027	0.000	2072	0.000	2117	0.000
1893	0.000	1938	0.000	1983	0.000	2028	0.000	2073	0.000	2118	0.000
1894	0.000	1939	0.000	1984	0.000	2029	0.000	2074	0.000	2119	0.000
1895	0.000	1940	0.000	1985	0.000	2030	0.000	2075	0.000	2120	0.000
1896	0.000	1941	0.000	1986	0.000	2031	0.000	2076	0.000	2121	0.000
1897	0.000	1942	0.000	1987	0.000	2032	0.000	2077	0.000	2122	0.000
1898	0.000	1943	0.000	1988	0.000	2033	0.000	2078	0.000	2123	0.000
1899	0.000	1944	0.000	1989	0.000	2034	0.000	2079	0.000	2124	0.000
1900	0.000	1945	0.000	1990	0.000	2035	0.000	2080	0.000	2125	0.000
1901	0.000	1946	0.000	1991	0.000	2036	0.000	2081	0.000	2126	0.000
1902	0.000	1947	0.000	1992	0.000	2037	0.000	2082	0.000	2127	0.000
1903	0.000	1948	0.000	1993	0.000	2038	0.000	2083	0.000	2128	0.000
1904	0.000	1949	0.000	1994	0.000	2039	0.000	2084	0.000	2129	0.000
1905	0.000	1950	0.000	1995	0.000	2040	0.000	2085	0.000	2130	0.000
1906	0.000	1951	0.000	1996	0.000	2041	0.000	2086	0.000	2131	0.000
1907	0.000	1952	0.000	1997	0.000	2042	0.000	2087	0.000	2132	0.000
1908	0.000	1953	0.000	1998	0.000	2043	0.000	2088	0.000	2133	0.000
1909	0.000	1954	0.000	1999	0.000	2044	0.000	2089	0.000	2134	0.000
1910	0.000	1955	0.000	2000	0.000	2045	0.000	2090	0.000	2135	0.000
1911	0.000	1956	0.000	2001	0.000	2046	0.000	2091	0.000	2136	0.000
1912	0.000	1957	0.000	2002	0.000	2047	0.000	2092	0.000	2137	0.000
1913	0.000	1958	0.000	2003	0.000	2048	0.000	2093	0.000	2138	0.000
1914	0.000	1959	0.000	2004	0.000	2049	0.000	2094	0.000	2139	0.000
1915	0.000	1960	0.000	2005	0.000	2050	0.000	2095	0.000	2140	0.000
1916	0.000	1961	0.000	2006	0.000	2051	0.000	2096	0.000	2141	0.000
1917	0.000	1962	0.000	2007	0.000	2052	0.000	2097	0.000	2142	0.000

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
2143	0.000	2188	0.000	2233	0.000	2278	0.000	2323	0.000	2368	0.000
2144	0.000	2189	0.000	2234	0.000	2279	0.000	2324	0.000	2369	0.000
2145	0.000	2190	0.000	2235	0.000	2280	0.000	2325	0.000	2370	0.000
2146	0.000	2191	0.000	2236	0.000	2281	0.000	2326	0.000	2371	0.000
2147	0.000	2192	0.000	2237	0.000	2282	0.000	2327	0.000	2372	0.000
2148	0.000	2193	0.000	2238	0.000	2283	0.000	2328	0.000	2373	0.000
2149	0.000	2194	0.000	2239	0.000	2284	0.000	2329	0.000	2374	0.000
2150	0.000	2195	0.000	2240	0.000	2285	0.000	2330	0.000	2375	0.000
2151	0.000	2196	0.000	2241	0.000	2286	0.000	2331	0.000	2376	0.000
2152	0.000	2197	0.000	2242	0.000	2287	0.000	2332	0.000	2377	0.098
2153	0.000	2198	0.000	2243	0.000	2288	0.000	2333	0.000	2378	0.098
2154	0.000	2199	0.000	2244	0.000	2289	0.000	2334	0.000	2379	0.098
2155	0.000	2200	0.000	2245	0.000	2290	0.000	2335	0.000	2380	0.098
2156	0.000	2201	0.000	2246	0.000	2291	0.000	2336	0.000	2381	0.098
2157	0.000	2202	0.000	2247	0.000	2292	0.000	2337	0.000	2382	0.098
2158	0.000	2203	0.000	2248	0.000	2293	0.000	2338	0.000	2383	0.098
2159	0.000	2204	0.000	2249	0.000	2294	0.000	2339	0.000	2384	0.098
2160	0.000	2205	0.000	2250	0.000	2295	0.000	2340	0.000	2385	0.098
2161	0.000	2206	0.000	2251	0.000	2296	0.000	2341	0.000	2386	0.213
2162	0.000	2207	0.000	2252	0.000	2297	0.000	2342	0.000	2387	0.384
2163	0.000	2208	0.000	2253	0.000	2298	0.000	2343	0.000	2388	0.384
2164	0.000	2209	0.000	2254	0.000	2299	0.000	2344	0.000	2389	0.384
2165	0.000	2210	0.000	2255	0.000	2300	0.000	2345	0.000	2390	0.384
2166	0.000	2211	0.000	2256	0.000	2301	0.000	2346	0.000	2391	0.384
2167	0.000	2212	0.000	2257	0.000	2302	0.000	2347	0.000	2392	0.384
2168	0.000	2213	0.000	2258	0.000	2303	0.000	2348	0.000	2393	0.384
2169	0.000	2214	0.000	2259	0.000	2304	0.000	2349	0.000	2394	0.384
2170	0.000	2215	0.000	2260	0.000	2305	0.000	2350	0.000	2395	0.384
2171	0.000	2216	0.000	2261	0.000	2306	0.000	2351	0.000	2396	0.573
2172	0.000	2217	0.000	2262	0.000	2307	0.000	2352	0.000	2397	0.621
2173	0.000	2218	0.000	2263	0.000	2308	0.000	2353	0.000	2398	0.621
2174	0.000	2219	0.000	2264	0.000	2309	0.000	2354	0.000	2399	0.621
2175	0.000	2220	0.000	2265	0.000	2310	0.000	2355	0.000	2400	0.621
2176	0.000	2221	0.000	2266	0.000	2311	0.000	2356	0.000	2401	0.621
2177	0.000	2222	0.000	2267	0.000	2312	0.000	2357	0.000	2402	0.621
2178	0.000	2223	0.000	2268	0.000	2313	0.000	2358	0.000	2403	0.621
2179	0.000	2224	0.000	2269	0.000	2314	0.000	2359	0.000	2404	0.621
2180	0.000	2225	0.000	2270	0.000	2315	0.000	2360	0.000	2405	0.659
2181	0.000	2226	0.000	2271	0.000	2316	0.000	2361	0.000	2406	0.813
2182	0.000	2227	0.000	2272	0.000	2317	0.000	2362	0.000	2407	0.813
2183	0.000	2228	0.000	2273	0.000	2318	0.000	2363	0.000	2408	0.813
2184	0.000	2229	0.000	2274	0.000	2319	0.000	2364	0.000	2409	0.813
2185	0.000	2230	0.000	2275	0.000	2320	0.000	2365	0.000	2410	0.813
2186	0.000	2231	0.000	2276	0.000	2321	0.000	2366	0.000	2411	0.813
2187	0.000	2232	0.000	2277	0.000	2322	0.000	2367	0.000	2412	0.813

Rainfall Profile

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
2413	0.813	2458	1.285	2503	1.332	2548	1.353	2593	1.603	2638	2.254
2414	0.813	2459	1.285	2504	1.332	2549	1.357	2594	1.603	2639	2.254
2415	0.905	2460	1.285	2505	1.332	2550	1.377	2595	1.603	2640	2.254
2416	0.966	2461	1.285	2506	1.332	2551	1.377	2596	1.603	2641	2.254
2417	0.966	2462	1.285	2507	1.332	2552	1.377	2597	1.622	2642	2.254
2418	0.966	2463	1.301	2508	1.332	2553	1.377	2598	1.698	2643	2.254
2419	0.966	2464	1.313	2509	1.332	2554	1.377	2599	1.698	2644	2.254
2420	0.966	2465	1.313	2510	1.332	2555	1.377	2600	1.698	2645	2.291
2421	0.966	2466	1.313	2511	1.331	2556	1.377	2601	1.698	2646	2.438
2422	0.966	2467	1.313	2512	1.330	2557	1.377	2602	1.698	2647	2.438
2423	0.966	2468	1.313	2513	1.330	2558	1.377	2603	1.698	2648	2.438
2424	0.966	2469	1.313	2514	1.330	2559	1.398	2604	1.698	2649	2.438
2425	1.085	2470	1.313	2515	1.330	2560	1.412	2605	1.698	2650	2.438
2426	1.085	2471	1.313	2516	1.330	2561	1.412	2606	1.698	2651	2.438
2427	1.085	2472	1.313	2517	1.330	2562	1.412	2607	1.766	2652	2.438
2428	1.085	2473	1.328	2518	1.330	2563	1.412	2608	1.811	2653	2.438
2429	1.085	2474	1.328	2519	1.330	2564	1.412	2609	1.811	2654	2.438
2430	1.085	2475	1.328	2520	1.330	2565	1.412	2610	1.811	2655	2.558
2431	1.085	2476	1.328	2521	1.332	2566	1.412	2611	1.811	2656	2.638
2432	1.085	2477	1.328	2522	1.332	2567	1.412	2612	1.811	2657	2.638
2433	1.085	2478	1.328	2523	1.332	2568	1.412	2613	1.811	2658	2.638
2434	1.121	2479	1.328	2524	1.332	2569	1.461	2614	1.811	2659	2.638
2435	1.175	2480	1.328	2525	1.332	2570	1.461	2615	1.811	2660	2.638
2436	1.175	2481	1.328	2526	1.332	2571	1.461	2616	1.811	2661	2.638
2437	1.175	2482	1.330	2527	1.332	2572	1.461	2617	1.941	2662	2.638
2438	1.175	2483	1.334	2528	1.332	2573	1.461	2618	1.941	2663	2.638
2439	1.175	2484	1.334	2529	1.332	2574	1.461	2619	1.941	2664	2.638
2440	1.175	2485	1.334	2530	1.334	2575	1.461	2620	1.941	2665	2.855
2441	1.175	2486	1.334	2531	1.338	2576	1.461	2621	1.941	2666	2.855
2442	1.175	2487	1.334	2532	1.338	2577	1.461	2622	1.941	2667	2.855
2443	1.175	2488	1.334	2533	1.338	2578	1.486	2623	1.941	2668	2.855
2444	1.227	2489	1.334	2534	1.338	2579	1.524	2624	1.941	2669	2.855
2445	1.240	2490	1.334	2535	1.338	2580	1.524	2625	1.941	2670	2.855
2446	1.240	2491	1.334	2536	1.338	2581	1.524	2626	2.000	2671	2.855
2447	1.240	2492	1.334	2537	1.338	2582	1.524	2627	2.089	2672	2.855
2448	1.240	2493	1.334	2538	1.338	2583	1.524	2628	2.089	2673	2.855
2449	1.240	2494	1.334	2539	1.338	2584	1.524	2629	2.089	2674	2.948
2450	1.240	2495	1.334	2540	1.350	2585	1.524	2630	2.089	2675	3.088
2451	1.240	2496	1.334	2541	1.353	2586	1.524	2631	2.089	2676	3.088
2452	1.240	2497	1.334	2542	1.353	2587	1.524	2632	2.089	2677	3.088
2453	1.249	2498	1.334	2543	1.353	2588	1.587	2633	2.089	2678	3.088
2454	1.285	2499	1.334	2544	1.353	2589	1.603	2634	2.089	2679	3.088
2455	1.285	2500	1.334	2545	1.353	2590	1.603	2635	2.089	2680	3.088
2456	1.285	2501	1.334	2546	1.353	2591	1.603	2636	2.221	2681	3.088
2457	1.285	2502	1.332	2547	1.353	2592	1.603	2637	2.254	2682	3.088

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
2683	3.088	2728	4.437	2773	5.912	2818	7.025	2863	7.571	2908	6.712
2684	3.285	2729	4.437	2774	5.912	2819	7.148	2864	7.571	2909	6.712
2685	3.335	2730	4.437	2775	5.912	2820	7.148	2865	7.571	2910	6.712
2686	3.335	2731	4.437	2776	5.912	2821	7.148	2866	7.529	2911	6.712
2687	3.335	2732	4.673	2777	5.912	2822	7.148	2867	7.467	2912	6.712
2688	3.335	2733	4.732	2778	5.912	2823	7.148	2868	7.467	2913	6.712
2689	3.335	2734	4.732	2779	5.912	2824	7.148	2869	7.467	2914	6.611
2690	3.335	2735	4.732	2780	6.136	2825	7.148	2870	7.467	2915	6.460
2691	3.335	2736	4.732	2781	6.193	2826	7.148	2871	7.467	2916	6.460
2692	3.335	2737	4.732	2782	6.193	2827	7.148	2872	7.467	2917	6.460
2693	3.387	2738	4.732	2783	6.193	2828	7.289	2873	7.467	2918	6.460
2694	3.595	2739	4.732	2784	6.193	2829	7.325	2874	7.467	2919	6.460
2695	3.595	2740	4.732	2785	6.193	2830	7.325	2875	7.467	2920	6.460
2696	3.595	2741	4.791	2786	6.193	2831	7.325	2876	7.353	2921	6.460
2697	3.595	2742	5.029	2787	6.193	2832	7.325	2877	7.325	2922	6.460
2698	3.595	2743	5.029	2788	6.193	2833	7.325	2878	7.325	2923	6.460
2699	3.595	2744	5.029	2789	6.246	2834	7.325	2879	7.325	2924	6.246
2700	3.595	2745	5.029	2790	6.460	2835	7.325	2880	7.325	2925	6.193
2701	3.595	2746	5.029	2791	6.460	2836	7.325	2881	7.325	2926	6.193
2702	3.595	2747	5.029	2792	6.460	2837	7.353	2882	7.325	2927	6.193
2703	3.758	2748	5.029	2793	6.460	2838	7.467	2883	7.325	2928	6.193
2704	3.866	2749	5.029	2794	6.460	2839	7.467	2884	7.325	2929	6.193
2705	3.866	2750	5.029	2795	6.460	2840	7.467	2885	7.289	2930	6.193
2706	3.866	2751	5.208	2796	6.460	2841	7.467	2886	7.148	2931	6.193
2707	3.866	2752	5.327	2797	6.460	2842	7.467	2887	7.148	2932	6.193
2708	3.866	2753	5.327	2798	6.460	2843	7.467	2888	7.148	2933	6.136
2709	3.866	2754	5.327	2799	6.611	2844	7.467	2889	7.148	2934	5.912
2710	3.866	2755	5.327	2800	6.712	2845	7.467	2890	7.148	2935	5.912
2711	3.866	2756	5.327	2801	6.712	2846	7.467	2891	7.148	2936	5.912
2712	3.866	2757	5.327	2802	6.712	2847	7.529	2892	7.148	2937	5.912
2713	4.148	2758	5.327	2803	6.712	2848	7.571	2893	7.148	2938	5.912
2714	4.148	2759	5.327	2804	6.712	2849	7.571	2894	7.148	2939	5.912
2715	4.148	2760	5.327	2805	6.712	2850	7.571	2895	7.025	2940	5.912
2716	4.148	2761	5.623	2806	6.712	2851	7.571	2896	6.942	2941	5.912
2717	4.148	2762	5.623	2807	6.712	2852	7.571	2897	6.942	2942	5.912
2718	4.148	2763	5.623	2808	6.712	2853	7.571	2898	6.942	2943	5.738
2719	4.148	2764	5.623	2809	6.942	2854	7.571	2899	6.942	2944	5.623
2720	4.148	2765	5.623	2810	6.942	2855	7.571	2900	6.942	2945	5.623
2721	4.148	2766	5.623	2811	6.942	2856	7.571	2901	6.942	2946	5.623
2722	4.263	2767	5.623	2812	6.942	2857	7.571	2902	6.942	2947	5.623
2723	4.437	2768	5.623	2813	6.942	2858	7.571	2903	6.942	2948	5.623
2724	4.437	2769	5.623	2814	6.942	2859	7.571	2904	6.942	2949	5.623
2725	4.437	2770	5.738	2815	6.942	2860	7.571	2905	6.712	2950	5.623
2726	4.437	2771	5.912	2816	6.942	2861	7.571	2906	6.712	2951	5.623
2727	4.437	2772	5.912	2817	6.942	2862	7.571	2907	6.712	2952	5.623

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
2953	5.327	2998	4.148	3043	2.855	3088	1.941	3133	1.524	3178	1.338
2954	5.327	2999	4.148	3044	2.855	3089	1.941	3134	1.524	3179	1.338
2955	5.327	3000	4.148	3045	2.855	3090	1.941	3135	1.486	3180	1.338
2956	5.327	3001	3.866	3046	2.855	3091	1.941	3136	1.461	3181	1.338
2957	5.327	3002	3.866	3047	2.855	3092	1.941	3137	1.461	3182	1.338
2958	5.327	3003	3.866	3048	2.855	3093	1.941	3138	1.461	3183	1.334
2959	5.327	3004	3.866	3049	2.638	3094	1.941	3139	1.461	3184	1.332
2960	5.327	3005	3.866	3050	2.638	3095	1.941	3140	1.461	3185	1.332
2961	5.327	3006	3.866	3051	2.638	3096	1.941	3141	1.461	3186	1.332
2962	5.208	3007	3.866	3052	2.638	3097	1.811	3142	1.461	3187	1.332
2963	5.029	3008	3.866	3053	2.638	3098	1.811	3143	1.461	3188	1.332
2964	5.029	3009	3.866	3054	2.638	3099	1.811	3144	1.461	3189	1.332
2965	5.029	3010	3.758	3055	2.638	3100	1.811	3145	1.412	3190	1.332
2966	5.029	3011	3.595	3056	2.638	3101	1.811	3146	1.412	3191	1.332
2967	5.029	3012	3.595	3057	2.638	3102	1.811	3147	1.412	3192	1.332
2968	5.029	3013	3.595	3058	2.558	3103	1.811	3148	1.412	3193	1.330
2969	5.029	3014	3.595	3059	2.438	3104	1.811	3149	1.412	3194	1.330
2970	5.029	3015	3.595	3060	2.438	3105	1.811	3150	1.412	3195	1.330
2971	5.029	3016	3.595	3061	2.438	3106	1.766	3151	1.412	3196	1.330
2972	4.791	3017	3.595	3062	2.438	3107	1.698	3152	1.412	3197	1.330
2973	4.732	3018	3.595	3063	2.438	3108	1.698	3153	1.412	3198	1.330
2974	4.732	3019	3.595	3064	2.438	3109	1.698	3154	1.398	3199	1.330
2975	4.732	3020	3.387	3065	2.438	3110	1.698	3155	1.377	3200	1.330
2976	4.732	3021	3.335	3066	2.438	3111	1.698	3156	1.377	3201	1.330
2977	4.732	3022	3.335	3067	2.438	3112	1.698	3157	1.377	3202	1.331
2978	4.732	3023	3.335	3068	2.291	3113	1.698	3158	1.377	3203	1.332
2979	4.732	3024	3.335	3069	2.254	3114	1.698	3159	1.377	3204	1.332
2980	4.732	3025	3.335	3070	2.254	3115	1.698	3160	1.377	3205	1.332
2981	4.673	3026	3.335	3071	2.254	3116	1.622	3161	1.377	3206	1.332
2982	4.437	3027	3.335	3072	2.254	3117	1.603	3162	1.377	3207	1.332
2983	4.437	3028	3.335	3073	2.254	3118	1.603	3163	1.377	3208	1.332
2984	4.437	3029	3.285	3074	2.254	3119	1.603	3164	1.357	3209	1.332
2985	4.437	3030	3.088	3075	2.254	3120	1.603	3165	1.353	3210	1.332
2986	4.437	3031	3.088	3076	2.254	3121	1.603	3166	1.353	3211	1.332
2987	4.437	3032	3.088	3077	2.221	3122	1.603	3167	1.353	3212	1.334
2988	4.437	3033	3.088	3078	2.089	3123	1.603	3168	1.353	3213	1.335
2989	4.437	3034	3.088	3079	2.089	3124	1.603	3169	1.353	3214	1.335
2990	4.437	3035	3.088	3080	2.089	3125	1.587	3170	1.353	3215	1.335
2991	4.263	3036	3.088	3081	2.089	3126	1.524	3171	1.353	3216	1.335
2992	4.148	3037	3.088	3082	2.089	3127	1.524	3172	1.353	3217	1.335
2993	4.148	3038	3.088	3083	2.089	3128	1.524	3173	1.350	3218	1.335
2994	4.148	3039	2.948	3084	2.089	3129	1.524	3174	1.338	3219	1.335
2995	4.148	3040	2.855	3085	2.089	3130	1.524	3175	1.338	3220	1.335
2996	4.148	3041	2.855	3086	2.089	3131	1.524	3176	1.338	3221	1.334
2997	4.148	3042	2.855	3087	2.000	3132	1.524	3177	1.338	3222	1.334

Rainfall Profile

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
3223	1.334	3242	1.313	3261	1.240	3280	1.085	3299	0.813	3318	0.384
3224	1.334	3243	1.313	3262	1.240	3281	1.085	3300	0.813	3319	0.384
3225	1.334	3244	1.313	3263	1.240	3282	1.085	3301	0.813	3320	0.384
3226	1.334	3245	1.313	3264	1.240	3283	1.085	3302	0.813	3321	0.384
3227	1.334	3246	1.313	3265	1.240	3284	1.085	3303	0.813	3322	0.384
3228	1.334	3247	1.313	3266	1.240	3285	1.085	3304	0.813	3323	0.384
3229	1.334	3248	1.313	3267	1.240	3286	1.085	3305	0.813	3324	0.384
3230	1.334	3249	1.313	3268	1.240	3287	1.085	3306	0.813	3325	0.384
3231	1.330	3250	1.301	3269	1.227	3288	1.085	3307	0.813	3326	0.384
3232	1.328	3251	1.285	3270	1.175	3289	0.966	3308	0.659	3327	0.213
3233	1.328	3252	1.285	3271	1.175	3290	0.966	3309	0.621	3328	0.098
3234	1.328	3253	1.285	3272	1.175	3291	0.966	3310	0.621	3329	0.098
3235	1.328	3254	1.285	3273	1.175	3292	0.966	3311	0.621	3330	0.098
3236	1.328	3255	1.285	3274	1.175	3293	0.966	3312	0.621	3331	0.098
3237	1.328	3256	1.285	3275	1.175	3294	0.966	3313	0.621	3332	0.098
3238	1.328	3257	1.285	3276	1.175	3295	0.966	3314	0.621	3333	0.098
3239	1.328	3258	1.285	3277	1.175	3296	0.966	3315	0.621	3334	0.098
3240	1.328	3259	1.285	3278	1.175	3297	0.966	3316	0.621	3335	0.098
3241	1.313	3260	1.249	3279	1.121	3298	0.905	3317	0.573	3336	0.098

Time Area Diagram

Total Area (ha) 0.467

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	2	0.093	4	6	0.093	8	10	0.095
2	4	0.093	6	8	0.093			

Model Details

Storage is Online Cover Level (m) 100.000

Infiltration Basin Structure

Invert Level (m) 99.400 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	638.0	0.600	638.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0073-2000-0600-2000
Design Head (m)	0.600
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	73
Invert Level (m)	99.400
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.600	2.0	Kick-Flo®	0.397	1.7
Flush-Flo™	0.177	2.0	Mean Flow over Head Range	-	1.7

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)
0.100	1.9	1.200	2.7	3.000	4.2	7.000	6.3
0.200	2.0	1.400	2.9	3.500	4.5	7.500	6.5
0.300	1.9	1.600	3.1	4.000	4.8	8.000	6.7
0.400	1.7	1.800	3.3	4.500	5.1	8.500	6.9
0.500	1.8	2.000	3.5	5.000	5.3	9.000	7.1
0.600	2.0	2.200	3.6	5.500	5.6	9.500	7.3
0.800	2.3	2.400	3.8	6.000	5.8		
1.000	2.5	2.600	3.9	6.500	6.0		

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 6 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	99.807	0.807	0.0	4.0	4.0	1.9	O K
30 min Summer	99.608	0.608	0.0	4.0	4.0	1.4	O K
60 min Summer	99.294	0.294	0.0	4.0	4.0	0.7	O K
120 min Summer	99.112	0.112	0.0	3.4	3.4	0.3	O K
180 min Summer	99.085	0.085	0.0	2.6	2.6	0.2	O K
240 min Summer	99.073	0.073	0.0	2.1	2.1	0.2	O K
360 min Summer	99.060	0.060	0.0	1.6	1.6	0.1	O K
480 min Summer	99.052	0.052	0.0	1.2	1.2	0.1	O K
600 min Summer	99.047	0.047	0.0	1.0	1.0	0.1	O K
720 min Summer	99.044	0.044	0.0	0.9	0.9	0.1	O K
960 min Summer	99.039	0.039	0.0	0.7	0.7	0.1	O K
1440 min Summer	99.032	0.032	0.0	0.5	0.5	0.1	O K
2160 min Summer	99.027	0.027	0.0	0.4	0.4	0.1	O K
2880 min Summer	99.024	0.024	0.0	0.3	0.3	0.1	O K
4320 min Summer	99.020	0.020	0.0	0.2	0.2	0.0	O K
5760 min Summer	99.018	0.018	0.0	0.2	0.2	0.0	O K
7200 min Summer	99.017	0.017	0.0	0.2	0.2	0.0	O K
8640 min Summer	99.015	0.015	0.0	0.1	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	183.695	0.0	4.8	17
30 min Summer	104.587	0.0	5.5	25
60 min Summer	59.547	0.0	6.3	38
120 min Summer	33.903	0.0	7.1	66
180 min Summer	24.387	0.0	7.7	96
240 min Summer	19.303	0.0	8.1	126
360 min Summer	13.885	0.0	8.7	186
480 min Summer	10.990	0.0	9.2	246
600 min Summer	9.168	0.0	9.6	306
720 min Summer	7.905	0.0	10.0	364
960 min Summer	6.306	0.0	10.6	484
1440 min Summer	4.586	0.0	11.6	716
2160 min Summer	3.335	0.0	12.6	1080
2880 min Summer	2.660	0.0	13.4	1460
4320 min Summer	1.895	0.0	14.3	2196
5760 min Summer	1.490	0.0	15.0	2880
7200 min Summer	1.236	0.0	15.6	3632
8640 min Summer	1.061	0.0	16.0	4384

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	99.014	0.014	0.0	0.1	0.1	0.0	O K
15 min Winter	99.967	0.967	0.0	4.0	4.0	2.2	O K
30 min Winter	99.725	0.725	0.0	4.0	4.0	1.7	O K
60 min Winter	99.233	0.233	0.0	4.0	4.0	0.5	O K
120 min Winter	99.090	0.090	0.0	2.7	2.7	0.2	O K
180 min Winter	99.070	0.070	0.0	2.0	2.0	0.2	O K
240 min Winter	99.060	0.060	0.0	1.6	1.6	0.1	O K
360 min Winter	99.050	0.050	0.0	1.1	1.1	0.1	O K
480 min Winter	99.044	0.044	0.0	0.9	0.9	0.1	O K
600 min Winter	99.040	0.040	0.0	0.8	0.8	0.1	O K
720 min Winter	99.037	0.037	0.0	0.7	0.7	0.1	O K
960 min Winter	99.032	0.032	0.0	0.5	0.5	0.1	O K
1440 min Winter	99.027	0.027	0.0	0.4	0.4	0.1	O K
2160 min Winter	99.023	0.023	0.0	0.3	0.3	0.1	O K
2880 min Winter	99.021	0.021	0.0	0.2	0.2	0.0	O K
4320 min Winter	99.017	0.017	0.0	0.2	0.2	0.0	O K
5760 min Winter	99.015	0.015	0.0	0.1	0.1	0.0	O K
7200 min Winter	99.014	0.014	0.0	0.1	0.1	0.0	O K
8640 min Winter	99.013	0.013	0.0	0.1	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.933	0.0	16.5	5136
15 min Winter	183.695	0.0	5.4	18
30 min Winter	104.587	0.0	6.1	26
60 min Winter	59.547	0.0	7.0	40
120 min Winter	33.903	0.0	8.0	66
180 min Winter	24.387	0.0	8.6	94
240 min Winter	19.303	0.0	9.1	126
360 min Winter	13.885	0.0	9.8	184
480 min Winter	10.990	0.0	10.3	248
600 min Winter	9.168	0.0	10.8	304
720 min Winter	7.905	0.0	11.2	366
960 min Winter	6.306	0.0	11.9	486
1440 min Winter	4.586	0.0	12.9	734
2160 min Winter	3.335	0.0	14.1	1100
2880 min Winter	2.660	0.0	15.0	1444
4320 min Winter	1.895	0.0	16.0	2184
5760 min Winter	1.490	0.0	16.8	2848
7200 min Winter	1.236	0.0	17.4	3632
8640 min Winter	1.061	0.0	18.0	4312

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	99.012	0.012	0.0	0.1	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.933	0.0	18.4	4968

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 548450 309100 TF 48450 09100
C (1km)	-0.026
D1 (1km)	0.307
D2 (1km)	0.334
D3 (1km)	0.283
E (1km)	0.314
F (1km)	2.460
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.014

Time From:	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**
0	2	0.003	4	6	0.003	8	10	0.002
2	4	0.003	6	8	0.003			

Model Details

Storage is Online Cover Level (m) 100.000

Infiltration Basin Structure

Invert Level (m) 99.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	**Area (m²)**	**Depth (m)**	**Area (m²)**
0.000	2.3	1.000	2.3

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0095-4000-1000-4000
Design Head (m)	1.000
Design Flow (l/s)	4.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	95
Invert Level (m)	99.000
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)	1.000	4.0	Kick-Flo®	0.629	3.2
Flush-Flo™	0.294	4.0	Mean Flow over Head Range	-	3.5

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)**
0.100	3.0	1.200	4.3	3.000	6.7	7.000	10.0
0.200	3.9	1.400	4.7	3.500	7.2	7.500	10.3
0.300	4.0	1.600	5.0	4.000	7.6	8.000	10.6
0.400	3.9	1.800	5.3	4.500	8.1	8.500	10.9
0.500	3.8	2.000	5.5	5.000	8.5	9.000	11.2
0.600	3.4	2.200	5.8	5.500	8.9	9.500	11.5
0.800	3.6	2.400	6.0	6.000	9.3		
1.000	4.0	2.600	6.2	6.500	9.6		

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 79 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	99.806	0.806	0.0	1.9	1.9	14.2	O K
30 min Summer	99.865	0.865	0.0	1.9	1.9	15.2	O K
60 min Summer	99.867	0.867	0.0	1.9	1.9	15.3	O K
120 min Summer	99.794	0.794	0.0	1.9	1.9	14.0	O K
180 min Summer	99.727	0.727	0.0	1.9	1.9	12.8	O K
240 min Summer	99.665	0.665	0.0	1.9	1.9	11.7	O K
360 min Summer	99.531	0.531	0.0	1.9	1.9	9.3	O K
480 min Summer	99.420	0.420	0.0	1.9	1.9	7.4	O K
600 min Summer	99.332	0.332	0.0	1.9	1.9	5.8	O K
720 min Summer	99.264	0.264	0.0	1.9	1.9	4.7	O K
960 min Summer	99.178	0.178	0.0	1.9	1.9	3.1	O K
1440 min Summer	99.100	0.100	0.0	1.6	1.6	1.8	O K
2160 min Summer	99.070	0.070	0.0	1.3	1.3	1.2	O K
2880 min Summer	99.057	0.057	0.0	1.0	1.0	1.0	O K
4320 min Summer	99.045	0.045	0.0	0.7	0.7	0.8	O K
5760 min Summer	99.039	0.039	0.0	0.6	0.6	0.7	O K
7200 min Summer	99.035	0.035	0.0	0.5	0.5	0.6	O K
8640 min Summer	99.032	0.032	0.0	0.4	0.4	0.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	214.311	0.0	16.1	22
30 min Summer	122.019	0.0	18.3	35
60 min Summer	69.472	0.0	20.8	60
120 min Summer	39.554	0.0	23.7	94
180 min Summer	28.451	0.0	25.6	128
240 min Summer	22.520	0.0	27.0	164
360 min Summer	16.199	0.0	29.1	228
480 min Summer	12.822	0.0	30.8	288
600 min Summer	10.696	0.0	32.1	346
720 min Summer	9.223	0.0	33.2	404
960 min Summer	7.357	0.0	35.3	518
1440 min Summer	5.350	0.0	38.5	742
2160 min Summer	3.891	0.0	42.0	1104
2880 min Summer	3.104	0.0	44.7	1468
4320 min Summer	2.211	0.0	47.7	2160
5760 min Summer	1.738	0.0	50.0	2920
7200 min Summer	1.442	0.0	51.9	3648
8640 min Summer	1.238	0.0	53.5	4336

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	99.030	0.030	0.0	0.4	0.4	0.5	O K
15 min Winter	99.912	0.912	0.0	1.9	1.9	16.0	O K
30 min Winter	99.984	0.984	0.0	2.0	2.0	17.3	O K
60 min Winter	99.998	0.998	0.0	2.0	2.0	17.6	O K
120 min Winter	99.915	0.915	0.0	1.9	1.9	16.1	O K
180 min Winter	99.826	0.826	0.0	1.9	1.9	14.5	O K
240 min Winter	99.737	0.737	0.0	1.9	1.9	13.0	O K
360 min Winter	99.540	0.540	0.0	1.9	1.9	9.5	O K
480 min Winter	99.373	0.373	0.0	1.9	1.9	6.6	O K
600 min Winter	99.257	0.257	0.0	1.9	1.9	4.5	O K
720 min Winter	99.181	0.181	0.0	1.9	1.9	3.2	O K
960 min Winter	99.106	0.106	0.0	1.7	1.7	1.9	O K
1440 min Winter	99.070	0.070	0.0	1.3	1.3	1.2	O K
2160 min Winter	99.053	0.053	0.0	0.9	0.9	0.9	O K
2880 min Winter	99.046	0.046	0.0	0.7	0.7	0.8	O K
4320 min Winter	99.037	0.037	0.0	0.5	0.5	0.7	O K
5760 min Winter	99.032	0.032	0.0	0.4	0.4	0.6	O K
7200 min Winter	99.029	0.029	0.0	0.3	0.3	0.5	O K
8640 min Winter	99.027	0.027	0.0	0.3	0.3	0.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.088	0.0	54.8	5072
15 min Winter	214.311	0.0	18.0	22
30 min Winter	122.019	0.0	20.5	35
60 min Winter	69.472	0.0	23.3	62
120 min Winter	39.554	0.0	26.6	100
180 min Winter	28.451	0.0	28.7	138
240 min Winter	22.520	0.0	30.3	176
360 min Winter	16.199	0.0	32.6	246
480 min Winter	12.822	0.0	34.5	304
600 min Winter	10.696	0.0	35.9	358
720 min Winter	9.223	0.0	37.2	410
960 min Winter	7.357	0.0	39.5	514
1440 min Winter	5.350	0.0	43.1	740
2160 min Winter	3.891	0.0	47.1	1088
2880 min Winter	3.104	0.0	50.0	1464
4320 min Winter	2.211	0.0	53.5	2196
5760 min Winter	1.738	0.0	56.1	2880
7200 min Winter	1.442	0.0	58.1	3608
8640 min Winter	1.238	0.0	59.9	4376

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	99.025	0.025	0.0	0.3	0.3	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	1.088	0.0	61.4	5112

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 548450 309100 TF 48450 09100
C (1km)	-0.026
D1 (1km)	0.307
D2 (1km)	0.334
D3 (1km)	0.283
E (1km)	0.314
F (1km)	2.460
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.040

Time From:	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**	**Time From:**	**(mins) To:**	**Area (ha)**
0	2	0.008	4	6	0.008	8	10	0.008
2	4	0.008	6	8	0.008			

Model Details

Storage is Online Cover Level (m) 100.000

Infiltration Basin Structure

Invert Level (m) 99.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	17.6	1.000	17.6

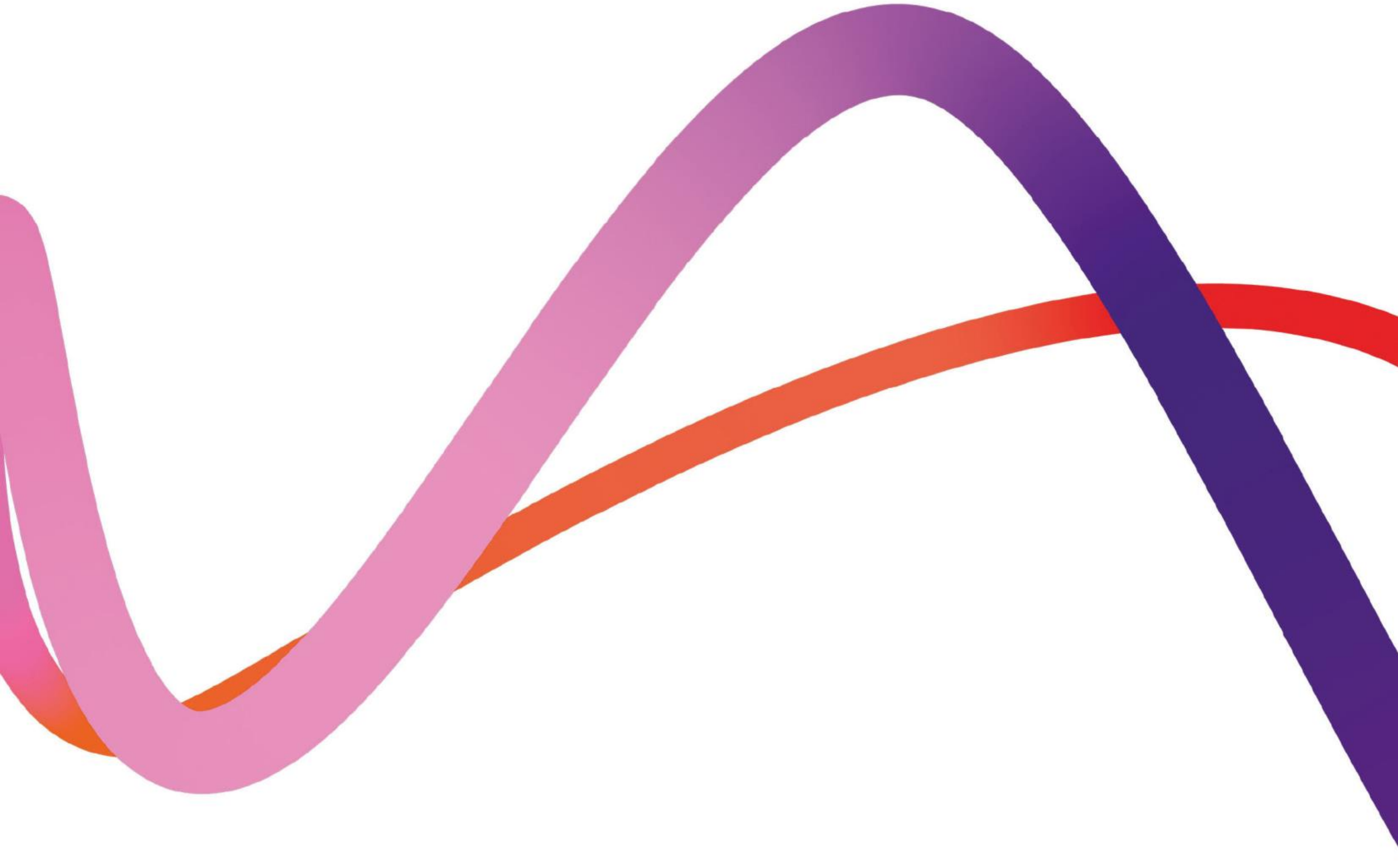
Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0067-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	67
Invert Level (m)	99.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.0	Kick-Flo®	0.599	1.6
Flush-Flo™	0.296	1.9	Mean Flow over Head Range	-	1.7

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)
0.100	1.6	1.200	2.2	3.000	3.3	7.000	4.9
0.200	1.9	1.400	2.3	3.500	3.5	7.500	5.1
0.300	1.9	1.600	2.5	4.000	3.8	8.000	5.2
0.400	1.9	1.800	2.6	4.500	4.0	8.500	5.4
0.500	1.8	2.000	2.7	5.000	4.2	9.000	5.5
0.600	1.6	2.200	2.9	5.500	4.4	9.500	5.7
0.800	1.8	2.400	3.0	6.000	4.6		
1.000	2.0	2.600	3.1	6.500	4.7		



Annex B
Preliminary Dewatering Calculations

Assessing the impacts of dewatering on water resources

Science Project Sc040020

Tier 1 analytical tools, Version 1.6

ENVIRONMENT AGENCY

WATER MANAGEMENT CONSULTANTS

TIER 1 TOOLS

This spreadsheet was produced as part of an Environment Agency science project (Sc040020) to develop a methododology for assessing the hydrogeological impact of dewatering abstractions. The regulatory context for the project was the introduction of new legislation (The Water Act 2003) which, among other things, removed the exemption from licensing previously enjoyed by dewatering abstractions. The assessment methodology has become known as Hydrogeological Impact Appraisal (HIA), and it is intended that similar methodologies will be used for consumptive groundwater abstractions and for groundwater-dependent features such as wetlands.

The HIA methodology, which is fully described in a Science Report (Boak *et al* 2006), takes a tiered approach, in line with Government recommendations on environmental risk assessment. The level of effort in any given appraisal is matched to the risks associated with the decision being made. Various tools are available to help those undertaking HIA, ranging from simple analytical equations (at Tier 1), through more sophisticated analytical models (Tier 2), to fully time-variant numerical groundwater modelling (Tier 3). This spreadsheet contains a selection of simple analytical equations, intended for use during Tier 1 of HIA.

Most of the equations in this spreadsheet will already be familiar to hydrogeologists, as they are standard equations presented in hydrogeological textbooks, guidance documents, and other publications. They are assembled here for convenience, to make it easy to try out different calculations when undertaking HIA. Professional judgement is still required, to decide on which equation to use when, and to take into account all the assumptions that are built into each equation. Notes on using the equations are given on the Index sheet.

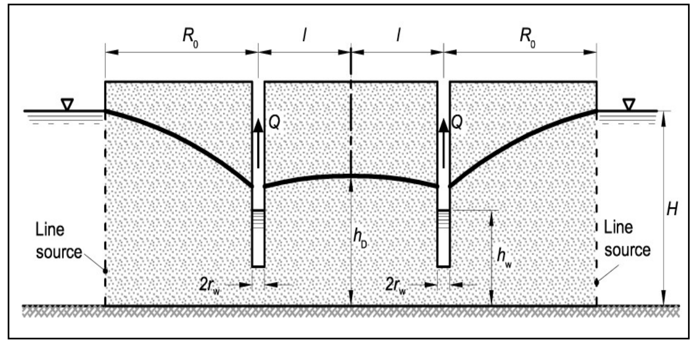
Water Management Consultants Ltd, Shrewsbury, UK (www.watermc.com)

12) Partial penetration by a double row of wellpoints of an unconfined aquifer midway between two equidistant and parallel line sources

$$Q=\left[\left(0.73+0.27\frac{(H-h_w)}{H}\right)\frac{Kx}{R_0}(H^2-h_w^2)\right]$$

Key
Essential input
Optional input
Calculated

		expected		min	max	
Head						
Height of water table at radius of influence	H	13	m	12	14	m
Height of water table at well	h_w	0.1	m	0.1	0.1	m
Conductivity						
Hydraulic conductivity of aquifer	K	0.1	m/d	0.05	0.3	m/d
Length of trench	*x*	80	m	80	80	m
Distance to line source, equal to radius of influence	R_0	50	m	50	100	m
Total discharge from wellpoints	**Q**	26.98	m^3/d	5.75	93.89	m^3/d



(Figures adapted from Mansur & Kaufman, 1962)

Height of WT at centre of dewatered area

$$h_D = h\left[\frac{C_1C_2}{R_0}(H-h)+1\right]$$

Distance to centre of dewatered area	l	15	m
	l/h	150	
Coefficient 1	C_1	1.01	
Radius of each well	r_w	0.1	m
	r_w/H	0.00769	
Coefficient 2	C_2	1.35	
Height of WT at centre of dewatered area	h_D	0.14	m

The following assumptions apply to this equation

- the slot is infinite in length
- R_0/H greater than or equal to 3
- the aquifer is unconfined
- the aquifer is homogeneous, isotropic and of uniform thickness
- the Dupuit Forcheimer assumption is valid
- the aquifer has reached steady state conditions
- the initial water table is horizontal

(Mansur & Kaufman, 1962)

Data sources (to complete an audit trail)		
Height of water table at radius of influence	H	14m deep excavation with groundwater levels 1mbgl (site investigation)
Height of water table at well	h_w	Assumed
Hydraulic conductivity of aquifer	K	PSD data
Length of trench	*x*	Design
Radius of influence	R_0	shortest distance to HWIDB drain
Distance to centre of dewatered area	l	Dewatering is by two lines of wells 30 m apart either side of the excavation
Radius of each well	r_w	Assumed