Hampshire Water Transfer and Water Recycling Project

Environmental Statement – Appendix 19.1 Flood Risk Assessment – 8 of 8 documents

VOLUME NUMBER: 6

PLANNING INSPECTORATE SCHEME NUMBER: WA010002

APPLICATION DOCUMENT REFERENCE: 6.2

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Document	Title
Environmental Statement – Appendix 19.1 Flood Risk Assessment – 1 of 8 documents	Preliminary Flood Risk Assessment
Environmental Statement – Appendix 19.1 Flood Risk Assessment – 2 of 8 documents	Water Recycling Plant Flood Risk Assessment
Environmental Statement – Appendix 19.1 Flood Risk Assessment – 3 of 8 documents	Budds Farm Wastewater Treatment Works Pumping Station and Motor Control Centre Kiosk Flood Risk Assessment
Environmental Statement – Appendix 19.1 Flood Risk Assessment – 4 of 8 documents	Break Pressure Tank and Intermediate Pumping Station E Flood Risk Assessment
Environmental Statement – Appendix 19.1 Flood Risk Assessment – 5 of 8 documents	Intermediate Pumping Station F - Flood Risk Assessment
Environmental Statement – Appendix 19.1 Flood Risk Assessment – 6 of 8 documents	Intermediate Pumping Station G Flood Risk Assessment
Environmental Statement – Appendix 19.1 Flood Risk Assessment – 7 of 8 documents	Break Pressure Tank K Flood Risk Assessment
Environmental Statement – Appendix 19.1 Flood Risk Assessment – 8 of 8 documents	Flood Risk Assessment Sustainable Drainage Systems Strategy

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from
Southern Water

Contents

1 Introduction

1.1 Purpose

1.1.1 Southern Water Services Limited (hereafter referred to as 'the Applicant') produced a Water Resources Management Plan (2020 – 2070) in 2019 (WRMP19), which outlined proposed long-term solutions to address an identified large-scale supply demand deficit in Hampshire from 2027 and to protect the unique chalk rivers in Hampshire, the River Test and River Itchen. This included a selection of long-term and large-scale water resource solutions, one of which was the Hampshire Water Transfer and Water Recycling Project (hereafter referred to as 'the Proposed Development'), which has since become the selected option to play a major role in making up the shortfall in water supply across the Hampshire supply area. The draft WRMP24 and revised draft WRMP24 reaffirmed the need for Proposed Development as the selected option required to address the continuing water resource deficit as identified in the WRMP19.

1.1.2 This report presents a Sustainable Drainage Systems (SuDS) strategy for a Development Consent Order (DCO) application for the Proposed Development. The proposed SuDS strategy has been produced for the indicative design of the Above Ground Plant (AGP) and Water Recycling Plant (WRP) within the Proposed Development as outlined in

1.1.3 Table 1-1; all of the sites would be owned and operated on behalf of the Applicant.

Table 1-1 AGP and WRP within the Proposed Development

AGP and WRP	Location
Proposed Water Recycling Plant (WRP)	The proposed site would be located off Harts Farm Way, Brockhampton, Bedhampton, Langstone, Havant, PO9 1HS.
Proposed Break Pressure Tank and Intermediate Pumping Station E (BPT/IPS-E)	The proposed site would be located off New Down Ln, Cosham, Portsmouth, PO7 5SE.
Proposed Intermediate Pumping Station F (IPS-F)	The proposed site would be located off Wickham Road, North Fareham, Fareham, Hampshire, PO17 5BD.
Proposed Intermediate Pumping Station G (IPS-G)	The proposed site would be located off Titchfield Lane, Wickham, Fareham, Hampshire, PO17 5HB.
Proposed Break Pressure Tank K (BPT-K)	The proposed site would be located off Winters Hill, Lower Upham, Winchester, Hampshire, SO32 2AL.

1.1.4 The pumping station and kiosk at Budds Farm Wastewater Treatment Works (WTW) and the Invasive Non-Native Species (INNS) Treatment Plant at

Otterbourne Water Supply Works (WSW) are not assessed as part of this report, as they comprise development within the Applicant's established operational sites. Surface water drainage and runoff for these elements would be accommodated within the existing site drainage infrastructure.

1.1.5 The AGP and WRP, as outlined in

1.1.6 Table 1-1, are all located within Flood Zone 1, indicating a low probability of flooding from rivers and the sea. Updated National Flood Risk Assessment (NaFRA2) data confirms that all of the sites have a low risk of flooding from all sources, including surface water, even under future climate change scenarios. However, as the AGP and WRP would be located on land that functions hydrologically as greenfield land, a surface water management strategy has been developed for their indicative design using SuDS, to ensure that the development does not result in an increase in rates or volumes of surface water leaving the site under the 1 in 2-year, 1 in 30-year and 1 in 100-year plus climate change rainfall events, while also mimicking natural processes. It is noted that the WRP would be located on land that was formerly a landfill site, and while was previously developed, it currently functions hydrologically as 'greenfield'.

1.1.7 This SuDS strategy has been developed for the indicative design of the AGP and WRP in full accordance with:

- Hampshire County Council's Lead Local Flood Authority (LLFA) guidance,
- Portsmouth City Council's LLFA guidance,
- The National Policy Statement (NPS) for Water Resources Infrastructure [1],
- The National Standards for Sustainable Drainage Systems (SuDS) [2],
- The National Planning Policy Framework (NPPF) [3],
- Planning Practice Guidance (PPG) [4], and
- The Construction Industry Research and Information Association (CIRIA) SuDS Manual (C753) [5].

1.1.8 As set out in the National Standards, SuDS are designed to achieve a range of objectives, including the following:

- Mimic natural drainage and manage surface runoff at or close to the surface and as close to its source as practicable;
- Manage surface water flooding and the rates and volumes of runoff from developments now and in the future;
- Contributing to cleansing diffuse particulate and chemical substances that may be found in surface water runoff by using drainage features in combination as a management train; and

- Providing water quality benefits and opportunities to encourage biodiversity and amenity.

1.2 Report objectives

1.2.1 The proposed AGP and WRP comprises areas of permanent hardstanding. These areas have the potential to increase surface water runoff due to their construction on previously undeveloped greenfield land, which if left unmanaged, could elevate flood risk both on-site and downstream. The objectives of this strategy are:

- To ensure the Proposed Development does not result in increased rates or volumes of surface water leaving the AGP and WRP sites while also mimicking natural processes; and
- To present a SuDS strategy that complies with the NPS and National Standards for SuDS, as well as relevant local planning policy and guidance.

1.2.2 The strategy adopts a natural approach to surface water management. This is in line with national expectations, ensuring runoff is managed close to its source and integrated within the site’s landscape. This would deliver multiple benefits including flood risk mitigation, water quality improvement, biodiversity enhancement, and climate resilience.

1.3 Available information

1.3.1 This report is based on the following available information:

- The Environment Agency’s (EA) Flood Map for Planning,
- Ground investigation works data,
- Publicly available DEFRA LiDAR Digital Terrain Model (DTM) data (LiDAR Composite, DTM at 1m resolution), and
- An indicative site layout plan, topographical survey and outline design drawings of the AGP and WRP, all provided by the Applicant. Site specific design parameters can be found within the Design Principles Document (Document Reference 5.11, DCO Volume 5).

2 Standards and policy

2.1 National policy statement

2.1.1 The National Policy Statement (NPS) for Water Resources Infrastructure provides that measures, including sustainable drainage systems should be put in place to manage flood risk and the impact of the natural water cycle satisfactorily. Within the context of the NPS, the term sustainable drainage systems is used and taken to cover the whole range of sustainable approaches to surface water drainage management including:

- Source control measures, including rainwater recycling and drainage
- Infiltration devices to allow water to soak into the ground, which can include individual soakaways and communal facilities
- Filter strips and swales, which are vegetated features that hold and drain water downhill mimicking natural drainage patterns
- Filter drains and porous pavements to allow rainwater and runoff to infiltrate into permeable material below ground and provide storage if needed
- Basins and ponds to hold excess water after rain and allow controlled discharge that avoids flooding
- Flood routes to carry and direct excess water through developments to minimise the impact of surface water flooding

2.1.2 The NPS states that the surface water drainage arrangements for any project should be such that the volumes and peak flow rates of surface water leaving the site are equivalent to greenfield runoff rates, taking into account climate change, unless specific off-site arrangements are made and result in the same net effect.

2.1.3 Approval for the development’s overall approach to drainage systems will form part of any development consent issued by the Secretary of State. Paragraph 4.7.20 of the NPS provides that the Secretary of State will therefore need to be satisfied that the proposed drainage system complies with the National Standards for Sustainable Drainage Systems. Following the policy requirements of the NPS, the National Standards for SuDS form the guiding policy document for this SuDS strategy.

2.2 National standards for sustainable drainage systems

2.2.1 The National Standards for SuDS were published by the Department for Environment, Food & Rural Affairs (Defra) in June 2025 and, at the time of writing, last updated on 30 July 2025. These standards set out a consistent framework for the design, construction, operation, and maintenance of SuDS in new developments across England, whether on greenfield or brownfield sites. They promote a natural approach to managing surface water, encouraging runoff to be managed close to its source using surface-based features that deliver multiple benefits including flood risk reduction, water quality improvement, biodiversity enhancement, and amenity provision. While these standards are not statutory (since Schedule 3 of the Flood and Water Management Act 2010 has not been enacted in England) they are widely adopted in practice. Planning authorities increasingly expect developers to demonstrate compliance with the standards as part of the planning application process. As such, compliance with the standards is key to securing planning approval and they are considered best practice for sustainable surface water management.

Principles

2.2.2 The National Standards for SuDS contain 11 principles which underpin the design of surface water management schemes, these include:

i. Surface water drainage systems shall be designed, constructed, maintained and operated following a natural approach to managing water. This should mimic natural drainage, manage surface runoff at or close to the surface and as close to its source as practicable. This approach should also control the flow of runoff and provide a range of additional benefits.

ii. The most effective surface water drainage systems use a series of different drainage features, operating as close to the source of runoff as practicable. These should work as a SuDS management train to control flow rates and reduce volumes of runoff, providing water quality benefits and opportunities to encourage biodiversity and amenity.

iii. The “SuDS Approach” treats rainfall and runoff as a resource, managing surface water flooding and controlling runoff rates while improving water quality through pollutant removal. It uses a combination of drainage features in a management train to manage runoff close to its source, delivering multiple benefits throughout the development’s lifetime. SuDS should be sustainable, considering both construction and long-term maintenance, and provide additional environmental and social benefits.

iv. Surface water management should be considered at the very earliest stages of site appraisal.

v. Site design should be informed by drainage needs, using land for multiple purposes (e.g. recreation, landscaping, water management) and ensuring all areas are served by SuDS where possible.

vi. Drainage systems should follow natural flow paths, ensuring exceedance flows are safely managed and integrated with urban design, landscape, and ecology for maximum benefit.

vii. SuDS design must consider local flood risk policies, strategies, assessments, and river basin management plans to ensure consistency and resilience.

viii. Early engagement with the local planning authority (LPA) should be undertaken to agree design, construction, operation and maintenance considerations to support an efficient application process.

ix. Developers should demonstrate compliance with the national standards from the conceptual stage of the planning application process and that a 'SuDS Approach' has been integrated throughout the development and its landscape design.

x. All appropriate planning applications should demonstrate how the national standards have been met in the site design.

xi. Where a development is phased, the design of the surface water drainage system should ensure that each of the standards will be delivered for each phase of the development.

Standards

2.2.3 There are 2 types of standards:

- The hierarchy standard (standard 1) gives criteria for prioritising the choice of final runoff destination.
- Fixed standards (standards 2 to 7) state the minimum design criteria that all surface water drainage systems should satisfy and how they should be built, maintained and operated

2.2.4 Both types of standards have accompanying requirements which provide detail on how to interpret, deliver and evaluate each standard. The seven standards are complementary, and as such, the delivery of each standard should support the delivery of another. A surface water drainage system design that delivers multiple benefits will include a range of features and each of these should contribute to the delivery of several, if not all, of the standards.

2.2.5 The Standards include:

2.2.6 **Standard 1)** A 'SuDS approach' shall be adopted to address the management of surface water by the development and where it should be discharged. Runoff shall be treated as a resource and managed in a way that avoids negative impacts of the development on flood risk, the morphology and water quality of receiving waters and the associated ecology.

2.2.7 Runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy (in order of preference):

- priority 1: collected for non-potable use
- priority 2: infiltrated to ground
- priority 3: discharged to an above ground surface water body

- priority 4: discharged to a surface water sewer, or another piped surface water drainage system
- priority 5: discharged to a combined sewer

2.2.8 **Standard 2)** Apply a 'SuDS approach' so that at least the first 5mm of rainfall for the majority of rainfall events does not result in runoff from the site to surface waters or piped drainage systems. Evidence shall be provided that the approach to managing runoff from 'everyday' rainfall has been developed.

2.2.9 **Standard 3)** A 'SuDS approach' shall be adopted to address the management of development runoff during extreme rainfall, including allowances for climate change and urban creep.

2.2.10 **Standard 4)** Apply a 'SuDS approach' that protects surface waters, groundwater and coastal waters by managing the quality of the surface water runoff to adequately address water quality risks from the development. The proposed SuDS management train(s) shall be based on a robust water quality risk assessment, appropriate to the pollution hazard and sensitivity of receiving waters.

2.2.11 **Standard 5)** A 'SuDS approach' shall be adopted that maximises benefits for amenity through the creation of multi-functional places and landscapes.

2.2.12 **Standard 6)** A 'SuDS approach' shall be adopted to ensure the surface water drainage system maximises biodiversity benefits throughout the development lifecycle.

2.2.13 **Standard 7)** SuDS must be designed for long-term performance, considering construction, operation, maintenance, decommissioning, and structural integrity over the life of the development.

2.3 Local planning policy

Hampshire County Council

2.3.1 The WRP, IPS-F, IPS-G and BPT-K are all located within the Hampshire County Council administrative area, who in their role as the Lead Local Flood Authority (LLFA) have produced Surface Water Guidance [6] that is aligned with the National Standards for SuDS, which form the baseline requirements for surface water drainage design in new developments. The guidance confirms that planning applications in Hampshire will be expected to comply with the National Standards from January 2026. SuDS have therefore been applied to ensure that the development does not result in an increase in rates or volumes of surface water leaving the site while also mimicking natural processes. The LLFA surface water management guidance has been followed with reference to the, the NPS for Water Resources Infrastructure, the National Standards for SuDS, and best practice information as set out in the Non-Statutory Technical Guidance and the CIRIA SuDS Manual (C753).

Portsmouth City Council

2.3.2 The BPT/IPS-E is located within the Portsmouth City Council administrative area, who in their role as the LLFA, have produced a Surface Water Management Plan (SWMP) [7]. The SWMP requires SuDS to be incorporated into all new development where drainage or flood risk may be affected, unless it can be clearly demonstrated that SuDS are inappropriate. Development should ensure post-development surface water runoff rates are no greater than existing rates, with runoff reduction (betterment) strongly preferred, particularly in areas at risk of surface water flooding. SuDS should be designed in accordance with the drainage hierarchy where reasonably practicable, prioritising rainwater reuse, infiltration, and discharge to surface water bodies before connection to sewers. Developers will need to demonstrate compliance with National Standards. SuDS have therefore been applied to ensure that the development does not result in an increase in rates or volumes of surface water leaving the site, while also mimicking natural processes. The LLFA surface water management guidance has been followed with reference to the NPS for Water Resources Infrastructure, the National Standards for SuDS, and best practice information as set out in the Non-Statutory Technical Guidance and the CIRIA SuDS Manual (C753).

3 Description of the proposed development

3.1 Description of the proposed development

3.1.1 The Proposed Development comprises the construction, operation and maintenance of the following components:

- Water Recycling Plant and associated pumping stations.
- Pipelines between Budds Farm Wastewater Treatment Works and the Water Recycling Plant.
- Pipelines between the Water Recycling Plant site and Bedhampton Springs, connecting into pipelines being delivered by Portsmouth Water between Bedhampton Springs and Havant Thicket Reservoir.
- Underground pipeline between the Water Recycling Plant site and Otterbourne Water Supply Works.
- Above Ground Plant comprising Intermediate Pumping Stations and Break Pressure Tanks located along the Pipeline between the Water Recycling Plant and Otterbourne Water Supply Works.

3.1.2 The Proposed Development would also comprise the use of the following existing infrastructure:

- Havant Thicket Reservoir for the storage of recycled water.
- The existing Eastney Long Sea Outfall, Eastney Pumping Station, and Eastney Transfer Tunnel for the release of reject water from the Water Recycling Plant.
- Pipelines and other related works that have been consented separately by Portsmouth Water for the transfer of recycled water and source water between Bedhampton Springs and Havant Thicket Reservoir.
- The construction and operation of the Proposed Development would include other works such as landscaping and environmental mitigation measures.

3.2 Proposed sustainable drainage systems strategy

3.2.1 This report specifically refers to the AGP and WRP, as outlined in

3.2.2 Table 1-1, within the Proposed Development, which includes:

- A new WRP near the existing Budds Farm WTW, with a maximum output of 60 Ml/d of recycled water,
- Pumping stations and break pressure tanks along the length of the underground pipelines.

3.2.3 All of the sites would be owned and operated on behalf of the Applicant.

3.2.4 The pumping station and kiosk at Budds Farm WTW and the INNS Treatment Plant at Otterbourne WSW are not assessed as part of this report, as they comprise development within the Applicant's established operational sites. Surface water drainage and runoff for these elements would be accommodated within the existing site drainage infrastructure.

4 Baseline conditions

4.1 Topography

4.1.1 A summary of existing ground levels and slopes at the proposed locations of the AGP and WRP is provided in Table 4-1. The existing topography has been carefully considered in the SuDS design. This approach ensures that the SuDS closely mimic each site's natural drainage behaviour and allow for gravity-based drainage throughout, eliminating the need for pumped solutions.

Table 4-1 Summary of Existing Ground Levels and Slopes

AGP and WRP	Topography of Existing Site
WRP	The proposed site for the WRP is a former uncapped domestic landfill with variable sloping topography. The terrain forms a broad mound, reaching elevations of approximately 15 mAOD.
BPT/IPS-E	Existing ground levels across the proposed BPT/IPS-E site range from approximately 94 mAOD in the south to around 86 mAOD in the north, indicating a general slope descending from south to north. The direction of this slope is towards the agricultural field to the north of the development, which serves as the primary receptor for existing surface water runoff generated across the site.
IPS-F	Existing ground levels across the proposed IPS-F site range from approximately 27.2 mAOD in the northwestern corner to around 17.4 mAOD in the southeastern corner, indicating a general slope descending from northwest to southeast. The direction of this slope is towards the ordinary watercourse field drain that runs along the northeast of the site, which serves as the primary receptor for existing surface water runoff generated across the site.
IPS-G	Existing ground levels across the proposed IPS-G site range from approximately 53.1 mAOD in the north to around 51.8 mAOD in the south of the site, indicating a general slope descending from north to south. The direction of this slope is towards the ordinary watercourse field drain that runs along the southwest of the site, which serves as the primary receptor for existing surface water runoff generated across the site.
BPT-K	Existing ground levels across the proposed BPT-K site range from approximately 74.6 mAOD in the western corner to around 64.8 mAOD in the eastern corner, indicating a general slope descending from west to east. The direction of this slope is towards the ordinary watercourse field drain that is adjacent to the northeast of the site, which serves as the primary receptor for existing surface water runoff generated across the site.

4.2 Ground conditions

4.2.1 Ground investigation work and infiltration testing has been carried out at the at the proposed locations of the AGP and WRP sites. Trial pits were excavated to a depth of 2.5m and infiltration testing was also conducted in accordance with BRE 365 standards. Infiltration testing has not been conducted at the proposed location of the WRP due to the site being a former uncapped domestic landfill. No infiltration testing has been conducted at IPS-G due to unsuitable ground conditions and trial pits were excluded from testing because of a high water table. Although one pit reached 1.5 m depth, slow seepage was present that limited the feasibility of infiltration testing. Infiltration testing results are presented in Appendix A and summarised in Table 4-2. The infiltration testing indicated slow and variable infiltration rates, and as such, no infiltration has been assumed in the sizing of the SuDS features; the SuDS are therefore inherently conservative in design. However, in practice, some infiltration is expected to occur within the SuDS features, with the exception of the SuDS features at the WRP where they would be impermeably lined due to the underlying landfill material. Although infiltration is listed as Priority 2 in the drainage hierarchy under the National Standards for SuDS, infiltration testing at each site has indicated rates too low to support infiltration as a primary drainage method.

Table 4-2 Infiltration Testing Results

Site Location	Trial Pit No	Easting	Northing	Infiltration Rate (m/s)
BPT/IPS-E	3E7501IT	466419	106462	Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.
BPT/IPS-E	3E7502IT	466456	106483	Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.
BPT/IPS-E	3E7503IT	466459	106508	1.40E-05
BPT/IPS-E	3E7504IT	466435	106523	Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.
BPT/IPS-E	3E7505IT	466448	106461	Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.
BPT/IPS-E	3E7506IT	466393	106470	Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.
BPT/IPS-E	3E7507IT	466393	106500	1.50E-04
BPT/IPS-E	3E7508IT	466405	106524	Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.
IPS-F	3F7509IT	458299	109002	Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.
IPS-F	3F7510IT	458266	109017	Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.
IPS-F	3F7512IT	458224	109025	3.90E-06
IPS-F	3F7513IT	458267	108982	3.50E-05
BPT-K	3K7541IT	452791	118482	Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.

Site Location	Trial Pit No	Easting	Northing	Infiltration Rate (m/s)
BPT-K	3K7542IT	452816	118499	Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.
BPT-K	3K7543IT	452807	118511	Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.
BPT-K	3K7544IT	452769	118473	Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.
BPT-K	3K7545IT	452757	118508	Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.
BPT-K	3K7546IT	452770	118530	Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.

4.3 Flood risk

4.3.1 According to the Flood Map for Planning provided by the EA [8], all of the proposed locations of the AGP and WRP are located within Flood Zone 1, indicating a low probability of flooding from rivers and the sea. The EA’s National Flood Risk Assessment Data (NaFRA2) [9] further supports this, showing the sites to be at low risk from fluvial and surface water flooding, both now and under future scenarios accounting for climate change. No groundwater or sewer-related flood risks were identified. The sites are at very low risk from reservoir failure as shown in the EA reservoir flood risk mapping and addressed in the associated flood risk assessments for each site. Due to high regulatory standards and strict reservoir maintenance, there is a very low risk posed from reservoir flooding. Once the HTR is completed, it would be included in future EA reservoir flood risk mapping, however, given the regulatory controls, the residual risk of reservoir failure would remain very low. Overall, the proposed locations of the AGP and WRP are considered to have a low probability of flooding, as detailed in the associated flood risk assessment for each site.

4.4 Existing drainage

4.4.1 A summary of the existing natural drainage receptors at the proposed locations of the AGP and WRP is provided in Table 4-3. The SuDS designs for all sites have been developed to discharge to the natural drainage receptors, thereby mimicking the site's existing drainage behaviour. This supports a natural approach to managing water, and as such, is in line with the ‘SuDS Approach’ outlined in the National Standards for SuDS.

Table 4-3 Summary of Existing Natural Drainage Receptors

AGP and WRP	Existing Natural Drainage Receptors
WRP	The proposed site of the WRP is a former uncapped domestic landfill which has variable sloping topography forming a broad mound. Rainfall currently sheds in multiple directions due to the broad mound topography, with portions infiltrating into the landfill, some entering surrounding road drainage networks, and some reaching the Hermitage Stream.
BPT/IPS-E	There are no existing sewers or drainage infrastructure in the vicinity of the proposed BPT/IPS-E site. The site naturally slopes to the north, directing surface water towards the agricultural field to the north of the site, which functions as the primary receptor for existing runoff generated across the site.
IPS-F	There are no existing sewers or drainage infrastructure in the vicinity of the proposed IPS-F site. The site naturally slopes to the northeast, directing surface water towards the ordinary watercourse field drain located to the northeast, which functions as the primary receptor for existing runoff generated across the site.
IPS-G	There are no existing sewers or drainage infrastructure in the vicinity of the proposed IPS-G site. The site naturally slopes to the southwest, directing surface water towards the ordinary watercourse field drain located to the southwest, which functions as the primary receptor for existing runoff generated across the site.
BPT-K	There are no existing sewers or drainage infrastructure in the vicinity of the proposed BPT-K site. The site naturally slopes to the northeast, directing surface water towards the ordinary watercourse field drain located to the northeast, which functions as the primary receptor for existing runoff generated across the site.

5 Proposed sustainable drainage systems strategy

5.1 Sustainable drainage systems management train

5.1.1 SuDS have been designed for the indicative design of the AGP and WRP as outlined in

5.1.2 Table 1-1, to promote a natural approach to managing water while also considering the operational nature of the proposed sites and spatial constraints. The SuDS strategy for the AGP and WRP has been designed to be predominantly pipe-free. By managing surface water primarily through above-ground features, the system avoids the need for extensive underground pipework. This approach offers several key benefits: it makes pollution incidents easier to detect and respond to, as contaminants remain visible and contained within surface features rather than being carried away unseen through pipes. It also replicates natural drainage patterns, supporting infiltration and ecological processes. Maintenance is simpler, more cost-effective and pipe-free systems have a significantly lower carbon footprint than subsurface piped systems. Appendix B contains the engineering plans showing the indicative location of the SuDS features within each of the AGP and WRP sites where SuDS have been applied. The SuDS management train for each site follows a broadly consistent approach, incorporating similar principles and techniques tailored to the specific characteristics and constraints of each location. The SuDS management train includes:

a. Loose gravel cover would be located between impermeable plant and buildings, extending approximately 200mm above and 250mm below the surrounding road level. The portion of gravel below road level would serve as long-term storage. However, at the WRP and BPT-K sites, long-term storage is not required (justification is provided in Section 5.3); therefore, the gravel cover at these locations would only need to extend above road level. Surface water would shed off buildings onto the loose gravel cover. During heavy rainfall events, and when the long-term storage capacity in the gravel below road level has been achieved, the water would shed onto the road via drainage holes in the kerbing, set into the main development platform (the platform itself would be ca. 200mm above surrounding road level and its external perimeter would be formed by the drainage kerbs containing outlet holes). From here it would drain as sheet runoff (at low depth/velocity/hazard) across the graded perimeter access road. The gravel would act in a similar way to that of permeable paving to treat and store water before infiltration to ground or controlled discharge to the downstream SuDS features.

b. The uniformly graded and gently sloping grass filter strips surrounding the perimeter access road would receive and treat the runoff through the promotion of sedimentation, filtration and infiltration.

c. At BPT-K, French drains would be installed along either side of the main break pressure tank building to collect roof runoff. These subsurface linear drainage features would intercept and filter surface water through gravel-filled trenches, promoting initial treatment via sedimentation and filtration. The drains would then convey the collected runoff to the adjacent road surfaces, from where it would flow towards the downstream SuDS features.

d. The WRP would also include a bioretention area, a shallow landscaped depression that would reduce runoff rates and volumes, and treat pollution through the use of engineered soils and vegetation. This additional SuDS feature at the WRP has been included in light of the higher land use pollution hazard index posed by the WRP and the sensitive nature of the receiving waterbody: the Hermitage Stream, which flows towards the Chichester and Langstone Harbours Special Area of Conservation and Ramsar site.

e. Perimeter grass swales would then receive the runoff from the filter strips (and WRP bioretention area) to convey, treat and attenuate the surface water runoff. These swales would convey the runoff to the detention basin while also enhancing the natural landscape through aesthetic and biodiversity benefit when compared with a traditional piped based drainage system.

f. The detention basin would form the last feature of the SuDS management train. This would be a landscaped depression, that would be dry except during and immediately following storm events, that would attenuate surface water before discharged at a controlled rate to the natural drainage receptor for each site. The principal water quality benefits of vegetated detention basins are associated with the removal of sediment and buoyant materials. The discharge would be controlled by a Hydro-Brake (or equivalent flow control device/structure, to be determined at the detailed design stage) at the outfall of the detention basin. The flow control structure enables the discharge to be reduced during lower return period rainfall events because of its stage-discharge relationship that limits flow at low water levels and gradually increases it as head rises.

5.2 Long-Term storage

5.2.1 According to the CIRIA SuDS Manual (C753, 2015), long-term storage provision refers to the additional volume of runoff generated by a development that exceeds the volume from the site in its natural (greenfield) state. The formula for estimating the extra runoff volume from a development site compared to the greenfield equivalent, and as such, the formula for the estimation of the long-term storage requirement, is shown in Equation 1.

Equation 1 Long-term storage volume

$$Vol_{xS} = RD \times A \times 10[\frac{PIMP}{100}(\alpha 0.8)(1 - \frac{PIMP}{100})(\beta SPR) - SPR]$$

Vol_{xS} = extra runoff volume of development runoff over greenfield runoff (m³)

***RD** = rainfall depth for the 1:100 year, 6 hour event (mm)*

***PIMP** = impermeable area as a percentage of the total area*

***A** = area of the site, in hectares (ha)*

***SPR** = SPR index for the SOIL or HOST class (specified as a decimal proportion; this specifies the proportion of runoff from previous surfaces. If SPRHOST values are used, then the minimum value should be set to 0.1)*

***α** = proportion of paved area draining to network values (0–1) with 80% assumed runoff*

***β** = proportion of pervious area draining to network or directly to river values (from 0 to 1)*

5.2.2 Where there is a requirement for long-term storage, all of the development has been conservatively assumed to comprise impermeable area, and all of these areas drain to the SuDS features, and as such, Equation 1 simplifies to:

Equation 2 Simplified long-term storage volume

$$Vol_{xs} = RD \times A \times 10\,(0.8 - SPR)$$

5.2.3 The Standard Percentage Runoff (SPR) value has been derived using the WRAP soil type classification, which is consistent with the original development of the IH124 method [10]. The WRAP soil-based SPR values are preferred in this context because they align directly with the assumptions and calibration of the IH124 equation. The SPR values for the AGP and WRP sites have also been determined from the HR Wallingford UK SuDS online tool [11].

5.2.4 The rainfall depth (RD) used in the long-term storage calculations has been defined based on the FEH22 rainfall for a 100-year return period and a 6-hour duration [12]. The RD value reflects the critical storm event used to assess excess runoff volume from the developed site compared to greenfield conditions.

5.2.5 For the AGP sites that require long-term storage (BPT/IPS-E, IPS-F and IPS-G), the input variables of the long-term storage equation are shown in Table 5-1**Error! Reference source not found.**, alongside the long-term storage volume requirement based on Equation 2. The long-term storage achieved within the SuDS design is also shown in Table 5-1.

Table 5-1 Input Variables of the Long-Term Storage Equation

AGP	Development Area (A) (ha)	Standard Percentage Runoff (SPR)	Rainfall Depth (RD) (mm) (FEH22 rainfall for a 100-year return period and a 6-hour duration)	Long-Term Storage Volume Required (m^3)	Long-term Storage Volume Achieved (m^3)
BPT/IPS-E	0.52	0.47	61.88	106.19	145.72
IPS-F	0.35	0.47	59.83	69.1	73.35
IPS-G	0.35	0.47	59.22	68.4	85.88

5.2.6 This additional runoff generated by the development represents the long-term storage requirement for the SuDS, which is accounted for in the loose gravel cover set at a depth below road level between impermeable plant and buildings. The loose gravel cover below road level would store water ensuring it is prevented from leaving the site other than through infiltration to ground or evaporation. The provision of long-term storage within the SuDS design enables the maximum permissible discharge rate of the Hydro-Brake at the detention basin to be set at the 1 in 100-year greenfield runoff rate as per standard 3.20 in the National Standards for SuDS: *"3.20 Where the volume of runoff discharged from the development to surface waters or sewers for the 1% AEP, 6-hour rainfall event is less than or equivalent to the volume of greenfield runoff for the same event, the peak allowable discharge rate from the development for the 1% AEP event shall be limited to the 1% AEP greenfield runoff rate or 3l/s/ha, whichever is the greater"*. The Hydro-Brake also enables the discharge to be reduced during lower return period rainfall events because of its stage-discharge relationship that limits flow at low water levels and gradually increases it as head rises.

5.3 Discharge rates

5.3.1 Baseline runoff rates for each site have been calculated using pre-development direct rainfall modelling undertaken in InfoWorks Integrated Catchment Modelling (ICM). FEH22 rainfall data and associated catchment descriptors were applied to each site to derive design rainfall profiles. Baseline simulations were undertaken using existing ground levels derived from LiDAR Digital Terrain Model data, with no climate change allowance applied, to represent greenfield conditions. Where relevant, upstream contributing catchments draining through the sites were delineated from the baseline terrain and included within the model. Baseline runoff rates were defined by extracting peak flows at downstream flow-through lines for the 1 in 2-year, 1 in 30-year and 1 in 100-year rainfall events, and these rates were subsequently used to inform the SuDS flow control sizing to ensure post-development discharges do not exceed greenfield runoff conditions. The methodology and results of the ICM for baseline conditions is provided in Appendix C.

5.3.2 At the AGP where long-term storage is provided, the discharge from the final detention basins have been capped at the 1 in 100-year greenfield runoff rate. The Hydro-Brake also enables the discharge to be reduced during lower return period rainfall events (1 in 2-year and 1 in 30-year rainfall events) because of its stage-discharge relationship that limits flow at low water levels and gradually increases it as head rises.

5.3.3 In accordance with the National Standards for SuDS, the discharge rate at the SuDS outfall for the WRP is not subject to the same restrictions as other sites. This is because the receiving waterbody, the Hermitage Stream, is tidal in nature and, as stated in the standards, where runoff discharges to an above-ground surface water body capable of accommodating uncontrolled flows without causing environmental harm, such as the sea or large tidal estuaries, requirements to control discharge to the equivalent greenfield runoff rates do not apply. The discharge rate at the WRP SuDS has been initially assessed at 250 l/s, which served as a maximum flow rate; this is a significant betterment over the uncontrolled post-development rate, which was estimated at approximately 600l/s. Final design and confirmation of this rate would be undertaken by the Contractor to suit the final basin levels. An assessment of the suitability of the Hermitage Stream to receive the proposed maximum discharge rate of 250 l/s has been undertaken using the National River Flow Archive (NRFA) gauging station 42017 - Hermitage Stream at Havant [13], for which the EA is the measuring authority. The river station QMED value is 9.42 m^3/s (9420 l/s), this represents the median annual flood flow at the location of the gauging station on the Hermitage Stream. It is also noted that the gauging station is located approximately 1.5 km upstream of the proposed WRP SuDS discharge location, and as such, flood flows would be expected to be even higher than this at the location of the SuDS discharge into the Hermitage Stream. The discharge rate for the SuDS at the WRP has been initially assessed at 250 l/s, which served as a maximum flow rate for the 1 in 100-year plus 45% climate change rainfall event. This demonstrates a negligible proportional increase relative to the river's typical flood flows, evidencing that the Hermitage Stream is capable of receiving the proposed SuDS discharge.

5.3.4 Due to spatial constraints at the BPT-K site, the provision for long-term surface water storage is not feasible. As such, the permissible discharge rate from the site has been restricted to 10 l/s to ensure that discharge does not exceed the baseline 1 in 2-year greenfield runoff rate.

5.3.5 The estimate of the greenfield runoff rates for the AGP and WRP sites based on the ICM for baseline conditions are shown in Table 5-2. The greenfield runoff rates for the 1 in 2-year, 1 in 30-year and 1 in 100-year are shown alongside the maximum permissible discharge of the SuDS from each site, with justification provided.

Table 5-2 Greenfield Runoff Rates

AGP and WRP	Greenfield 1 in 2-year (l/s)	Greenfield 1 in 30-year (l/s)	Greenfield 1 in 100-year (l/s)	Maximum Permissible SuDS Discharge (l/s)	Justification
WRP	N/A	N/A	N/A	N/A	In accordance with Standard 3.9 of the National Standards for SuDS, the discharge rate at the SuDS outfall for the WRP is not subject to the same restrictions as other sites. This is because the receiving waterbody is tidal in nature and, as stated in the standards, where runoff discharges to an above-ground surface water body capable of accommodating uncontrolled flows without causing environmental harm, such as the sea or large tidal estuaries, requirements to control discharge to the equivalent greenfield runoff rates do not apply.
BPT/IPS-E	9.6	18.8	23.1	23.1	Long-term storage within the SuDS design ensures that the volume of runoff discharged from the development to surface waters is less than or equivalent to the volume of greenfield runoff for the same event. As such, the peak allowable discharge rate from the development for the 1% AEP event shall be limited to the 1% AEP greenfield runoff rate.
IPS-F	3.1	7.68	14	14	Long-term storage within the SuDS design ensures that the volume of runoff discharged from the development to surface waters is less than or equivalent to the volume of greenfield runoff for the same event. As such, the peak allowable discharge rate from the development for the 1% AEP event shall be limited to the 1% AEP greenfield runoff rate. The SuDS at IPS-F would also receive additional runoff from the upstream catchment that has been accounted for in the design.

AGP and WRP	Greenfield 1 in 2-year (l/s)	Greenfield 1 in 30-year (l/s)	Greenfield 1 in 100-year (l/s)	Maximum Permissible SuDS Discharge (l/s)	Justification
IPS-G	10.2	23.1	55	55	Long-term storage within the SuDS design ensures that the volume of runoff discharged from the development to surface waters is less than or equivalent to the volume of greenfield runoff for the same event. As such, the peak allowable discharge rate from the development for the 1% AEP event shall be limited to the 1% AEP greenfield runoff rate. The SuDS at IPS-G would also receive additional runoff from the upstream catchment that has been accounted for in the design.
BPT-K	13.1	24.7	30.4	13.1	Due to no long-term storage within the SuDS, the volume of runoff discharged from the for the 1% AEP, 6-hour rainfall event is greater than the volume of greenfield runoff for the same rainfall event, as such, the peak allowable discharge rate from the development for the 1% AEP event is limited to the 50% AEP greenfield runoff rate. The allowable discharge rate has been limited to 10 l/s to provide a betterment.

5.4 Sustainable drainage systems discharge receptor

5.4.1 The proposed SuDS for IPS-F, IPS-G and BPT-K would discharge from the detention basin into adjacent ditches/field drains, which are designated as Ordinary Watercourses. The connection from the SuDS to the ordinary watercourses is anticipated to be via underground pipework into a headwall structure on the ordinary watercourse. This allows for the controlled discharge into the receiving watercourse and is a standard method for such connections.

5.4.2 The proposed SuDS for BPT/IPS-E would discharge from the detention basin as overland flow to the existing natural receptor via a swale that would convey the flow, with its outfall gradually tapering to the existing ground elevation to enable diffuse, non-concentrated discharge downslope. The existing receptor for BPT/IPS-E is the agricultural field located to the north of the site. Surface water would be discharged as overland flow down the site's slope, mimicking natural and existing flow conditions. The SuDS features have been designed to route around the screening bund and under the access road.

5.4.3 The proposed SuDS at the WRP would discharge from the detention basin via a concrete culvert beneath the adjacent public footpath into the tidal section of the Hermitage Stream, which is classified as a Main River. A flow control would be incorporated to help maintain permanent wetness within the basin, supporting ecological and water quality functions while also mitigating erosion risk at the outfall. A concrete headwall would be constructed on the bank of the Hermitage Stream to facilitate this connection, consistent with existing headwall structures already present along the Hermitage Stream in this area. To deter the passage of eels, a step would be placed within the SuDS outfall pipe. The step would be a minimum of 0.3m in height and have an overhang/lip (Design Principle: WRP_2 Hermitage Stream). The final outfall location, situated within the DCO-defined boundary along the WRP land parcel, would be confirmed during detailed design.

5.4.4 The SuDS indicative designs for all sites have been developed to discharge to the natural drainage receptors, as outlined in Table 4-3, thereby mimicking the site's natural drainage behaviour.

5.5 Sustainable drainage systems performance testing and designing for exceedance

5.5.1 The SuDS strategy for the AGP and WRP has been designed to manage the 100-year plus 45% climate change peak rainfall event. The 45% uplift represents the upper end allowance for the East Hampshire Management Catchment for the 2070s epoch (the 2070s epoch is applied to developments with a lifetime between 2061 and 2125). All of the AGP and WRP sites are located within the East Hampshire Management Catchment. The design of the SuDS for each site was initially sized using InfoDrainage, based on the development platform area only. This approach provided preliminary estimates of storage and flow control requirements for impermeable surfaces within the development. The InfoDrainage model setup and results are provided in Appendix D. A direct rainfall model undertaken in InfoWorks ICM has assessed the performance of the SuDS features under the 1 in 2-year, 1 in 30-year and 1 in 100-year rainfall events, all with an appropriate upper end climate change allowance. The indicative site layouts, including the indicative SuDS layouts, have been incorporated into the terrain models to simulate overland flow routing. The model outputs demonstrate how rainfall runoff is managed across the sites, with results showing expected water depths, velocities, and hazard ratings. The modelling confirms the effectiveness of the SuDS in mitigating surface water flood risk while also showing low water depths and a low hazard rating across the sites. Additionally, the modelling illustrates pre and post development exceedance flow routes, to show how surface water is conveyed across the sites before and after development.

5.5.2 The baseline pre-development models were used to determine the greenfield runoff rates for the sites, and where relevant, their upstream contributing catchment. The 1 in 2-year and 1 in 30-year rainfall events have been modelled to ensure that the discharge from the SuDS do not exceed the greenfield runoff rates for these lower order events. The 1 in 2-year, 1 in 30-year and 1 in 100-year simulations for the proposed SuDS demonstrate that there is an overall reduction in discharge rates relative to baseline greenfield conditions, even when climate change is considered. Full results and mapping outputs of the ICM direct rainfall modelling are provided in Appendix C. For IPS-F and IPS-G, the SuDS system would receive runoff from the wider upstream catchment and this has been accounted for within the design of the SuDS and the associated discharge rates.

5.5.3 The proposed SuDS have been designed and modelled to accommodate the 1 in 100-year plus 45% climate change rainfall event. In accordance with Paragraph 4.7.12 of the NPS for Water Resources Infrastructure and Section 3.40 of the National Standards for SuDS, consideration has been given to events that exceed the design capacity of the system.

5.5.4 All proposed buildings and structures are set a minimum of 200mm above road level, ensuring that in all rainfall scenarios surface water runoff sheds away from buildings and onto the roads. The site topography and drainage layout have been designed such that exceedance flows follow predictable and controlled flow routes. Runoff from buildings and hardstanding would drain to perimeter filter strips and swales which are set below road level, conveying flows toward the detention basin located at the lowest point of the site. In the event of a storm exceeding the 1 in 100-year plus climate change design event, exceedance flows would continue to follow these same overland flow routes as identified in Appendix C, conveying water toward the detention basin. Baseline ICM modelling has identified existing exceedance pathways/receptors, exceedance flows from each site would replicate these existing flow paths and would drain to existing exceedance receptors.

5.5.5 It is therefore considered that for events exceeding the design capacity of the proposed SuDS system, surface water would be safely conveyed along defined exceedance pathways to the natural drainage receptor without adverse flood risk to the development, surrounding land, or third-party receptors. No properties or vulnerable receptors are located within the exceedance flow route, and no adverse impacts are anticipated.

5.6 Water quality

5.6.1 The SuDS management train has been tested for pollution mitigation through the use of the CIRIA Simple Index Approach. This method is used to assess and mitigate pollution risks in surface water drainage systems, particularly in SuDS. It was developed by the Construction Industry Research and Information Association (CIRIA) as part of their guidance document CIRIA C753: The SuDS Manual. CIRIA assigns pollution hazard indices for three key pollutants: total suspended solids (TSS), metals and hydrocarbons. The SuDS are then assessed as to their sufficiency in removing these pollutants. The following steps are applied:

a. Determine the pollution hazard index;

b. Determine the pollution mitigation index for the proposed SuDS components; and

c. Determine sufficiency of pollution mitigation indices for selected SuDS components.

5.6.2 For a SuDS to be effective, the mitigation indices must be equal to or greater than the pollution hazard indices for each pollutant.

5.6.3 The CIRIA Simple Index Approach for the proposed SuDS management train is included in Appendix E; it is conservatively based upon the highest possible pollution hazard index (i.e. a Site where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured). The pollution mitigation index is also conservatively assumed to only include three SuDS features: Filter Strip, Swale and Detention Basin (the loose gravel cover that would provide initial filtration of surface water and the bioretention area at the WRP that would reduce runoff rates and volumes and treat pollution through the use of engineered soils and vegetation, are conservatively not included in the assessment). According to the Simple Index Approach, the SuDS are sufficient in mitigating TSS, metals and hydrocarbon pollutants.

5.6.4 A conservative, site-wide high pollution hazard index was applied in the Simple Index Approach; however, this rating does not apply to all areas of the site. The only areas where chemicals are delivered or handled are fully bunded and drained to foul, and are therefore completely isolated from the SuDS system. As runoff from these areas does not enter the surface water system, the Simple Index Approach remains appropriate for the areas discharging to SuDS, and the proposed SuDS train provides sufficient pollution mitigation.

5.6.5 The SuDS for each site would include an isolation/shut off penstock (or similar mechanism) at the final outfall of the detention basins, as shown in Appendix B. This would allow the outfall to be closed in the worst-case event of chemical or fuel spills occurring across the whole site.

5.6.6 Chemical delivery would take place at the WRP, as such, chemical delivery areas within the WRP site would be bunded and drained to foul to prevent contamination with clean surface water runoff reaching the SuDS system. Concrete kerbs/sleeping policeman would form a continuous sealed bund around delivery areas that would drain to a foul pumping station to be forwarded on to Budds Farm WTW. A separator would be in place on the drainage runs from the delivery areas to the on-site foul pumping station. When a delivery vehicle arrives on site, they would use a "Castell" key interlock system, which forces the driver to divert the drainage from the bund to an offline interceptor tank, so that if any spillages occur during delivery these can be captured. Once delivery is complete and driver has washed out the delivery hoses (all going to interceptor), drainage would be diverted to the on-site foul pumping station to be forwarded on to Budds Farm WTW.

5.6.7 Given its location at a historic landfill site, the SuDS features and gravel areas at the WRP would be lined with an impermeable liner. The core of the geo-environmental strategy for the WRP is 'betterment' - i.e., construction of the WRP would not provide complete remediation as this is simply not feasible, but it would make the post-development geo-environmental conditions better than the present conditions. Largely, this is achieved by emplacing impermeable surfacing and then capturing the run-off to a non-infiltration SuDS drainage system.

5.6.8 The proposed SuDS features would provide attenuation storage of surface water while also providing water quality benefit. Although elements of the SuDS are below the threshold for inclusion in the Biodiversity Net Gain (BNG) calculations, they would nonetheless deliver additional biodiversity benefits. The provision of SuDS as part of the surface water management plan for the site ensures that the development does not increase the rate or volume of surface water leaving the AGP and WRP site.

5.6.9 An outline SuDS planting and maintenance statement for the proposed SuDS has been produced and is available in Appendix F.

5.7 Water recycling plant access

5.7.1 The WRP includes the widening of the existing access road leading to the site. This access is currently formed of impermeable hardstanding and drains southwards towards Harts Farm Way, where runoff then enters the roadside ditch that runs adjacent to the north of this road. Although the proposed SuDS for the WRP would intercept a large proportion of the existing surface water runoff currently shedding from the access road into the ditch, the widening of the access would result in a net increase in impermeable area that must be managed. In accordance with the SuDS principles applied across this strategy, surface water runoff from the proposed widened access would be conveyed, treated and attenuated through a filter strip and swale running parallel to the access road. The access would be graded to direct runoff onto these SuDS features, which would subsequently convey flows to a shallow (600 mm deep) attenuation basin located near the site entrance. The basin would have a total volume of 33m^3 to attenuate flow such that discharge from the system does not exceed preexisting conditions. The basin would provide attenuation and water quality treatment prior to a controlled discharge to the existing ditch along Harts Farm Way. The outfall control would be achieved via a weir or similar structure. Discharge from this basin would be limited to the existing impermeable runoff rate and has been verified against the existing 1 in 2-year, 30-year and 100-year runoff rate. The indicative layout of the SuDS for the WRP access road is shown within the SuDS indicative layout plan for the WRP in Appendix B.

5.7.2 To determine the existing 1 in 2-year, 30-year and 100-year peak runoff rate from the existing access road, a simplified baseline model was developed in InfoDrainage. The existing impermeable area draining to the ditch is shown in Figure 1, and has an approximate area of 595 m². This existing impermeable runoff catchment was represented as a single sub-catchment routed directly to a reporting manhole with no intervening pipework, storage or infiltration, ensuring that no artificial attenuation was introduced.

Figure 1 The Existing WRP Site Access Road Impermeable Area Catchment

5.7.3 FEH22 design rainfall was applied across a full range of storm durations. The 1 in 2-year, 30-year and 100-year rainfall events were simulated within the baseline model to establish the controlled discharge rate to which the basin outfall would be restricted. Climate change allowances have not been applied in determining the existing runoff rate of the access road. As expected for a small impermeable catchment, the short-duration summer storm generated the highest peak flow, with the 15-minute event producing the peak runoff rate. The existing peak runoff rates for the access road are shown in Table 5-3. These values have therefore been adopted as the existing runoff rate for the access road and forms the baseline for setting the proposed discharge control.

Table 5-3 Existing Peak Runoff Rates for the Access Road

Rainfall Event	Peak Runoff Rate from Existing Access Road
1 in 2-year	10.9 l/s
1 in 30-year	23.4 l/s
1 in 100-year	29.5 l/s

5.7.4 The proposed SuDS for the widened access road to the WRP have been designed using InfoDrainage based on an impermeable catchment area of approximately 960 m², representing the enlarged new access road that would drain to the existing ditch along Harts Farm Way. Within the model, runoff from this area is conveyed via a swale into a detention basin, which provides attenuation before discharging into the ditch through a weir-controlled outfall. The basin has a total depth of 600 mm, with the compound weir assigned to regulate discharge. The proposed compound weir comprises a weir extending the full depth of the attenuation basin. The lower 300mm of the weir is narrower in width, acting as the primary flow control to regulate discharge during smaller, more frequent storm events and to allow the basin to drain completely between events. The upper 300mm of the weir is wider in width, providing additional discharge capacity during larger design events, preventing excessive water levels within the basin whilst continuing to restrict discharge to the existing runoff rate for the access road.

5.7.5 The design ensures that peak discharge rates, while also accounting for future climate change allowances, from the proposed access road SuDS do not exceed the existing baseline flows. The InfoDrainage model setup and results are shown in Appendix D. The East Hampshire Management Catchment upper end climate change allowances for the 2070s epoch (development with a lifetime between 2061 and 2125) have been incorporated by applying a 40% uplift to the 2-year and 30-year design storms and a 45% uplift to the 100-year event. Peak discharge rates for the proposed access road SuDS are shown in Table 5-4. There is a net reduction in peak runoff rates in all events when compared to the peak runoff rates of the existing access road. The InfoDrainage results demonstrate that, even under future climate scenarios, the proposed SuDS for the WRP access road would not increase runoff rates when compared with existing conditions, ensuring compliance with the drainage principles established for the wider Proposed Development.

Table 5-4 Peak Discharge Rates for the Proposed WRP Access Road SuDS

Rainfall Event	Peak Runoff Rate from Proposed SuDS
1 in 2-year +40%CC	7.7 l/s
1 in 30-year +40%CC	20.4 l/s
1 in 100-year +45%CC	29.1 l/s

5.7.6 The SuDS has been designed to manage runoff up to the 1 in 100-year plus climate change event. For rainfall events that exceed this design standard, the system would continue to operate safely by allowing exceedance flows to follow the natural topography of the access road. As the SuDS features have been aligned with existing ground levels, any exceedance runoff would naturally flow along the established overland flow paths and drain toward the site's existing downstream receptor. Given that the exceedance route is along the access road, no sensitive buildings or infrastructure are at risk of flooding.

6 Sustainable drainage systems principles/standards review

6.1 Sustainable drainage systems principles

6.1.1 Following the NPS for Water Resources Infrastructure, the approval for the development's overall approach to drainage systems will form part of any development consent issued by the Secretary of State. The Secretary of State will therefore need to be satisfied that the proposed drainage system complies with the National Standards for Sustainable Drainage Systems. All submissions for planning consents should demonstrate how the principles of the National Standards for SuDS have been met in the design. Table 6-1 demonstrates how the SuDS strategy for the AGP and WRP complies with these principles.

6.2 Sustainable drainage systems standards

6.2.1 Following the NPS for Water Resources Infrastructure, the approval for the development's overall approach to drainage systems will form part of any development consent issued by the Secretary of State. The Secretary of State will therefore need to be satisfied that the proposed drainage system complies with the National Standards for Sustainable Drainage Systems. All submissions for planning consents should demonstrate how the National Standards for SuDS have been met in the design. There may be specific circumstances or constraints, such as the type or size of a development that mean it is not possible to deliver one or more of the standards. In these circumstances the opportunity to meet the standard shall be maximised and justification be developed in consultation with the approving body, who may agree to a departure unless regulatory controls prohibit such a departure. Table 6-2 demonstrates how the SuDS strategy for the AGP and WRP complies with these standards and justifies exception criteria where appropriate.

Table 6-1 Compliance with SuDS Principles

SuDS Principle	Compliance
Surface water drainage systems shall be designed, constructed, maintained and operated following a natural approach to managing water. This should mimic natural drainage, manage surface runoff at or close to the surface and as close to its source as practicable. This approach should also control the flow of runoff and provide a range of additional benefits.	The SuDS strategy mimics natural drainage using surface-based features such as gravel cover, filter strips, bioretention area, swales, and a detention basin. The SuDS strategy controls runoff rates and volumes to ensure they do not exceed baseline greenfield conditions.
The most effective surface water drainage systems use a series of different drainage features, operating as close to the source of runoff as practicable. These should work as a SuDS management train to control flow rates and reduce volumes of runoff, providing water quality benefits and opportunities to encourage biodiversity and amenity.	The SuDS strategy uses a series of SuDS features in a management train that starts at the source of the runoff. The provision of vegetated features such as filter strips, swales and detention basin provides water quality benefits and encourages biodiversity compared to traditional piped drainage systems.
The 'SuDS Approach' is defined as: SuDS should treat rainfall and runoff as a resource, manage surface water flooding and runoff rates, cleanse pollutants, using drainage features in combination as a management train, managing runoff close to its source, delivering multiple benefit SuDS over the lifetime of the development and being sustainable, considering both construction and long-term maintenance and the additional environmental and social benefits afforded by the system.	The SuDS strategy aligns with the 'SuDS Approach'. The SuDS manages runoff rates, manages flooding and water quality in a management train, manages runoff close to its source and is designed for long-term performance while also providing biodiversity benefit (Although elements of the SuDS are below the threshold for inclusion in the BNG calculations, they would nonetheless deliver additional biodiversity benefits). Pollution mitigation is confirmed using the CIRIA Simple Index Approach (Appendix E).
Surface water management should be considered at the very earliest stages of site appraisal.	Surface water management was considered from the outset, with infiltration testing and flood modelling informing the SuDS design. The SuDS have been influential in the design of the site layout from an early stage.
Site design should be informed by drainage needs, using land for multiple purposes (e.g. recreation, landscaping, water management) and ensuring all areas are served by SuDS where possible.	The SuDS features are integrated into the site layout and landscape, providing water management and biodiversity benefits. Land is not used for recreational use as it would be an operational site.
Drainage systems should follow natural flow paths, ensuring exceedance flows are safely managed and integrated with urban design, landscape, and ecology for maximum benefit.	The site layout and SuDS design follow natural drainage patterns, with exceedance flow routes modelled. The SuDS discharge into the existing natural drainage receptor for the site.
SuDS design must consider local flood risk policies, strategies, assessments, and river basin management plans to ensure consistency and resilience.	The strategy aligns with the NPS for Water Resources Infrastructure, the PPG, Hampshire County Council and Portsmouth City Council LLFA guidance, the CIRIA SuDS Manual, and the National Standards for SuDS.

SuDS Principle	Compliance
Early engagement with the local planning authority (LPA) should be undertaken to agree design, construction, operation and maintenance considerations to support an efficient application process.	Several pre-application meetings have taken place with Hampshire County Council and Portsmouth City Council in their roles as LLFA for the Proposed Development. The concept proposals for the SuDS strategy were presented, including the SuDS philosophy, hierarchy, and long-term storage approach. The proposed use of gravel for long-term storage, infiltration to ground where feasible, and exceedance runoff conveyed via filter strips and swales to a detention basin was discussed. Both LLFAs confirmed agreement with the proposed SuDS concept and approach.
Developers should demonstrate compliance with the national standards from the conceptual stage of the planning application process and that a 'SuDS Approach' has been integrated throughout the development and its landscape design.	The SuDS strategy demonstrates compliance with national standards and integrates SuDS throughout the site design.
All appropriate planning applications should demonstrate how the national standards have been met in the site design.	This principle is achieved through this report.
Where a development is phased, the design of the surface water drainage system should ensure that each of the standards will be delivered for each phase of the development.	The Proposed Development would not be phased; the SuDS have been influential in the design of the site layout from an early stage.

Table 6-2 Compliance with SuDS Standards”

SuDS Standard	Compliance
Standard 1) A ‘SuDS approach’ shall be adopted to address the management of surface water by the development and where it should be discharged. Runoff shall be treated as a resource and managed in a way that avoids negative impacts of the development on flood risk, the morphology and water quality of receiving waters and the associated ecology. Runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy (in order of preference):	
Priority 1: collected for non-potable use	N/A: The proposed BPT and IPS sites would remain largely unmanned, with minimal operational demand for non-potable water. As such, the collection and reuse of surface water was not considered viable, given the infrequent use of toilet facilities and the limited overall requirement of non-potable water on these sites. Water reuse was not incorporated into the SuDS strategy for the Proposed WRP as it was not considered operationally feasible for this site, and would require pumping. According to the National Standards for SuDS, pumping shall only be utilised for any parts of the development that cannot be drained by gravity. The proposed SuDS strategy for the WRP site utilises a gravity-based system which is deemed preferential.
Priority 2: infiltrated to ground	The SuDS strategy involves the use of source control and infiltration/sub-base storage techniques within the loose gravel to manage water directly adjacent to the source of runoff. Infiltration testing was also conducted in accordance with BRE 365 standards. The testing indicates slow and variable infiltration rates, and as such, infiltration cannot be solely relied on as a discharge receptor. As a conservative approach, no infiltration has been assumed in the sizing of the SuDS features. However, in practice, some infiltration is expected to occur within the SuDS features. There would be no infiltration within the SuDS features of the WRP as these would be impermeably lined due to the site being a former landfill.
Priority 3: discharged to an above ground surface water body	The SuDS strategy would attenuate runoff and provide a controlled release to the natural drainage receptor of the sites. For BPT/IPS-E this would be the field to the north of the site, for the WRP this is the adjacent EA Main River and for IPS-F, IPS-G and BPT-K this is an ordinary watercourse field drain adjacent to the site. The proposed drainage receptor for each site has

SuDS Standard	Compliance
	replicated the sites natural drainage conditions; the proposed SuDS strategy therefore mimics existing natural drainage behaviour.
Priority 4: discharged to a surface water sewer, or another piped surface water drainage system	The SuDS strategy does not discharge to a surface water sewer, or another piped surface water drainage system.
Priority 5: discharged to a combined sewer	The SuDS strategy does not discharge to a combined sewer.
Standard 2) Apply a 'SuDS approach' so that at least the first 5mm of rainfall for the majority of rainfall events does not result in runoff from the site to surface waters or piped drainage systems. Evidence shall be provided that the approach to managing runoff from 'everyday' rainfall has been developed.	The SuDS strategy has been developed to ensure that at least the first 5mm of rainfall from the majority of rainfall events is retained on-site and does not result in runoff to surface waters or piped drainage systems, in accordance with the National SuDS Standards. At BPT/IPS-E, IPS-F and IPS-G long-term storage is provided beneath the loose gravel cover, which significantly exceeds the volume required to retain the first 5mm of rainfall. As demonstrated in Section 5.2. This ensures that runoff from everyday rainfall events is effectively retained within the site. Although long-term storage is not provided at the WRP and BPT-K, the SuDS features at these sites have been designed to promote attenuation of everyday rainfall. The use of loose gravel cover, French drains, filter strips, swales, and bioretention areas ensures that the first 5mm of rainfall is captured and treated at source and not discharged to surface waters or piped systems. These features collectively provide sufficient interception capacity to meet the standard, even in the absence of dedicated long-term storage. The SuDS strategy would provide a sufficient volume of attenuation storage (i.e. within the loose gravel long-term storage and the attenuation features) to accommodate all of the runoff generated by the Proposed Development during the design event (whilst taking climate change into account). The SuDS have been designed to accommodate the 1 in 100-year rainfall event, with a 45% uplift for climate change. As such, for most events, discharges are likely to remain at or close to zero.

SuDS Standard	Compliance
Standard 3) A 'SuDS approach' shall be adopted to address the management of development runoff during extreme rainfall, including allowances for climate change and urban creep.	The SuDS strategy would provide a sufficient volume of attenuation storage (i.e. within the loose gravel long-term storage and the attenuation features) to accommodate all of the runoff generated by the Proposed Development during the design event (whilst taking climate change into account). The SuDS have been designed to accommodate the 1 in 100-year rainfall event, with a 45% uplift for climate change. The 45% uplift represents the upper end allowance for the East Hampshire Management Catchment for the 2070s epoch. As presented in this report, the provision of long-term storage ensures that the Proposed Development does not result in an increase in surface water runoff volume. Standard 3.20 states that: "*Where the volume of runoff discharged from the development to surface waters or sewers for the 1% AEP, 6-hour rainfall event is less than or equivalent to the volume of greenfield runoff for the same event, the peak allowable discharge rate from the development for the 1% AEP event shall be limited to the 1% AEP greenfield runoff rate or 3l/s/ha, whichever is the greater*". Following the standards; the permissible discharge from the SuDS for BPT/IPS-E, IPS-F and IPS-G would be restricted to a maximum 1 in 100-year greenfield runoff rate for the site. Additionally, the discharge from the detention basin does not exceed the greenfield runoff rate for 1 in 2-year and 1 in 30-year events. In accordance with Standard 3.9 of the National Standards for SuDS, the discharge rate at the SuDS outfall for the WRP is not subject to the same restrictions as other sites. This is because the receiving waterbody is tidal in nature and, as stated in the standards, where runoff discharges to an above-ground surface water body capable of accommodating uncontrolled flows without causing environmental harm, such as the sea or large tidal estuaries, requirements to control discharge to the equivalent greenfield runoff rates do not apply. The SuDS incorporates multiple attenuation points across the development. The SuDS for all sites are not located in areas identified at risk of flooding in the 1% AEP event from pluvial or fluvial sources. Urban creep allowances are not applicable to the proposed development, as the sites are operational facilities of a controlled nature and are not subject to residential development. Any future changes that could introduce urban creep would require a separate planning application.
Standard 4) Apply a 'SuDS approach' that protects surface waters, groundwater and coastal waters by managing the quality of the surface water runoff to adequately address water quality risks from the development. The proposed SuDS management train(s) shall be based on a robust water quality risk assessment, appropriate to the pollution hazard and sensitivity of receiving waters.	The SuDS strategy applies a water quality risk assessment using the CIRIA Simple Index Approach. The proposed SuDS management train: including gravel cover, filter strips, swales, and a detention basin, has been assessed for its effectiveness in mitigating pollution hazards such as suspended solids, metals, and hydrocarbons. The assessment confirms that the SuDS features provide sufficient treatment to protect surface waters, groundwater and coastal waters ensuring compliance with the water quality standard.
Standard 5) A 'SuDS approach' shall be adopted that maximises benefits for amenity through the creation of multi-functional places and landscapes.	The Proposed Development would be formed of operational sites, and therefore the opportunity for amenity use is not applicable. However, the SuDS selection and design have been influenced by the topography of the sites. The landscape around the perimeters of the AGP and WRP has been designed to integrate the sites into the landscape as much as possible and would include new landscaping around their perimeters.
Standard 6) A 'SuDS approach' shall be adopted to ensure the surface water drainage system maximises biodiversity benefits throughout the development lifecycle.	The SuDS strategy Planting statement (Appendix F) prioritises UK native species and those tolerant of seasonal wet/dry conditions, enhancing ecological resilience. Species selected

SuDS Standard	Compliance
	for nutrient uptake, erosion control, and habitat enhancement support local wildlife and ecological function. The SuDS strategy would complement the existing environment and provide opportunities for increased biodiversity.
Standard 7) SuDS must be designed for long-term performance, considering construction, operation, maintenance, decommissioning, and structural integrity over the life of the development.	The SuDS strategy has been designed to operate safely and effectively over the design lifetime of the Proposed Development. The SuDS Planting and Maintenance Statement (Appendix F) outlines tailored maintenance regimes for each SuDS component to ensure their long-term functionality; maintenance is aligned with CIRIA SuDS Manual (C753) guidance.

7 Lead local flood authority consultation

7.1.1 A pre-application consultation meeting took place with Hampshire County Council, in its role as LLFA for the AGP, WRP and wider Proposed Development on 4 July 2024. The concept proposals for the development including the SuDS philosophy, SuDS hierarchy (CIRIA SuDS Manual) and long-term storage approach were discussed. The SuDS concept proposal of utilising gravel as long-term storage, and using infiltration to ground where possible, with exceedance run-off shedding onto roads and into filter strips, to be conveyed via swales to a detention basin prior to controlled discharge was discussed. Hampshire County Council attendees agreed with the concept and approach of the proposal. Following this LLFA 'in-principle' approval to the surface water management proposal, it was concluded that a detailed Flood Risk Assessment (FRA) for each above ground site within the Proposed Development would be produced.

7.1.2 On 27 March 2025, a consultation meeting was held with both LLFAs; Portsmouth City Council and Hampshire County Council, to discuss the SuDS proposals for the Break Pressure Tank/Intermediate Pumping Station E (BPT/IPS-E) site. The SuDS strategy outlined within this document was presented during the meeting, the concept of mimicking existing and natural surface water flow pathways using overland discharge via a tapered swale was presented. Both LLFAs supported the discharge via overland flow approach, with Portsmouth City Council recommending additional bunding for flood mitigation and Hampshire County Council requesting modelling to confirm no increased flood risk. Both of these requests have been implemented within this document.

7.1.3 A pre-application consultation meeting was held with Hampshire County Council on 2 September 2025 to discuss their comments on the draft FRAs for Intermediate Pumping Stations F and G (IPS-F and IPS-G) within the Proposed Development. The meeting addressed Hampshire County Council's feedback dated 23 April 2025, including points on climate change allowances, discharge rates and exceedance flow pathways. The SuDS drainage strategy was discussed in the context of the CIRIA SuDS Manual Approach 1; with long-term storage provided via gravel layers to manage runoff. Hampshire County Council agreed in principle with the approach, noting that discharge rates should vary with rainfall design events. The Applicant committed to modelling the 1 in 2 and 1 in 30-year rainfall events to demonstrate compliance. Exceedance flow modelling using InfoWorks ICM for the IPS-F and IPS-G was presented, showing pre and post development flow paths and confirming the effectiveness of SuDS features. Hampshire County Council was satisfied with the modelling outputs, though requested updates to figures to avoid misinterpretation of gravel areas as flooded zones. The meeting concluded with agreement that Hampshire County Council's comments would be incorporated into the next revision, and further modelling and figure updates would be undertaken to support the DCO submission. Full results and mapping outputs of the ICM direct rainfall modelling, which includes the 1 in 2-year, 1 in 30-year and 1 in 100-year rainfall events, are provided in Appendix C.

8 Conclusions

8.1.1 This report presents a SuDS strategy for the indicative design of the AGP and WRP within the Proposed Development. The SuDS strategy has been developed to ensure that the proposed Above Ground Plant and Water Recycling Plant does not result in an increase in the rate or volume of surface water runoff leaving the site, while also mimicking natural processes and aligning with national and local drainage standards.

8.1.2 This SuDS strategy involves the use of source control and surface level drainage techniques to manage surface water directly adjacent to the source of runoff. The proposed SuDS features have been designed to accommodate the 1 in 100-year rainfall event with a 45% climate change allowance. Designing to this return period ensures that for the majority of rainfall events, runoff would be retained on-site and that discharges from the SuDS would not exceed the greenfield runoff rate for the equivalent rainfall event, where applicable.

8.1.3 The National Standards for SuDS promote a natural approach to managing water, encouraging surface water runoff to be managed close to its source using a SuDS management train. The SuDS incorporate water quality treatment with pollution mitigation confirmed using the CIRIA Simple Index Approach. This ensures effective removal of suspended solids, metals, and hydrocarbons. In addition, the SuDS planting has been designed to enhance biodiversity and ecological resilience.

8.1.4 The proposed SuDS strategy complies with the National Policy Statement for Water Resources Infrastructure, the National Standards for SuDS, Lead Local Flood Authority guidance, and the CIRIA SuDS Manual (C753). It delivers multiple benefits including flood risk reduction, water quality improvement, biodiversity enhancement, and climate resilience. The SuDS strategy confirms that the AGP and WRP would not result in an increase in surface water runoff rates or volumes, and would remain safe and operational over its intended lifetime.

8.1.5 In summary, the SuDS strategy ensures:

- No increase in surface water runoff rates or volumes leaving the site, when compared with existing greenfield rates, over a range of return periods including the 1 in 2-year, 1 in 30-year and the 1 in 100-year.
- Effective attenuation and treatment of runoff.
- Compliance with national and local flood risk and drainage policy, and
- Alignment with the National Policy Statement for Water Resources Infrastructure and the National Standards for SuDS.

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10 Glossary

Term	Definition
Above Ground Plant (AGP)	This collectively refers to the Intermediate Pumping Stations and Break Pressure Tanks.
As Low As Reasonably Practicable (ALARP)	Involves weighing a risk against the trouble, time and money needed to control it. Thus, ALARP describes the level to which we expect to see risks controlled.
Amenity	Refers to the qualities of a place that make it enjoyable and attractive to users of an area.
Applicant	Southern Water Services Limited.
Autumn 2025 Consultation	The statutory, targeted consultation held in Autumn 2025 to consult on eight further design refinements to the Proposed Development made in response to feedback from the Spring 2025 Consultation, further investigations, surveys and assessments, and design development.
Baseline	The current environmental and social conditions within the Order Limits or within a study area. This provides a benchmark against which changes arising from the Proposed Development are assessed for each relevant assessment.
Biodiversity	The variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems.
Biodiversity Net Gain (BNG)	This is an approach to development that delivers measurable improvements that delivers a net gain for biodiversity by creating or enhancing habitats.
Break Pressure Tank (BPT)	BPT are anticipated to be required at high points along the pipeline route. Water is pumped to BPTs, where it then flows onwards using gravity from the tank. This reduces the amount of energy required to transfer water. BPTs reduce the overall maximum pressure in the pipeline system associated with changes in flow rate as a result of topography.
Budds Farm pumping station	A pumping station located at Budds Farm Wastewater Treatment Works to support the transfer of treated wastewater to the Water Recycling Plant site.
Budds Farm Wastewater Treatment Works (WTW)	An existing Southern Water site that treats wastewater from the Applicant's customers prior to release into the Solent from the Eastney Long Sea Outfall. The Proposed Development would utilise highly treated wastewater from the Budds Farm WTW to produce recycled water at the Water Recycling Plant site. Reject water would be transferred from the Water Recycling Plant back to Budds Farm WTW where a connection would be made for onwards

Term	Definition
	transfer to the existing Eastney Transfer Tunnel, Eastney Pumping Station and Eastney Long Sea Outfall for discharge into the Solent. Chemical filter washing at the Water Recycling Plant site would generate process waste that would be discharged via the foul sewer network to Budds Farm WTW for treatment.
Capacity	The maximum traffic flow that a road or junction can accommodate without causing unreasonable delay.
‘Classic’ operation scenario	This scenario refers to the maintenance of water levels in Havant Thicket Reservoir, in accordance with Portsmouth Water’s existing planning permission, through the use of spring water inputs from Bedhampton and Havant Springs only.
Climate	The general weather conditions prevailing over a long period of time. Climate change will see trends in the climate conditions changing (seasonal averages and extremes).
Construction compounds	Temporary areas required to facilitate the construction of the Proposed Development.
Construction waste	Consists of all waste produced directly or indirectly during the construction process, including excavated material displaced during this process that no longer has a use.
Contractor	The Applicant or a person appointed by the Applicant or by anyone else having the benefit of part or all of the Development Consent Order to carry out any construction element of the Proposed Development or to operate the Proposed Development.
Cumulative effects	Effects from the interrelationship between the Proposed Development with other committed developments.
Cut and fill	Cut and fill is a common earthworks technique used in construction and civil engineering projects. It involves the removal (‘cut’) of soil or material from higher areas of a site and the placement (‘fill’) of that material into lower areas to create a level surface suitable for development.
Design principles	Design principles which reflect the design approach adopted for the Proposed Development and as set out in the Design Principles Document (Document reference 5.11, DCO Volume 5) and will control the detailed design post-consent in accordance with Schedule 2 of the draft Development Consent Order (Document reference 3.1, DCO Volume 3).
Development Consent Order (DCO)	A statutory order which provides consent for a project and means that a range of other consents, such as planning permission and listed building consent, will not be required. A DCO can also include powers authorising the compulsory acquisition and temporary possession of land and rights over land which is the subject of an application. A draft DCO (Document reference 3.1, DCO Volume 3) is submitted by the applicant as part of its application [14].

Term	Definition
Drinking water	Water that has been treated to strict regulatory standards, ready for supply to domestic and non-domestic customers as drinking water.
Drought conditions	Droughts are naturally occurring events and are typically characterised by a prolonged period of abnormally low rainfall, leading to a shortage of water.
Eastney Long Sea Outfall (LSO)	An existing Southern Water infrastructure component used to release treated wastewater from Budds Farm Wastewater Treatment Works. No works to the Eastney LSO are proposed as part of the Proposed Development; however, reject water produced from the Water Recycling Plant will be released from the Eastney LSO using the Eastney Transfer Tunnel and Eastney Pumping Station.
Eastney Pumping Station (PS)	An existing Southern Water infrastructure component. No works are proposed to it as part of the Proposed Development. The Eastney PS receives treated wastewater flows, via gravity, from Budds Farm Wastewater Treatment Works and pumps it out via the Eastney Long Sea Outfall. This pumping station also receives storm flows from the Eastney catchment area. Reject water from the proposed Water Recycling Plant will be released from the Eastney Long Sea Outfall using the Eastney PS and Eastney Transfer Tunnel.
Eastney Transfer Tunnel (TT)	An existing Southern Water infrastructure component. The Eastney TT connects the Budds Farm Wastewater Treatment Works final effluent channel via a shaft located at Budds Farm Wastewater Treatment Works to the Eastney Pumping Station to release treated wastewater. Reject water from the Water Recycling Plant will be released from the Eastney Long Sea Outfall using the Eastney Pumping Station and Eastney TT. A new connection point to the Eastney TT, located at Budds Farm Wastewater Treatment Works, is required. No additional works to the Eastney TT are proposed as part of the Proposed Development.
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact with the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
Environmental Impact Assessment (EIA)	EIA is a process for identifying the likely significant environmental effects (beneficial and adverse) of a Proposed Development to inform the decision-making process by the Secretary of State when determining an application for a Development Consent Order.
Environmental Impact Assessment (EIA) Regulations	The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 [15]; the Regulations which

Term	Definition
	this Environmental Statement has been prepared in accordance with.
Enhancement	Measures taken to achieve a benefit, which are unrelated to an adverse impact or which go beyond that required to mitigate/compensate for an impact. For example, restoration of a degraded habitat to leave it in a measurably better state than it was before the Proposed Development or other interventions to leave a positive legacy for the community.
Environmental Statement (ES) (DCO Volume 6)	A document reporting the findings of the Environmental Impact Assessment which describes the likely significant effects arising from the Proposed Development on the environment and measures proposed to mitigate likely significant effects.
Extreme drought	A drought event that occurs every 1-in-500 years, or a 0.2% chance of occurring in any given year [16].
Flood Risk Assessment (FRA) (Environmental Statement Appendix 19.1 Flood Risk Assessment, Volume II (Document reference 6.2, DCO Volume 6))	A technical report that evaluates the potential for flooding from all sources (e.g. fluvial, coastal, surface water, groundwater, reservoir and sewers) on a development site and proposes measures to manage and mitigate those risks. It is a crucial part of the planning process, ensuring that new developments are located and designed in a way that minimises the potential for flood damage and protects people and property both on the site and in the wider area. A FRA (Environmental Statement Appendix 19.1 Flood Risk Assessment, Volume II (Document reference 6.2, DCO Volume 6)) is submitted by the Applicant as part of the Development Consent Order application.
Flood Zone 1	Land having a less than 0.1% annual probability of river or sea flooding.
Flood Zone 2	Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding.
Flood Zone 3a	Land having a 1% or greater annual probability of river flooding; or land having a 0.5% or greater annual probability of sea flooding.
Flood Zone 3b	Comprises land where water from rivers or sea has to flow or be stored in times of flood. Functional floodplain will normally comprise: Normally land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively, or Land that is designed to flood, even if it would only food in more extreme events (such as 0.1% annual probability of flooding).
Functionally Linked Land	Land or sea beyond the boundary of a National Site Network site which can ecologically support the populations

Term	Definition
	for which the site was designated or classified and fulfil its functions.
Green Infrastructure	The National Planning Policy Framework [17] defines green infrastructure as *"a network of multi-functional green and blue spaces and other natural features, urban and rural, which is capable of delivering a wide range of environmental, economic, health and wellbeing benefits for nature, climate, local and wider communities and prosperity."* For the purpose of the Proposed Development, Green Infrastructure focus areas have been identified on the Indicative Environmental Masterplan (appended to the Design Approach Document (Document Reference 5.12, DCO volume 5)) which shows areas where there are opportunities to enhance the wider network.
Hampshire Water Transfer and Water Recycling Project	This is the name of the Proposed Development, that is the Strategic Resource Option being delivered as part of the Water For Life Hampshire programme. A water supply scheme comprising a combination of both water transfer and water recycling technology that would play a major role in making up the shortfall in water supply across the Hampshire supply area, especially in a drought.
Havant Thicket Reservoir	The Havant Thicket Reservoir is a development under construction by Portsmouth Water that has planning permission granted by the relevant local planning authorities. Following the transfer of recycled water from the Water Recycling Plant site, the recycled water would be combined with water contained within the Havant Thicket Reservoir. The Proposed Development would use the Havant Thicket Reservoir for the storage of recycled water, before transfer to Otterbourne Water Supply Works.
Impact	A change that is caused by an action/activity associated with the Proposed Development.
Invasive Non-Native Species (INNS)	The Great British Non-Native Species Secretariat defines INNS as *"any non-native animal or plant that has the ability to spread causing damage to the environment, the economy, our health and the way we live"* [18].
Invasive Non-Native Species (INNS) Treatment at Otterbourne Water Supply Works	Infrastructure to be located at Otterbourne Water Supply Works to ensure the addition of source water transferred from Havant Thicket Reservoir would not introduce pathways for the spread of INNS.
Leakage (socio-economic)	The loss or outflow of potential economic benefits, jobs, or skilled workers from a specific area, sector, or group - often to the detriment of the local or intended beneficiaries.

Term	Definition
Light Detection and Ranging (LiDAR)	A survey detection system based on radar principles using light. It makes 3-dimensional representations of areas of the Earth's surface.
Limits of Deviation for Above Ground Plant	The ‘Limits of Deviation for Above Ground Plant’ represents the extent of the area within which the Above Ground Plant would be located. These are shown in the Design Principles Document (Document reference 5.11, DCO Volume 5). The ‘Limits of Deviation for Above Ground Plant’ do not represent the footprint of the Above Ground Plant.
Limits of Deviation for Pipeline	The ‘Limits of Deviation for Pipeline’ represent the area within the Order Limits that the pipeline could be permanently located once constructed. These are shown on the Works plans (Document reference 2.3, DCO Volume 2). The ‘Limits of Deviation for Pipeline’ does not represent the construction working area for the pipeline.
Main River	Watercourses designated under the Water Resources Act 1991 [19] as ‘main’ are usually larger rivers and streams that are shown on the Environment Agency’s Statutory Main River map. The Environment Agency has permissive powers, but not a duty, to carry out maintenance, improvement or construction work on designated Main Rivers to manage flood risk.
Maximum operation	The period when the Proposed Development is operating at maximum flows. During maximum operation, the Water Recycling Plant would produce 60 Megalitres per day (Ml/d) of recycled water, and 90Ml/d of source water would be transferred from Havant Thicket Reservoir to Otterbourne Water Supply Works.
Minimum operation	A minimum operation is required to ensure that the Proposed Development is in regular working use for when higher outputs are required. During minimum operation, the Water Recycling Plant would have an output of approximately 10 Megalitres per day (Ml/d).
Mitigation	Measures intended to avoid, prevent, reduce and, where possible, offset likely significant adverse environmental effects. Measures follow the mitigation hierarchy as described in section 5.3 of Environmental Statement Chapter 5 EIA approach and methodology, Volume I (Document reference 6.1, DCO Volume 6).
Monitoring	Measures to ensure the systematic and ongoing collection, analysis and evaluation of data related to the implementation and performance of a development. Monitoring can be undertaken to monitor conditions in the future to verify any environmental effects identified by the Environmental Impact Assessment, the effectiveness of mitigation or enhancement measures or ensure remedial action are taken should adverse effects above a set threshold occur. All monitoring measures adopted by the

Term	Definition
	Proposed Development are reflected in Environmental Statement Appendix 5.5 Commitments Register, Volume II (Document reference 6.2, DCO Volume 6).
Nationally Significant Infrastructure Projects (NSIPs)	NSIPs are large scale major development projects in England or Wales which require permission under the Planning Act 2008 [20]. Projects are only defined as nationally significant if they meet the relevant threshold set out in the Planning Act 2008 [14].
Ofwat	Ofwat (The Water Services Regulation Authority) is a non-ministerial government department that is the regulator of the water and wastewater services industry in England and Wales.
Order Limits	The 'Order Limits' represent the extent of the area within which the Proposed Development, authorised by the Development Consent Order, may be carried out, including the permanent and temporary land needed for construction, operation and maintenance activities. The Order Limits are shown on the Works plans (Document reference 2.3, DCO Volume 2) and Land plans (Document reference 2.2, DCO Volume 2).
Ordinary Watercourse	An Ordinary Watercourse is any channel that water flows through that is not designated as an Environment Agency Main River. Lead local flood authorities and internal drainage boards have responsibility for Ordinary Watercourses.
Otterbourne Water Supply Works (WSW)	An existing Southern Water site which abstracts water from river Itchen and ground sources, and will continue to do in certain circumstances after the Proposed Development. The Proposed Development would transfer source water from Havant Thicket Reservoir to Otterbourne WSW. The source water would be treated to strict regulatory standards at Otterbourne WSW prior to being supplied to customers.
Operational Environmental Management Plan (OEMP) (Document reference 7.7, DCO Volume 7)	Provides a framework of commitments for the operational stage of the Proposed Development. These include general operational practices which have the potential to have an environmental impact, in addition to Proposed Development specific environmental mitigations. The measures contained in the OEMP are secured by a requirement in Schedule 2 to the Development Consent Order.
Outline Construction Environmental Management Plan (CEMP) (Document reference 7.1, DCO Volume 7)	Contains identified topic specific mitigation measures to be adopted during construction, and specifies plans and method statements to be produced by the Contractor to avoid and reduce environmental effects. Mitigation measures are generally tertiary mitigation, although some secondary mitigation measures are also included. The measures contained in the Outline CEMP are secured by a requirement in Schedule 2 to the Development

Term	Definition
	Consent Order. Detailed CEMP(s) will be produced and submitted for approval in accordance with the corresponding requirement in Schedule 2 to the draft Development Consent Order (Document reference 3.1, DCO Volume 3).
Permanent access	Identifies locations where permanent access will be taken from the highway network for the purpose of operation of the Proposed Development.
Pipeline between the Water Recycling Plant site and Otterbourne Water Supply Works	An underground pipeline approximately 35 kilometres long would transfer approximately 90 Mega litres per day of source water at maximum operation, from the Water Recycling Plant site to Otterbourne Water Supply Works. Above Ground Plant would support the transfer of water from the Water Recycling Plant site to Otterbourne Water Supply Works. Due to the length of the pipeline, it has been divided into sections: Section D: The Water Recycling Plant site to Portsdown Hill Section E: Portsdown Hill to Boarhunt Section F: Boarhunt to Crockerhill Section G: Crockerhill to Wickham Section H: Wickham to Shedfield Section J: Shedfield to the River Hamble Section K: The River Hamble to Lower Upham Section L: Lower Upham to Brambridge Section M: Brambridge to Otterbourne Water Supply Works
Pipelines between Budds Farm Wastewater Treatment Works and the Water Recycling Plant site	Two pipelines between Budds Farm Wastewater Treatment Works and the Water Recycling Plant site: one to transfer treated wastewater from Budds Farm Wastewater Treatment Works to the Water Recycling Plant site and the other to transfer reject water from the Water Recycling Plant site to Budds Farm Wastewater Treatment Works. The Pipelines would connect to the existing treated wastewater release infrastructure and the reject water would be released via the existing Eastney Long Sea Outfall using the existing Eastney Transfer Tunnel and Eastney Pumping Station. The development required to connect into the existing treated wastewater infrastructure would form part of this component of the Proposed Development. The Pipelines between Budds Farm Wastewater Treatment works and the Water Recycling Plant site would be installed on the same route under the Hermitage Stream and Harts Farm Way and would be approximately 700m in length. The Pipelines between Budds Farm Wastewater Treatment works and the Water Recycling Plant site would transfer a maximum flow of approximately 82 Mega litres per day

Term	Definition
	(Ml/d) of treated wastewater to the Water Recycling Plant site. The pipeline from the Water Recycling Plant site to Budds Farm Wastewater Treatment Works would be sized for the same transfer capacity of approximately 82Ml/d as it may be necessary to return the maximum volume of water being treated back to Budds Farm Wastewater Treatment Works.
Pipelines between the Water Recycling Plant site and Bedhampton Springs	The Pipelines would transfer recycled water from the Water Recycling Plant site to Bedhampton Springs, and source water from Bedhampton Springs back to the Water Recycling Plant site (before transfer to Otterbourne Water Supply Works). The Pipelines, connecting to pipelines being delivered by Portsmouth Water between Bedhampton Springs and Havant Thicket Reservoir, would enable the transfer at maximum operation of approximately 60 Mega litres per day (Ml/d) of recycled water from the Water Recycling Plant site to Havant Thicket Reservoir and approximately 90Ml/d of source water from Havant Thicket Reservoir to the Water Recycling Plant site, for onward transfer to Otterbourne Water Supply Works.
‘Post-WRP’ operation scenario	This scenario is used to describe an operational scenario following commissioning of the Proposed Development and the release of recycled water into Havant Thicket Reservoir.
Preferred pipeline corridor	The preferred pipeline corridor was selected as part of the scheme development process which considered a number of pipeline corridor and Above Ground Plant options. The preferred pipeline corridor was consulted on at the Summer 2022 Consultation. Additional information is provided within the Scheme Development Report (Document reference 5.10, DCO Volume 5).
Principal Aquifer	Rocks or soils that provide significant quantities of water and can support water supply and/or baseflow to rivers, lakes and wetlands on a strategic scale. They typically have a high intergranular and/or fracture permeability, meaning they usually provide a high level of water storage.
Process waste	Process waste is chemical waste that is removed from the water recycling process.
Project of national significance	Large scale development that has been directed by the Secretary of State to be treated as development for which a Development Consent Order is required under Section 35 of the Planning Act 2008 [20] due to being a project of national significance.
Proposed Development	This refers to the Hampshire Water Transfer and Water Recycling Project, as described in Environmental Statement Chapter 3 Description of the Proposed Development, Volume I (Document reference 6.1, DCO Volume 6).

Term	Definition
Public Consultation 2021	The consultation undertaken in early 2021 which consulted on the 75Ml/d desalination plant at Fawley as part of the Water Resources Management Plan 2019 Preferred Strategy and introduced alternative water transfer and water recycling options to consultees.
River Basin Management Plan	River basin management plans set the legally binding locally specific environmental objectives that underpin water regulation (such as permitting) and planning activities. They provide a stable planning base for economic development.
Receptor	An individual, group or asset that receives an impact of effect.
Recycled water	Purified water that has been produced by taking treated wastewater and removing remaining impurities using advanced treatment techniques.
Reject water	During the water recycling process, reject water is produced. Reject water is water containing impurities removed from the treated wastewater and released using the existing Eastney Transfer Tunnel and Eastney Long Sea Outfall.
Release from the Eastney Long Sea Outfall (LSO)	The existing Eastney LSO releases treated wastewater from Budds Farm Wastewater Treatment Works via the existing Eastney Transfer Tunnel and Eastney Pumping Station. The Proposed Development would utilise the Eastney LSO for the release of reject water produced by the Water Recycling Plant site. During maximum operation approximately 22 Mega litres per day (Ml/d) of reject water would be released from the Eastney LSO. During minimum flow operation approximately 4Ml/d of reject water would be released from the Eastney LSO.
Remediation	An action taken to break or modify the source-pathway-receptor (contaminant) linkage so that the risks are removed or reduced to an acceptable level for the land use under consideration [21].
Residual effects	Remaining effects of the Proposed Development following the implementation of any secondary (foreseeable) mitigation.
Secondary A aquifer	These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.
Secondary B aquifer	These are mainly lower permeability layers that may store and yield limited amounts of groundwater through characteristics like thin cracks (called fissures) and openings or eroded layers.
Secondary undifferentiated aquifer	This has been assigned in cases where it has not been possible to attribute either a Secondary A or B aquifer to the

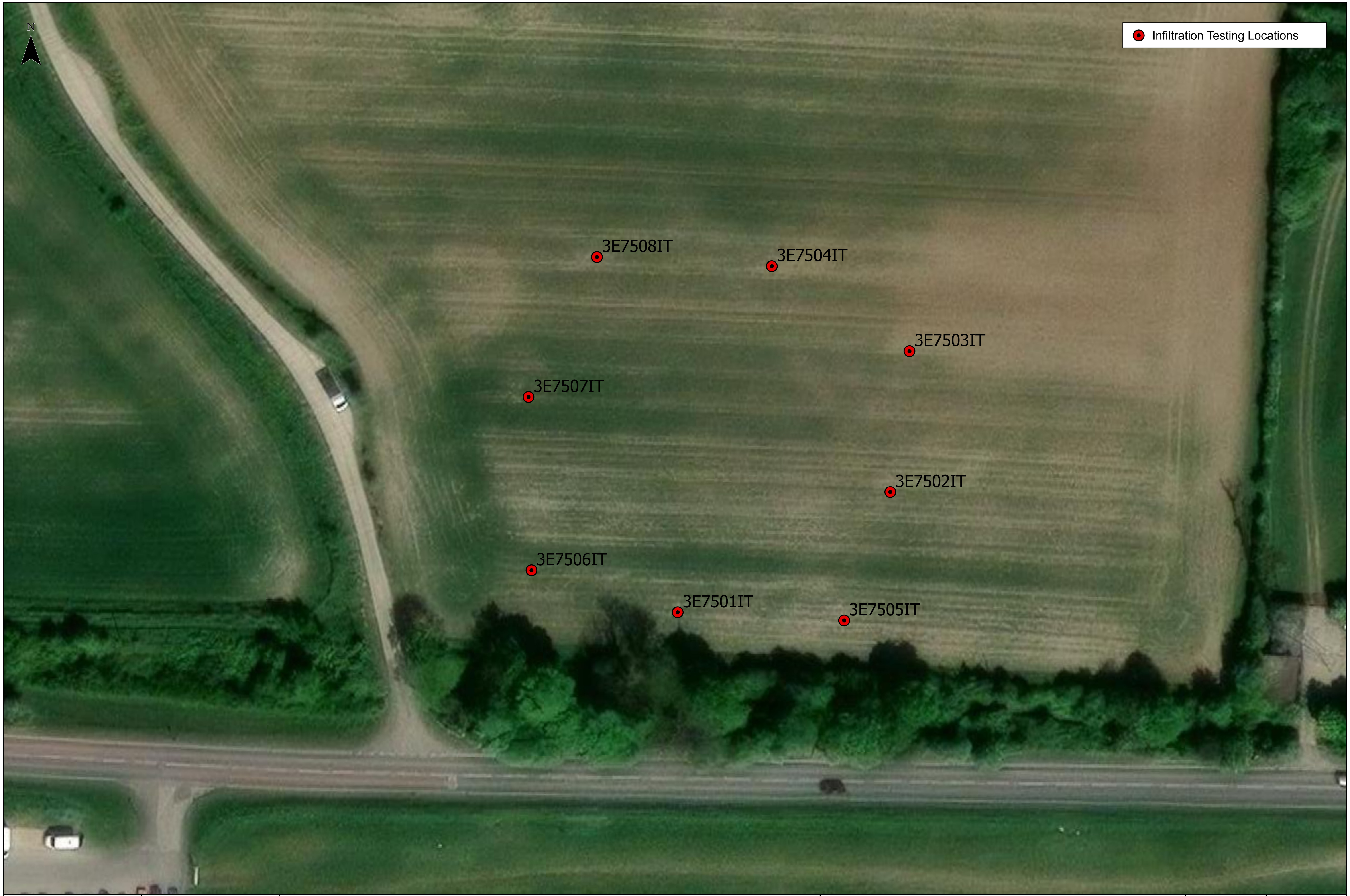
Term	Definition
	soil type due to the variable characteristics. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
Sensitivity	The extent to which a receptor is likely to accept or respond to a change.
Severe drought	A drought event that occurs every 1-in-200 years, or a 0.5% chance of occurring in any given year [22].
Significance	Significance is assessed by comparing the magnitude of an impact with a receptor's value, sensitivity, permanence or reversibility, in an assessment-specific matrix. The criteria in this matrix can be pre-set, allowing for objective impact assessment rather than subjective impact evaluation.
Site of Importance for Nature Conservation (SINC)	An important wildlife site which contributes to the ecological network in Hampshire. To safeguard these sites, they are designated as non-statutory designated SINCs. SINCs are also known nationally as Local Wildlife Sites. They represent a legacy of good management and rely upon continued stewardship by landowners.
Site of Special Scientific Interest (SSSI)	A nationally site designated by Natural England as an area of special interest by reason of any of its flora, fauna, geological or physiographical features. SSSI are legally protected under the Wildlife and Countryside Act 1981 (as amended) [23].
Source Protection Zone 1 (SPZ1)	Inner protection zone - defined as the 50-day travel time from any point below the water table to the abstraction source. This zone has a minimum radius of 50m radius from the source, whichever is larger.
Source Protection Zone 1c (SPZ1c)	Inner protection zone - defined as the 50-day travel time from any point below the water table to the abstraction source. This zone has a minimum radius of 50m and is where there is protective geology cover, such as clay.
Source Protection Zone 2 (SPZ2)	Outer protection zone - defined by a 400-day travel time. The zone will default to a minimum radius of 250m or 500m, depending on the size of the abstraction, if the 400-day travel time zone is smaller.
Source Protection Zone 2c (SPZ2c)	Outer protection zone – defined by a 400-day travel time. The zone will default to a minimum radius of 250m or 500m, depending on the size of the abstraction, if the 400-day travel time zone is smaller, and is where there is a protective geology cover of low permeability sat above a unit of high permeability.
Source Protection Zone 3 (SPZ3)	Source catchment protection zone - defined as the area around an abstraction source within which all groundwater recharge is presumed to be discharged at the abstraction source.

Term	Definition
Source water	Water that is used as a source for drinking water. For the Proposed Development, this water is treated to strict regulatory standards at the Otterbourne Water Supply Works before being supplied to customers.
Source-pathway-receptor linkage	For a risk to arise there must be hazard that consists of a ‘source’ (e.g. high rainfall); a ‘receptor’ (e.g. people, environment); and a pathway between the source and the receptor (e.g. flooding).
South East England	Comprising counties of Berkshire, Buckinghamshire, East Sussex, Hampshire, Isle of Wight, Kent, London, Oxfordshire, Surrey and West Sussex.
Special Area of Conservation (SAC)	Area(s) of protected habitat(s) and species as defined in the European Union Habitats Directive (92/43/EEC) [24].
Special Protection Area (SPA)	A designated area for birds under the European Union Directive on the Conservation of Wild Birds (2009/147/EC) [25].
Spring 2025 Consultation	The statutory consultation held in Spring 2025 to consult on water quality modelling updates, and design refinements made to the Proposed Development in response to feedback from the Summer 2024 Consultation and ongoing scheme development.
Spring 2026 Consultation	The statutory, targeted consultation held in Spring 2026 to consult on one further design refinement at Otterbourne Water Supply Works as a result of additional works and treatment required.
Study area	A defined spatial scope (e.g. the area which may be impacted) for each topic assessment.
Sustainable Drainage System (SuDS)	A Sustainable Drainage System that generally mimic the natural drainage patterns of an undeveloped site allowing infiltration into the ground (where feasible) and controlling outflow rates from a proposed development. This reduces the impact and risk of flooding and can provide additional benefits such as pollution control, increased biodiversity, and provision of water-based amenity space.
Summer 2022 Consultation	The non-statutory consultation undertaken in summer 2022 which consulted on the Proposed Development, including the process undertaken to select the Proposed Development and the process undertaken to identify the preferred pipeline corridor, Water Recycling Plant site, and emerging Above Ground Plant zones.
Summer 2024 Consultation	The statutory consultation held in 2024 which consulted on the Proposed Development, including the draft Order Limits, the proposed pipeline routes, proposed sites for the Above Ground Plant and Water Recycling Plant, temporary construction compounds and any temporary or permanent access routes.

Term	Definition
Temporary construction access	Identifies locations where temporary access will be taken from the highway network for the purpose of construction of the Proposed Development.
Treated wastewater	Wastewater that has been treated to strict regulatory standards and is typically released to rivers or the sea.
Trenchless crossings	Crossings where trenchless installation techniques will be used during construction of the Proposed Development.
Washout valves	Located at topographical low points along the Proposed Development pipelines to facilitate commissioning and emptying a section of pipe for repair and maintenance.
Waste	Any substance or object which the holder discards or intends to or is required to discard – unusable or unwanted.
Wastewater	A combination of water from kitchens, bathrooms, sinks and taps (in domestic and non-domestic properties) and rainwater from roads and roofs, that is transported to, and cleaned at, a wastewater treatment works.
Water for Life Hampshire	This is the programme being progressed by the Applicant to address the sustainability objectives of to meet demand following a reduction in abstractions on Hampshire's two main rivers - The Test and Itchen - and ensuring a resilient water supply for the Applicant's customers, especially during times of drought.
Water Recycling Plant (WRP)	The WRP would receive a total maximum volume of approximately 82 Mega litres per day (Ml/d) of treated wastewater from Budds Farm Wastewater Treatment Works. This would provide a maximum output of approximately 60Ml/d of recycled water. Approximately 22Ml/d of reject water is produced from the water recycling process and would be combined with the existing Budds Farm Wastewater Treatment Works treated wastewater flows (that are generated by the existing operation of Budds Farm Wastewater Treatment Works), and released via the existing Eastney Transfer Tunnel, Eastney Pumping Station, and Eastney Long Sea Outfall operated by the Applicant.
Water Recycling Plant (WRP) site	The site containing the WRP, three pumping stations, a main process building, kiosks, administrative buildings and parking facilities. Located at a site north-west of Budds Farm Wastewater Treatment Works.
Water Resources Management Plan 2019 (WRMP19)	The Applicant's existing WRMP19 which sets out how the Applicant will manage and develop water resources to ensure a resilient supply of water for at least the next 25 years. The WRMP identifies the need for a strategic water resource options within the Western (Hampshire) supply area, from which the Proposed Development has been determined as the preferred solution to meet this need.

Term	Definition
Final Draft Water Resources Management Plan 2024 (WRMP24)	The Applicant's Final Draft WRMP24 which sets out how the Applicant will manage and develop water resources to ensure a resilient supply of water for at least the next 25 years The Final Draft WRMP24 supports the need for a strategic water resource option within the Western (Hampshire) supply area, from which the Proposed Development has been determined as the preferred solution to meet this need. The Final Draft WRMP24 has been submitted to Defra for approval.
The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (WER)	The WER [26] transpose the European Water Framework Directive 2000/60/EC into law in England and Wales.
The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 (WFD Direction)	The WFD Direction [27] establish a series of thresholds that are used in the classification of water body status under the Water Environment (Water Framework Directive) England and Wales) Regulation 2017.
Works plans (Document reference 2.3, DCO Volume 2)	The Works plans show the spatial extent of the works that are detailed in Schedule 1 of the draft Development Consent Order (Document reference 3.1, DCO Volume 3) to be consented and operated by the Development Consent Order when made.

Appendix A Infiltration testing results



Microsoft, Vantor

Stantec

Client

HWTWRP
BPT/IPS-E
Infiltration Testing Locations

1:587 @ A3	Date: 13/01/2025
Drawn: WB	Checked: KL
Figure: 1	Rev: 1

Document Path: C:\HWTWRP Infiltration Testing\HWTWRP Infiltration Testing.aprx

Stantec

Client

WATER for LIFE from Southern Water.

HWTWRP
IPS-F
Infiltration Testing Locations

0 25 50 m

Microsoft, Vantor

1:587 @ A3	Date: 13/01/2025
Drawn: WB	Checked: KL
Figure: 2	Rev: 1

Document Path: C:\HWTWRP Infiltration Testing\HWTWRP Infiltration Testing.aprx

Stantec

Client

WATER for LIFE from Southern Water

HWTWRP
BPT-K
Infiltration Testing Locations

Microsoft, Vantor

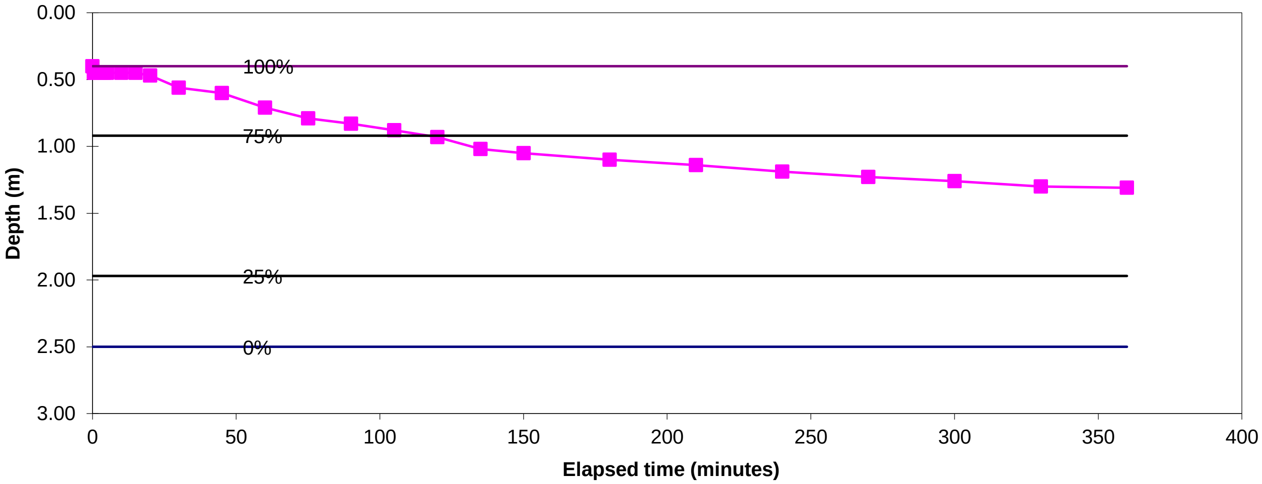
1:587 @ A3	Date: 13/01/2025
Drawn: WB	Checked: KL
Figure: 3	Rev: 1

Document Path: C:\HWTWRP Infiltration Testing\HWTWRP Infiltration Testing.aprx

Soakaway Test

Trial Pit No: 3E7501IT　Test No: 1　Date: 06/09/2023
Length (m): 3.00　Datum height: 0.50 m agl
Width (m): 0.60　Granular infill: No
Depth (m): 2.50

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.40	60	0.71
0.5	0.45	75	0.79
1	0.45	90	0.83
1.5	0.45	105	0.88
2	0.45	120	0.93
2.5	0.45	135	1.02
3	0.45	150	1.05
4	0.45	180	1.10
5	0.45	210	1.14
10	0.45	240	1.19
15	0.45	270	1.23
20	0.47	300	1.26
30	0.56	330	1.30
45	0.60	360	1.31



Start water depth for analysis (mbgl): 0.40
75% effective depth (mbgl): 0.92　Elapsed time (mins): 117.0
50% effective depth (mbgl): 1.45
25% effective depth (mbgl): 1.97
Base of soakage zone (mbgl): 2.50

Volume outflow between 75% and 25% effective depth (m3):
Mean surface area of outflow (m^2): 9.36
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins):

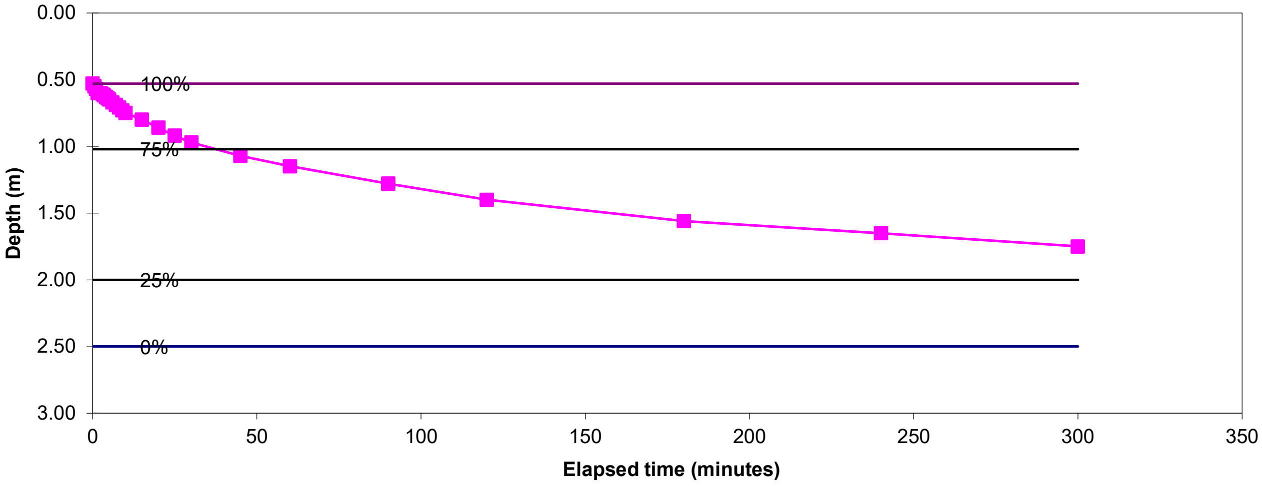
Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**
Remarks	Results processed following BRE DG 365 (2016).

Testing: BP Checked: Approved:	Notes:	**Project** WFL Hampshire Water Transfer and Water Recycling Project (Phase 2) **Project No.** G2034-22 **Carried out for** Clancy Docwra on behalf of Southern Water	**Figure** **SKWY/3E7501IT/**

Soakaway Test

Trial Pit No: 3E7502IT
Test No: 1
Date: 05/09/2023
Length (m): 2.50
Datum height: 0.50 m agl
Width (m): 0.70
Granular infill: None
Depth (m): 2.50

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.53	9	0.73
0.5	0.55	10	0.75
1	0.57	15	0.80
1.5	0.60	20	0.86
2	0.60	25	0.92
2.5	0.60	30	0.97
3	0.61	45	1.07
3.5	0.62	60	1.15
4	0.63	90	1.28
4.5	0.64	120	1.40
5	0.65	180	1.56
6	0.67	240	1.65
7	0.69	300	1.75
8	0.71		



Start water depth for analysis (mbgl):	0.53		
75% effective depth (mbgl):	1.02	Elapsed time (mins):	37.5
50% effective depth (mbgl):	1.51		
25% effective depth (mbgl):	2.00		
Base of soakage zone (mbgl):	2.50		

Volume outflow between 75% and 25% effective depth (m3):

Mean surface area of outflow (m^2): 8.09
(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**

Remarks: Results processed following BRE DG 365 (2016).

Testing: TC
Checked:
Approved:

Notes:

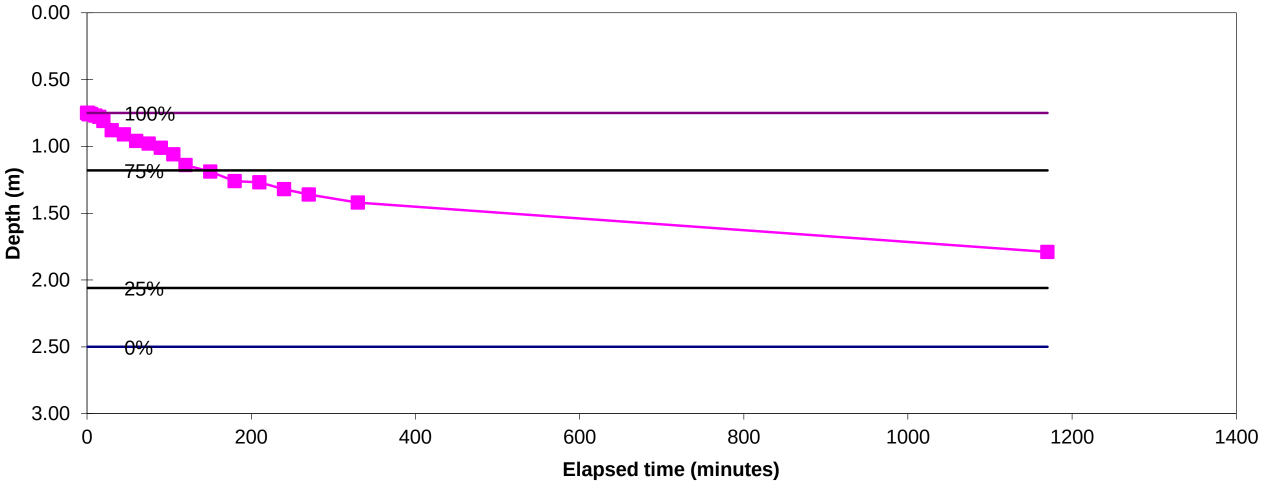
Project WFL Hampshire Water Transfer and Water Recycling Project (Phase 2)
Project No. G2034-22
Carried out for Clancy Docwra on behalf of Southern Water

Figure **SKWY/3E7502IT/**

Soakaway Test

Trial Pit No: 3E7502IT
Test No: 2
Date: 06/09/2023
Length (m): 3.20
Datum height: 0.30 m agl
Width (m): 0.60
Granular infill: No
Depth (m): 2.50

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.75	30	0.88
0.5	0.75	45	0.91
1	0.75	60	0.96
1.5	0.75	75	0.98
2	0.76	90	1.01
2.5	0.76	105	1.06
3	0.76	120	1.14
3.5	0.76	150	1.19
4	0.76	180	1.26
4.5	0.76	210	1.27
5	0.76	240	1.32
10	0.77	270	1.36
15	0.78	330	1.42
20	0.81	1170	1.79



Start water depth for analysis (mbgl): 0.75
75% effective depth (mbgl): 1.18
Elapsed time (mins): 144.0
50% effective depth (mbgl): 1.62
25% effective depth (mbgl): 2.06
Base of soakage zone (mbgl): 2.50

Volume outflow between 75% and 25% effective depth (m3):
Mean surface area of outflow (m^2): 8.61
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**
Remarks	Results processed following BRE DG 365 (2016).

Testing: BP
Checked:
Approved:

Notes:

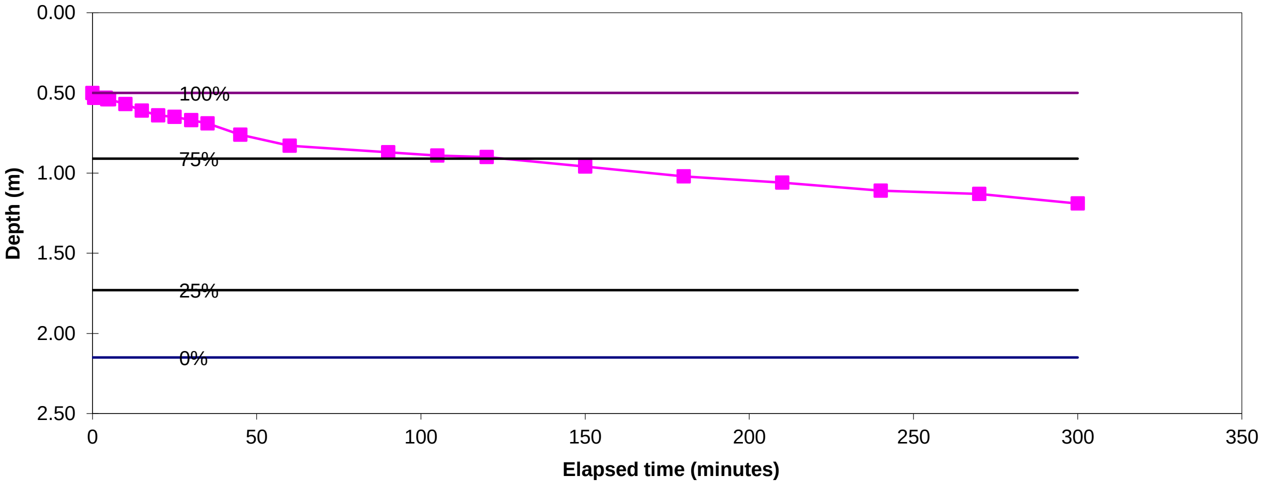
Project **WFL Hampshire Water Transfer and Water Recycling Project (Phase 2)**
Project No. **G2034-22**
Carried out for **Clancy Docwra on behalf of Southern Water**

Figure
SKWY/3E7502IT/

Soakaway Test

Trial Pit No: 3E7502IT
Test No: 3
Date: 07/09/2023
Length (m): 3.20
Datum height: 0.40 m agl
Width (m): 0.60
Granular infill: No
Depth (m): 2.15

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.50	25	0.65
0.5	0.53	30	0.67
1	0.53	35	0.69
1.5	0.53	45	0.76
2	0.53	60	0.83
2.5	0.53	90	0.87
3	0.53	105	0.89
3.5	0.53	120	0.90
4	0.53	150	0.96
4.5	0.54	180	1.02
5	0.54	210	1.06
10	0.57	240	1.11
15	0.61	270	1.13
20	0.64	300	1.19



Start water depth for analysis (mbgl): 0.50
75% effective depth (mbgl): 0.91
Elapsed time (mins): 125.0
50% effective depth (mbgl): 1.32
25% effective depth (mbgl): 1.73
Base of soakage zone (mbgl): 2.15
Volume outflow between 75% and 25% effective depth (m3):
Mean surface area of outflow (m^2): 8.23
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**
Remarks	Results processed following BRE DG 365 (2016).

Testing: BP
Checked:
Approved:

Notes:

Project WFL Hampshire Water Transfer and Water Recycling Project (Phase 2)
Project No. G2034-22
Carried out for Clancy Docwra on behalf of Southern Water

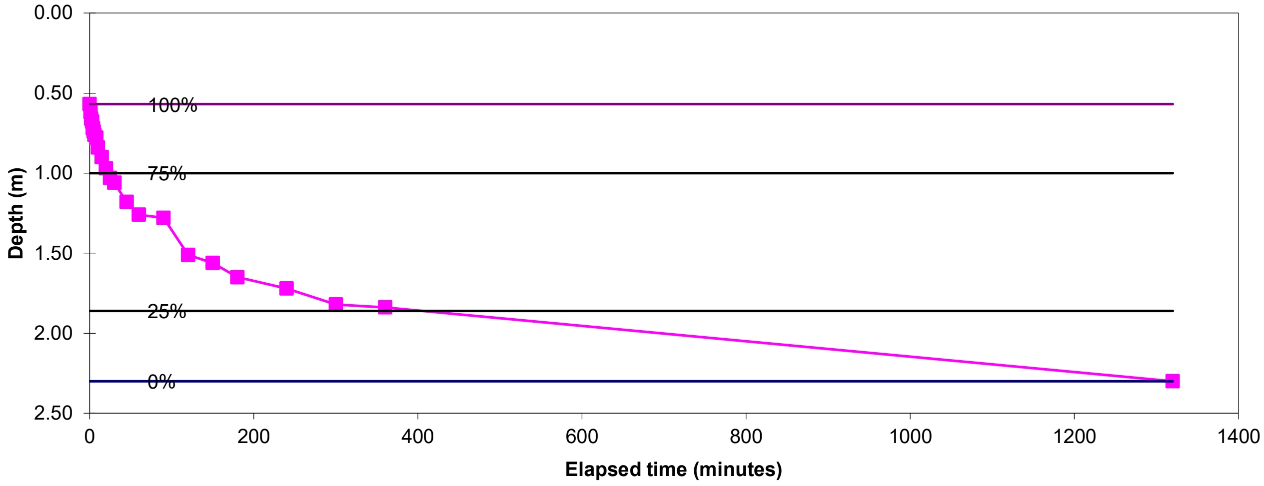
Figure
SKWY/3E7502IT/

Soakaway Test

Trial Pit No: 3E7503IT
Test No: 1
Date: 31/08/2023

Length (m): 2.40
Width (m): 0.80
Depth (m): 2.30
Datum height: 0.78 m agl
Granular infill: None

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.57	60	1.26
1	0.62	90	1.28
2	0.66	120	1.51
3	0.68	150	1.56
4	0.72	180	1.65
5	0.74	240	1.72
6	0.76	300	1.82
8	0.78	360	1.84
10	0.84	1320	2.30
15	0.90		
20	0.97		
25	1.03		
30	1.06		
45	1.18		



Start water depth for analysis (mbgl): 0.57
75% effective depth (mbgl): 1.00 Elapsed time (mins): 22.5
50% effective depth (mbgl): 1.43
25% effective depth (mbgl): 1.86 Elapsed time (mins): 401.7
Base of soakage zone (mbgl): 2.30

Volume outflow between 75% and 25% effective depth (m3): 1.651
Mean surface area of outflow (m^2): 7.49
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins): 379.2

Soil infiltration rate: (for depth range 1.00 m to 1.86 m)	**9.7E-6 m/s**

Remarks Results processed following BRE DG 365 (2016).

Trail pit was dry next morning at 8:30

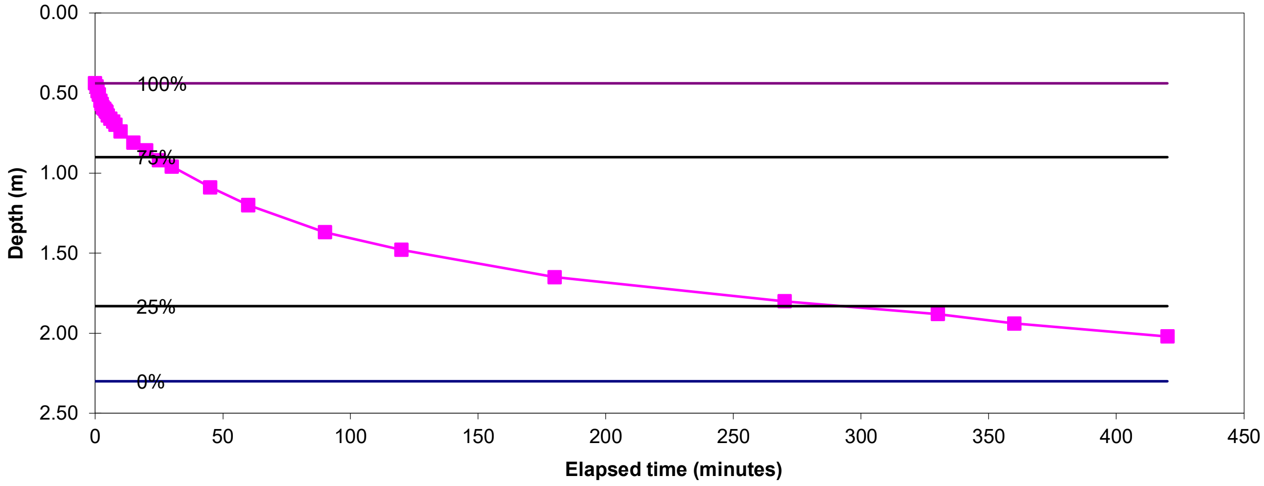
Testing: 0 Checked: Approved:	Notes:	Project Project No. Carried out for	WFL Hampshire Water Transfer and Water Recycling Project G2034-22 Clancy Docwra on behalf of Southern Water	Figure **SKWY/3E7503IT/**

Soakaway Test

Trial Pit No: 3E7503IT
Test No: 2
Date: 05/09/2023

Length (m): 2.40
Width (m): 0.80
Depth (m): 2.30
Datum height: 0.75 m agl
Granular infill: None

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.44	10	0.74
0.5	0.46	15	0.81
1	0.49	20	0.86
1.5	0.51	25	0.92
2	0.55	30	0.96
2.5	0.57	45	1.09
3	0.59	60	1.20
3.5	0.60	90	1.37
4	0.61	120	1.48
4.5	0.62	180	1.65
5	0.64	270	1.80
6	0.66	330	1.88
7	0.68	360	1.94
8	0.70	420	2.02



Start water depth for analysis (mbgl): 0.44
75% effective depth (mbgl): 0.90 Elapsed time (mins): 23.3
50% effective depth (mbgl): 1.37
25% effective depth (mbgl): 1.83 Elapsed time (mins): 292.5
Base of soakage zone (mbgl): 2.30

Volume outflow between 75% and 25% effective depth (m3): 1.786
Mean surface area of outflow (m^2): 7.87
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins): 269.2

Soil infiltration rate: **(for depth range 0.90 m to 1.83 m)**	**1.4E-5 m/s**

Remarks Results processed following BRE DG 365 (2016).

Testing: TC
Checked:
Approved:

Notes:

Project WFL Hampshire Water Transfer and Water Recycling Project (Phase 2)
Project No. G2034-22
Carried out for Clancy Docwra on behalf of Southern Water

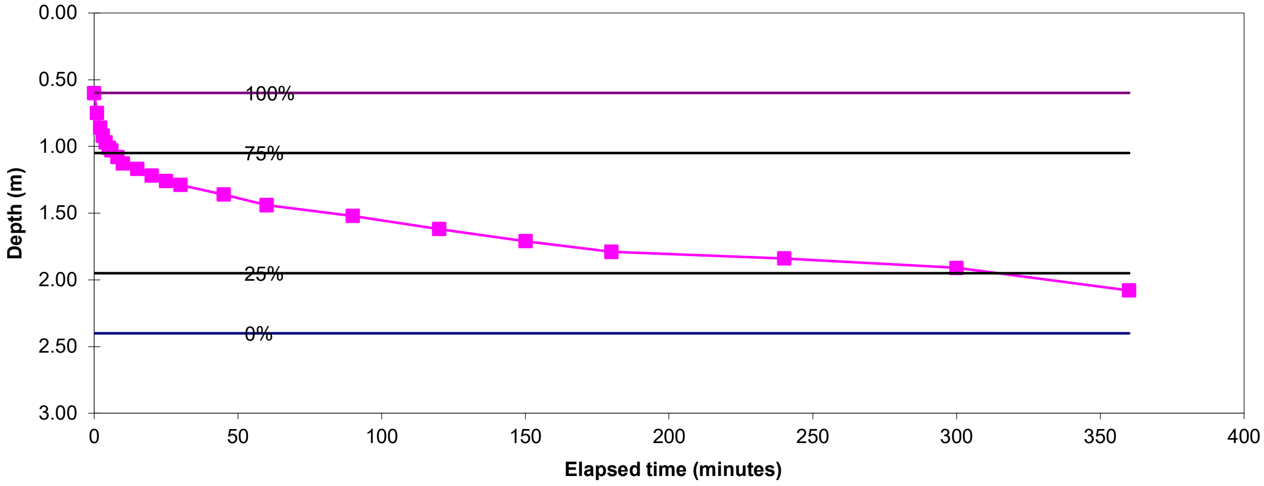
Figure
SKWY/3E7503IT/

Soakaway Test

Trial Pit No: 3E7504IT
Test No: 1
Date: 05/09/2023

Length (m):	2.40	Datum height:	0.50 m agl
Width (m):	0.80	Granular infill:	None
Depth (m):	2.40		

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.60	60	1.44
1	0.75	90	1.52
2	0.86	120	1.62
3	0.92	150	1.71
4	0.97	180	1.79
5	1.01	240	1.84
6	1.03	300	1.91
8	1.08	360	2.08
10	1.13		
15	1.17		
20	1.22		
25	1.26		
30	1.29		
45	1.36		



Start water depth for analysis (mbgl):	0.60		
75% effective depth (mbgl):	1.05	Elapsed time (mins):	6.8
50% effective depth (mbgl):	1.50		
25% effective depth (mbgl):	1.95	Elapsed time (mins):	314.1
Base of soakage zone (mbgl):	2.40		

Volume outflow between 75% and 25% effective depth (m3): 1.728

Mean surface area of outflow (m^2): 7.68
(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins): 307.3

Soil infiltration rate: **(for depth range 1.05 m to 1.95 m)**	**1.2E-5 m/s**

Remarks: Results processed following BRE DG 365 (2016).

Testing: 0
Checked:
Approved:

Notes:

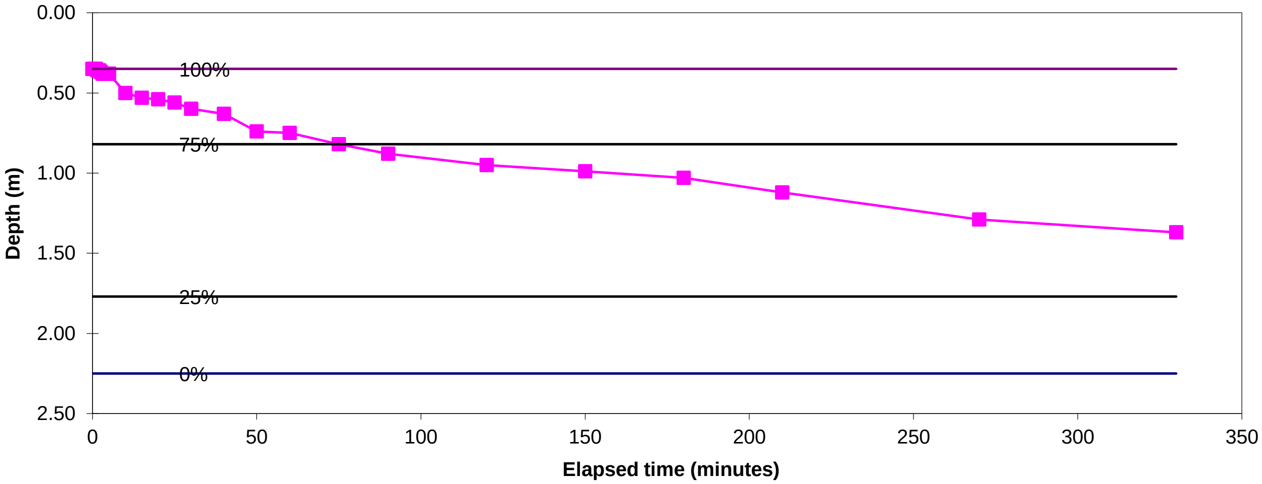
Project WFL Hampshire Water Transfer and Water Recycling Project (Phase 2)
Project No. G2034-22
Carried out for Clancy Docwra on behalf of Southern Water

Figure SKWY/3E7504IT/

Soakaway Test

Trial Pit No:	3E7504IT	Test No:	2	Date: 06/09/2023
Length (m):	3.00	Datum height:	0.60	m agl
Width (m):	0.60	Granular infill:	No	
Depth (m):	2.25			

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.35	25	0.56
0.5	0.35	30	0.60
1	0.35	40	0.63
1.5	0.36	50	0.74
2	0.36	60	0.75
2.5	0.37	75	0.82
3	0.38	90	0.88
3.5	0.38	120	0.95
4	0.38	150	0.99
4.5	0.38	180	1.03
5	0.38	210	1.12
10	0.50	270	1.29
15	0.53	330	1.37
20	0.54		



Start water depth for analysis (mbgl):	0.35		
75% effective depth (mbgl):	0.82	Elapsed time (mins):	75.0
50% effective depth (mbgl):	1.30		
25% effective depth (mbgl):	1.77		
Base of soakage zone (mbgl):	2.25		

Volume outflow between 75% and 25% effective depth (m3):

Mean surface area of outflow (m^2): 8.64
(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**
Remarks	Results processed following BRE DG 365 (2016).

Testing: BP Checked: Approved:	Notes:	**Project** WFL Hampshire Water Transfer and Water Recycling Project (Phase 2) **Project No.** G2034-22 **Carried out for** Clancy Docwra on behalf of Southern Water	**Figure** **SKWY/3E7504IT/**

Soakaway Test

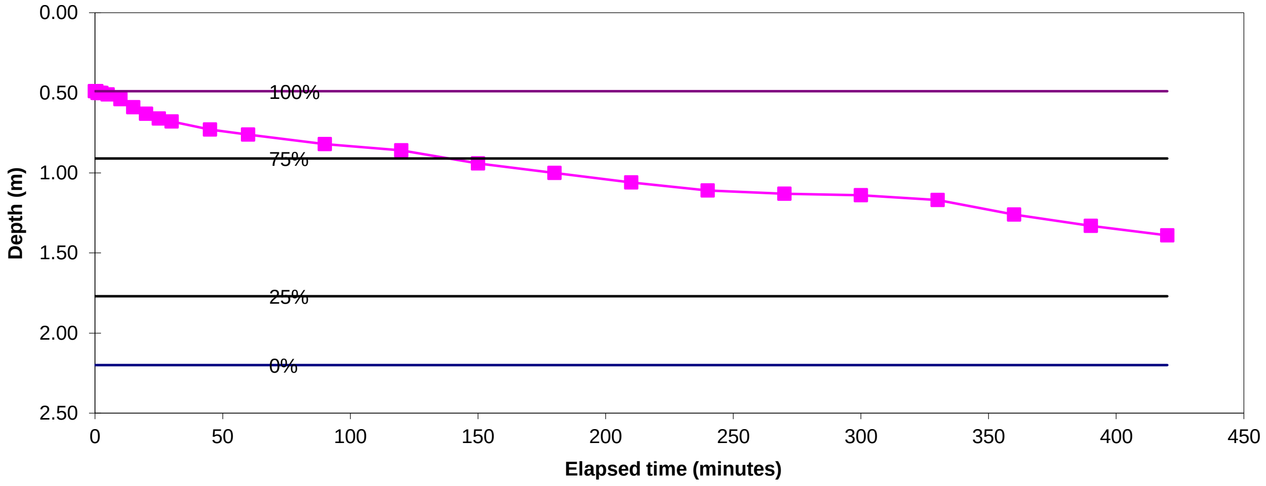
SOCOTEC

Trial Pit No: 3E7504IT
Length (m): 3.80
Width (m): 0.60
Depth (m): 2.20

Test No: 3
Datum height: 0.55 m agl
Granular infill: No

Date: 07/09/2023

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.49	90	0.82
0.5	0.49	120	0.86
1	0.50	150	0.94
1.5	0.50	180	1.00
2	0.50	210	1.06
2.5	0.50	240	1.11
5	0.51	270	1.13
10	0.54	300	1.14
15	0.59	330	1.17
20	0.63	360	1.26
25	0.66	390	1.33
30	0.68	420	1.39
45	0.73		
60	0.76		



Start water depth for analysis (mbgl): 0.49
75% effective depth (mbgl): 0.91
Elapsed time (mins): 138.8
50% effective depth (mbgl): 1.34
25% effective depth (mbgl): 1.77
Base of soakage zone (mbgl): 2.20
Volume outflow between 75% and 25% effective depth (m3):
Mean surface area of outflow (m^2): 9.85
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**
Remarks	Results processed following BRE DG 365 (2016).

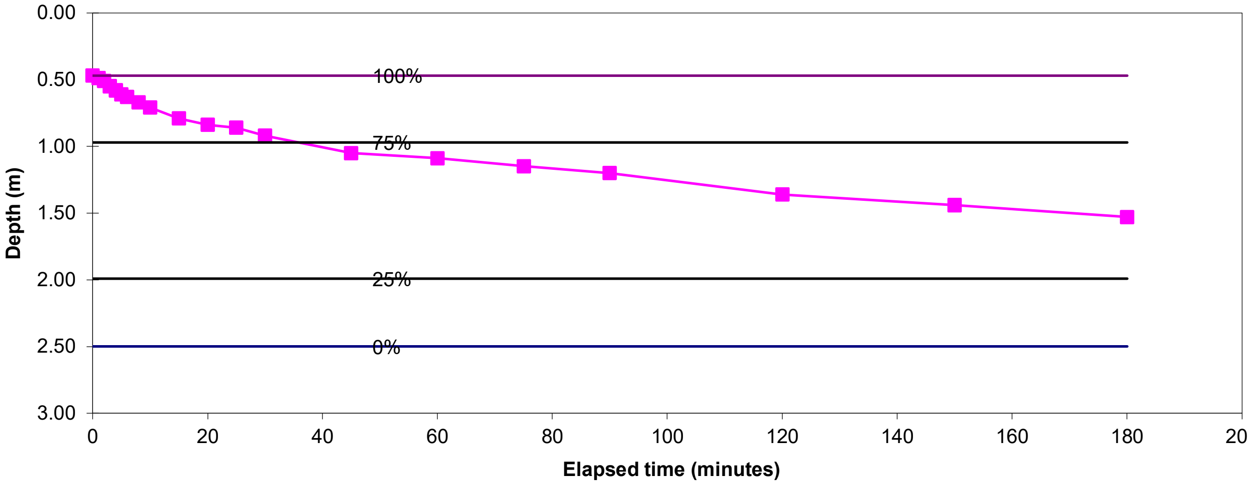
Testing: BP Checked: Approved:	Notes:	Project: WFL Hampshire Water Transfer and Water Recycling Project (Phase 2) Project No.: G2034-22 Carried out for: Clancy Docwra on behalf of Southern Water	Figure SKWY/3E7504IT/

Soakaway Test

Trial Pit No: 3E7505IT
Test No: 1
Date: 05/09/2023

Length (m): 0.80
Width (m): 2.50
Depth (m): 2.50
Datum height: 0.50 m agl
Granular infill: None

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.47	60	1.09
1	0.49	75	1.15
2	0.51	90	1.20
3	0.55	120	1.36
4	0.58	150	1.44
5	0.61	180	1.53
6	0.63		
8	0.67		
10	0.71		
15	0.79		
20	0.84		
25	0.86		
30	0.92		
45	1.05		



Start water depth for analysis (mbgl):	0.47		
75% effective depth (mbgl):	0.97	Elapsed time (mins):	35.8
50% effective depth (mbgl):	1.48		
25% effective depth (mbgl):	1.99		
Base of soakage zone (mbgl):	2.50		

Volume outflow between 75% and 25% effective depth (m3):

Mean surface area of outflow (m^2): 8.73
(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**

Remarks: Results processed following BRE DG 365 (2016).

Testing: 0
Checked:
Approved:

Notes:

Project: WFL Hampshire Water Transfer and Water Recycling Project (Phase 2)
Project No.: G2034-22
Carried out for: Clancy Docwra on behalf of Southern Water

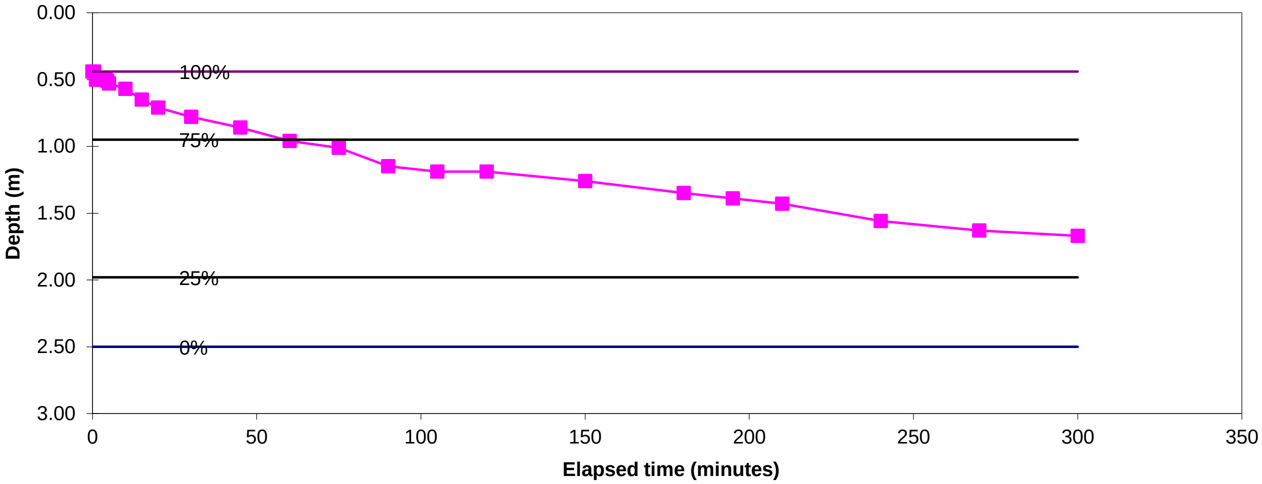
Figure: SKWY/3E7505IT/

Soakaway Test

Trial Pit No: 3E7505IT
Test No: 2
Date: 06/09/2023

Length (m): 3.20
Width (m): 0.60
Depth (m): 2.50
Datum height: 0.40 m agl
Granular infill: No

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.44	30	0.78
0.5	0.44	45	0.86
1	0.50	60	0.96
1.5	0.50	75	1.01
2	0.50	90	1.15
2.5	0.50	105	1.19
3	0.50	120	1.19
3.5	0.50	150	1.26
4	0.50	180	1.35
4.5	0.51	195	1.39
5	0.53	210	1.43
10	0.57	240	1.56
15	0.65	270	1.63
20	0.71	300	1.67



Start water depth for analysis (mbgl): 0.44
75% effective depth (mbgl): 0.95
Elapsed time (mins): 58.5
50% effective depth (mbgl): 1.47
25% effective depth (mbgl): 1.98
Base of soakage zone (mbgl): 2.50

Volume outflow between 75% and 25% effective depth (m3):
Mean surface area of outflow (m^2): 9.75
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins):

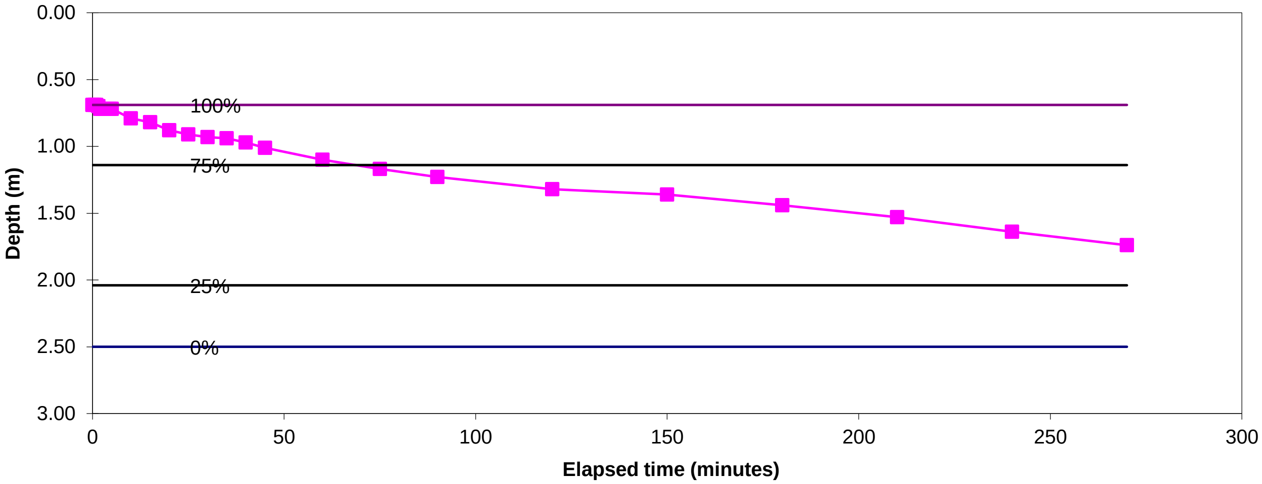
Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**
Remarks	Results processed following BRE DG 365 (2016).

Testing: BP Checked: Approved:	Notes:	**Project** WFL Hampshire Water Transfer and Water Recycling Project (Phase 2) **Project No.** G2034-22 **Carried out for** Clancy Docwra on behalf of Southern Water	**Figure** **SKWY/3E7505IT/**

Soakaway Test

Trial Pit No: 3E7505IT
Test No: 3
Date: 07/09/2023
Length (m): 3.00
Width (m): 0.60
Depth (m): 2.50
Datum height: 0.30 m agl
Granular infill: No

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.69	25	0.91
0.5	0.69	30	0.93
1	0.69	35	0.94
1.5	0.70	40	0.97
2	0.72	45	1.01
2.5	0.72	60	1.10
3	0.72	75	1.17
3.5	0.72	90	1.23
4	0.72	120	1.32
4.5	0.72	150	1.36
5	0.72	180	1.44
10	0.79	210	1.53
15	0.82	240	1.64
20	0.88	270	1.74



Start water depth for analysis (mbgl):	0.69		
75% effective depth (mbgl):	1.14	Elapsed time (mins):	68.6
50% effective depth (mbgl):	1.59		
25% effective depth (mbgl):	2.04		
Base of soakage zone (mbgl):	2.50		

Volume outflow between 75% and 25% effective depth (m3):

Mean surface area of outflow (m^2): 8.35
(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**
Remarks	Results processed following BRE DG 365 (2016).

Testing: BP
Checked:
Approved:

Notes:

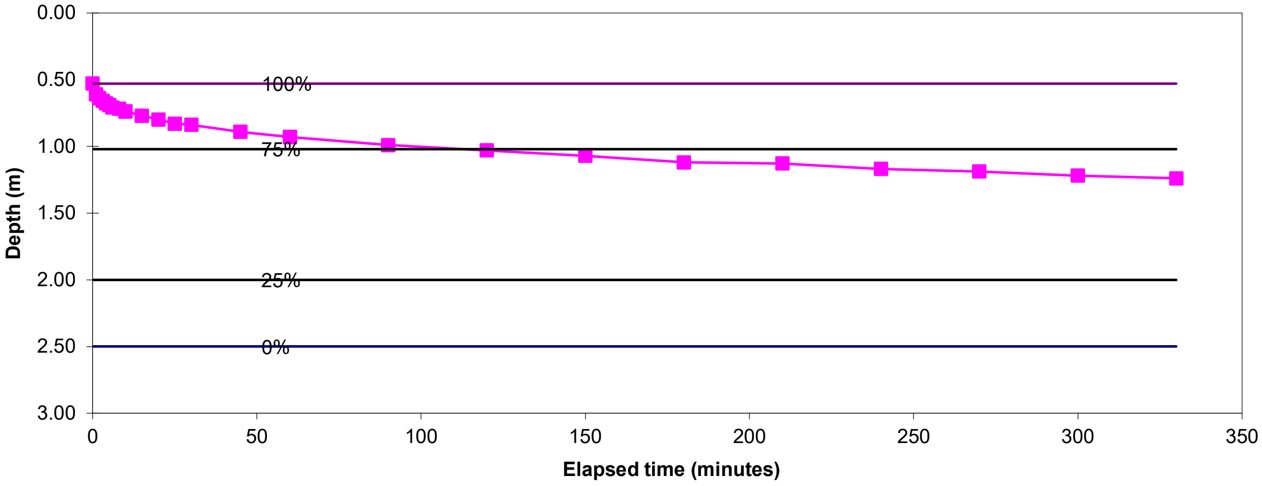
Project WFL Hampshire Water Transfer and Water Recycling Project (Phase 2)
Project No. G2034-22
Carried out for Clancy Docwra on behalf of Southern Water

Figure
SKWY/3E7505IT/

Soakaway Test

Trial Pit No: 3E7506IT
Test No: 1
Date: 30/08/2023
Length (m): 2.30
Datum height: 0.57 m agl
Width (m): 0.80
Granular infill: None
Depth (m): 2.50

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.53	60	0.93
1	0.61	90	0.99
2	0.64	120	1.03
3	0.66	150	1.07
4	0.68	180	1.12
5	0.69	210	1.13
6	0.71	240	1.17
8	0.72	270	1.19
10	0.74	300	1.22
15	0.77	330	1.24
20	0.80		
25	0.83		
30	0.84		
45	0.89		



Start water depth for analysis (mbgl): 0.53
75% effective depth (mbgl): 1.02
Elapsed time (mins): 112.5
50% effective depth (mbgl): 1.51
25% effective depth (mbgl): 2.00
Base of soakage zone (mbgl): 2.50
Volume outflow between 75% and 25% effective depth (m3):
Mean surface area of outflow (m^2): 7.98
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**

Remarks
Results processed following BRE DG 365 (2016).

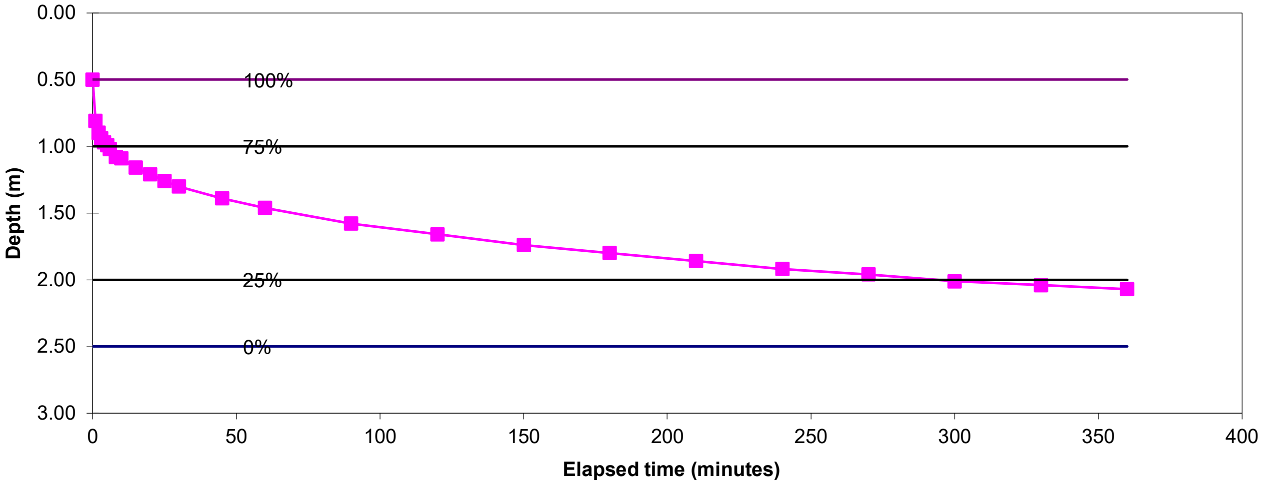
Test failed to reach 75% effective depth after 24 hours. Test failed.

Testing: 0
Checked:
Approved:
Notes:
Project **WFL Hampshire Water Transfer and Water Recycling Project**
Project No. **G2034-22**
Carried out for **Clancy Docwra on behalf of Southern Water**
Figure
SKWY/3E7506IT/

Soakaway Test

Trial Pit No:	3E7507IT	Test No:	1	Date:	30/08/2023
Length (m):	3.00	Datum height:	0.45	m agl	
Width (m):	0.70	Granular infill:	None		
Depth (m):	2.50				

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.50	60	1.46
1	0.81	90	1.58
2	0.90	120	1.66
3	0.94	150	1.74
4	0.97	180	1.80
5	0.99	210	1.86
6	1.02	240	1.92
8	1.08	270	1.96
10	1.09	300	2.01
15	1.16	330	2.04
20	1.21	360	2.07
25	1.26		
30	1.30		
45	1.39		



Start water depth for analysis (mbgl):	0.50		
75% effective depth (mbgl):	1.00	Elapsed time (mins):	5.3
50% effective depth (mbgl):	1.50		
25% effective depth (mbgl):	2.00	Elapsed time (mins):	294.0
Base of soakage zone (mbgl):	2.50		

Volume outflow between 75% and 25% effective depth (m3): 2.100

Mean surface area of outflow (m^2): 9.50
(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins): 288.7

Soil infiltration rate: **(for depth range 1.00 m to 2.00 m)**	**1.3E-5 m/s**

Remarks Results processed following BRE DG 365 (2016).

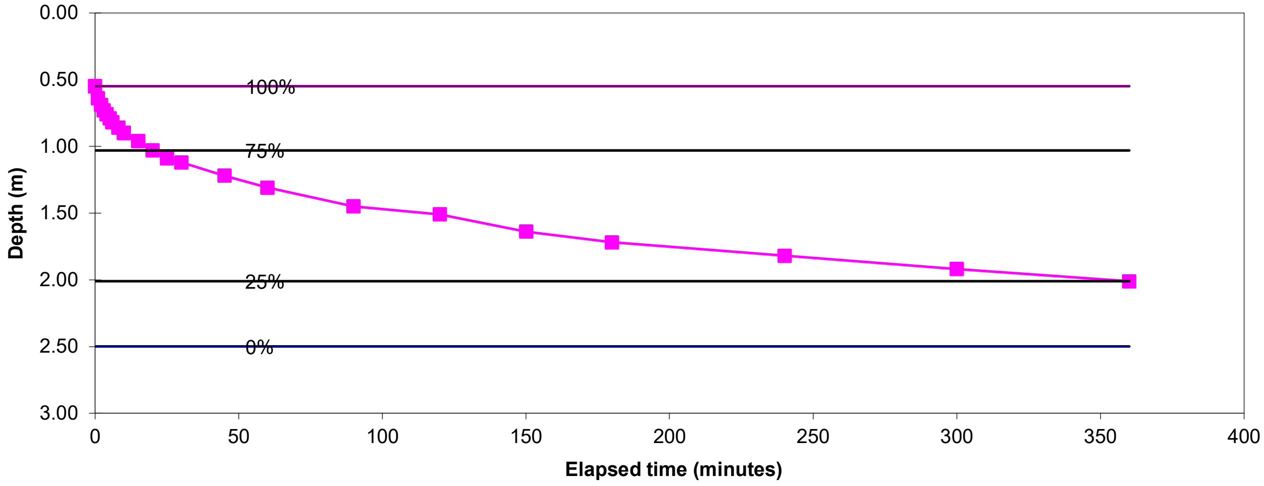
Testing: 0 Checked: Approved:	Notes:	Project: WFL Hampshire Water Transfer and Water Recycling Project Project No. G2034-22 Carried out for: Clancy Docwra on behalf of Southern Water	Figure **SKWY/3E7507IT/**

Soakaway Test

SOCOTEC

Trial Pit No: 3E7507IT
Test No: 2
Date: 31/08/2023
Length (m): 3.00
Datum height: 0.45 m agl
Width (m): 0.70
Granular infill: None
Depth (m): 2.50

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.55	60	1.31
1	0.64	90	1.45
2	0.69	120	1.51
3	0.73	150	1.64
4	0.76	180	1.72
5	0.79	240	1.82
6	0.82	300	1.92
8	0.86	360	2.01
10	0.90		
15	0.96		
20	1.03		
25	1.09		
30	1.12		
45	1.22		



Start water depth for analysis (mbgl): 0.55
75% effective depth (mbgl): 1.03
Elapsed time (mins): 20.0
50% effective depth (mbgl): 1.52
25% effective depth (mbgl): 2.01
Elapsed time (mins): 45.0
Base of soakage zone (mbgl): 2.50
Volume outflow between 75% and 25% effective depth (m3): 2.058
Mean surface area of outflow (m^2): 9.35
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins): 25.0

Soil infiltration rate: **(for depth range 1.03 m to 2.01 m)**	**1.5E-4 m/s**
Remarks	Results processed following BRE DG 365 (2016).

Testing: 0
Checked:
Approved:

Notes:

Project WFL Hampshire Water Transfer and Water Recycling Project
Project No. G2034-22
Carried out for Clancy Docwra on behalf of Southern Water

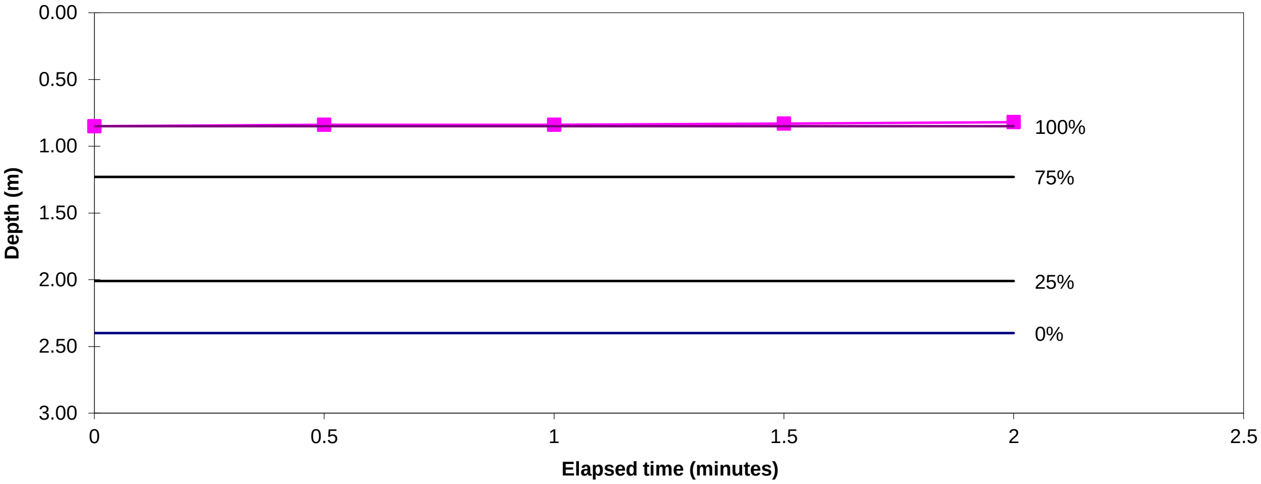
Figure
SKWY/3E7507IT/

Soakaway Test

Trial Pit No: 3E7507IT
Test No: 3
Date: 04/09/2023

Length (m): 3.70
Width (m): 0.40
Depth (m): 2.40
Datum height: 0.50 m agl
Granular infill: No

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.85		
0.5	0.84		
1	0.84		
1.5	0.83		
2	0.82		



Start water depth for analysis (mbgl): 0.85
75% effective depth (mbgl): 1.23
50% effective depth (mbgl): 1.62
25% effective depth (mbgl): 2.01
Base of soakage zone (mbgl): 2.40

Volume outflow between 75% and 25% effective depth (m3):
Mean surface area of outflow (m^2): 7.88
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**
Remarks	Results processed following BRE DG 365 (2016).

Testing: bp
Checked:
Approved:

Notes:

Project WFL Hampshire Water Transfer and Water Recycling Project (Phase 2)
Project No. G2034-22
Carried out for Clancy Docwra on behalf of Southern Water

Figure
SKWY/3E7507IT/

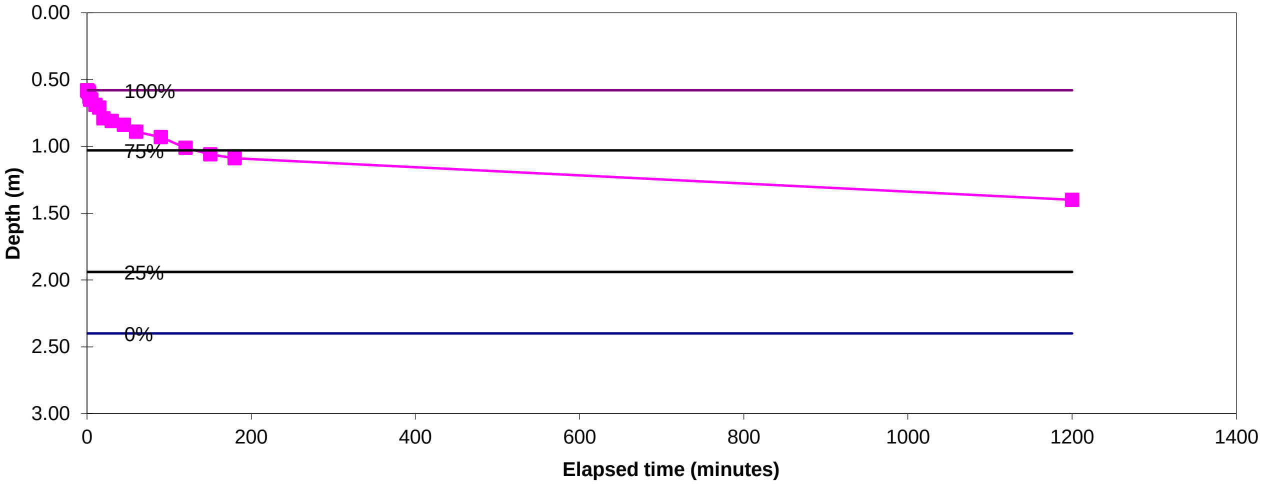
Soakaway Test

SOCOTEC

Trial Pit No: 3E7508IT
Test No: 1
Date: 06/09/2023

Length (m): 3.80
Datum height: 0.40 m agl
Width (m): 0.60
Granular infill: No
Depth (m): 2.40

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.58	30	0.81
0.5	0.58	45	0.84
1	0.59	60	0.89
1.5	0.59	90	0.93
2	0.59	120	1.01
2.5	0.60	150	1.06
3	0.63	180	1.09
3.5	0.65	1200	1.40
4	0.65		
4.5	0.65		
5	0.65		
10	0.69		
15	0.71		
20	0.79		



Start water depth for analysis (mbgl): 0.58
75% effective depth (mbgl): 1.03
Elapsed time (mins): 132.0
50% effective depth (mbgl): 1.49
25% effective depth (mbgl): 1.94
Base of soakage zone (mbgl): 2.40

Volume outflow between 75% and 25% effective depth (m3):
Mean surface area of outflow (m^2): 10.29
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**
Remarks	Results processed following BRE DG 365 (2016).

Testing: BP
Checked:
Approved:

Notes:

Project WFL Hampshire Water Transfer and Water Recycling Project (Phase 2)
Project No. G2034-22
Carried out for Clancy Docwra on behalf of Southern Water

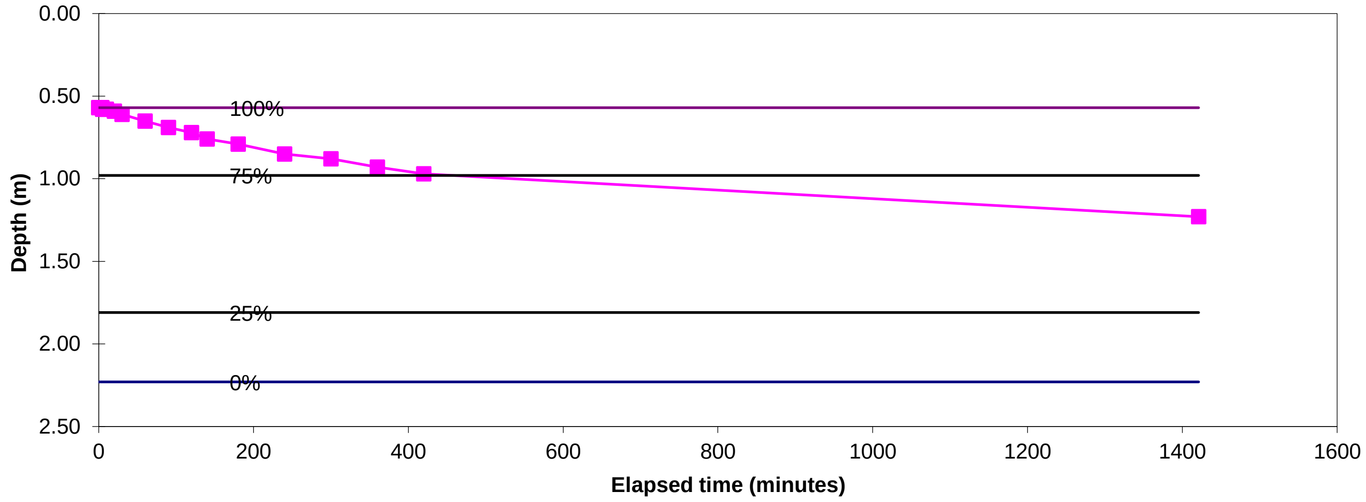
Figure
SKWY/3E7508IT/

Soakaway Test

Trial Pit No: 3F7509IT
Test No: 1
Date: 07/05/2024

Length (m): 2.80
Datum height: 0.00 m agl
Width (m): 0.80
Granular infill: None
Depth (m): 2.23

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.57	180	0.79
0.5	0.57	240	0.85
1	0.57	300	0.88
2	0.57	360	0.93
3	0.57	420	0.97
4	0.57	1421	1.23
5	0.58		
10	0.58		
20	0.59		
30	0.61		
60	0.65		
90	0.69		
120	0.72		
140	0.76		



Start water depth for analysis (mbgl): 0.57
75% effective depth (mbgl): 0.98
Elapsed time (mins): 458.5
50% effective depth (mbgl): 1.40
25% effective depth (mbgl): 1.81
Base of soakage zone (mbgl): 2.23
Volume outflow between 75% and 25% effective depth (m3):
Mean surface area of outflow (m^2): 8.22
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**
Remarks	Results processed following BRE DG 365 (2016).

Testing: JB
Checked:
Approved:

Notes:

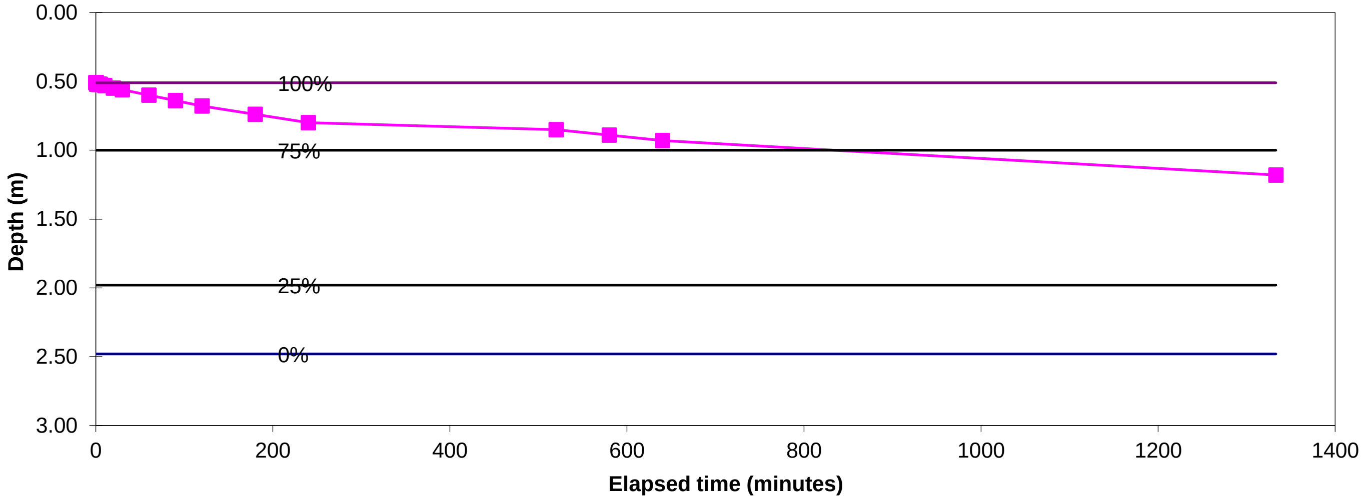
Project **WFL Hampshire Water Transfer and Water Recycling Project**
Project No. **G4011-24 Phase 3B/C**
Carried out for **Clancy Docwra on behalf on Southern Water**

Figure
SKWY/3F7509IT/1

Soakaway Test

Trial Pit No: 3F7509IT
Test No: 2
Date: 08/05/2024
Length (m): 2.80
Width (m): 0.80
Depth (m): 2.48
Datum height: 0.00 m agl
Granular infill: None

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.51	240	0.80
0.5	0.51	520	0.85
1	0.52	580	0.89
2	0.52	640	0.93
3	0.52	1333	1.18
4	0.52		
5	0.52		
10	0.53		
20	0.55		
30	0.56		
60	0.60		
90	0.64		
120	0.68		
180	0.74		



Start water depth for analysis (mbgl): 0.51
75% effective depth (mbgl): 1.00
Elapsed time (mins): 834.0
50% effective depth (mbgl): 1.49
25% effective depth (mbgl): 1.98
Base of soakage zone (mbgl): 2.48

Volume outflow between 75% and 25% effective depth (m3):
Mean surface area of outflow (m^2): 9.37
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins):

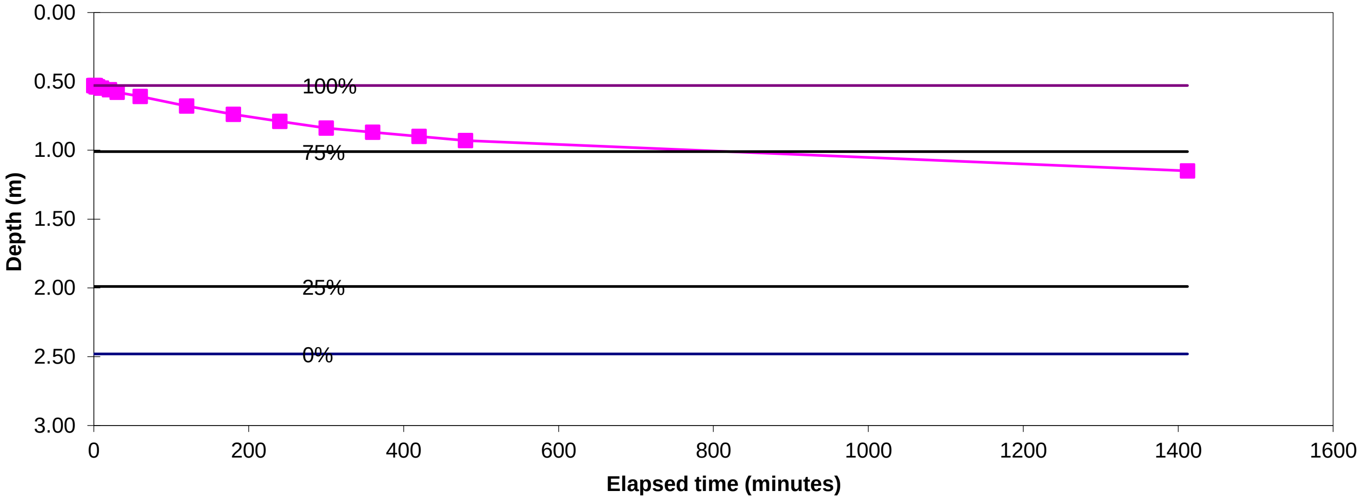
Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**
Remarks	Results processed following BRE DG 365 (2016).

Testing: JB Checked: Approved:	Notes:	**Project** **Project No.** **Carried out for**	**WFL Hampshire Water Transfer and Water Recycling Project** **G4011-24 Phase 3B/C** **Clancy Docwra on behalf on Southern Water**	**Figure** **SKWY/3F7509IT/2**

Soakaway Test

Trial Pit No:	3F7509IT	Test No:	3	Date:	09/05/2024
Length (m):	2.80	Datum height:	0.00	m agl	
Width (m):	0.80	Granular infill:	None		
Depth (m):	2.48				

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.53	300	0.84
0.5	0.53	360	0.87
1	0.53	420	0.90
2	0.53	480	0.93
3	0.54	1412	1.15
4	0.54		
5	0.54		
10	0.55		
20	0.56		
30	0.58		
60	0.61		
120	0.68		
180	0.74		
240	0.79		



Start water depth for analysis (mbgl):	0.53		
75% effective depth (mbgl):	1.01	Elapsed time (mins):	818.9
50% effective depth (mbgl):	1.50		
25% effective depth (mbgl):	1.99		
Base of soakage zone (mbgl):	2.48		

Volume outflow between 75% and 25% effective depth (m3):

Mean surface area of outflow (m^2): 9.30

(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**
Remarks	Results processed following BRE DG 365 (2016).

Testing: JB Checked: Approved:	Notes:	**Project** **Project No.** **Carried out for**	**WFL Hampshire Water Transfer and Water Recycling Project** **G4011-24 Phase 3B/C** **Clancy Docwra on behalf on Southern Water**	**Figure** **SKWY/3F7509IT/3**

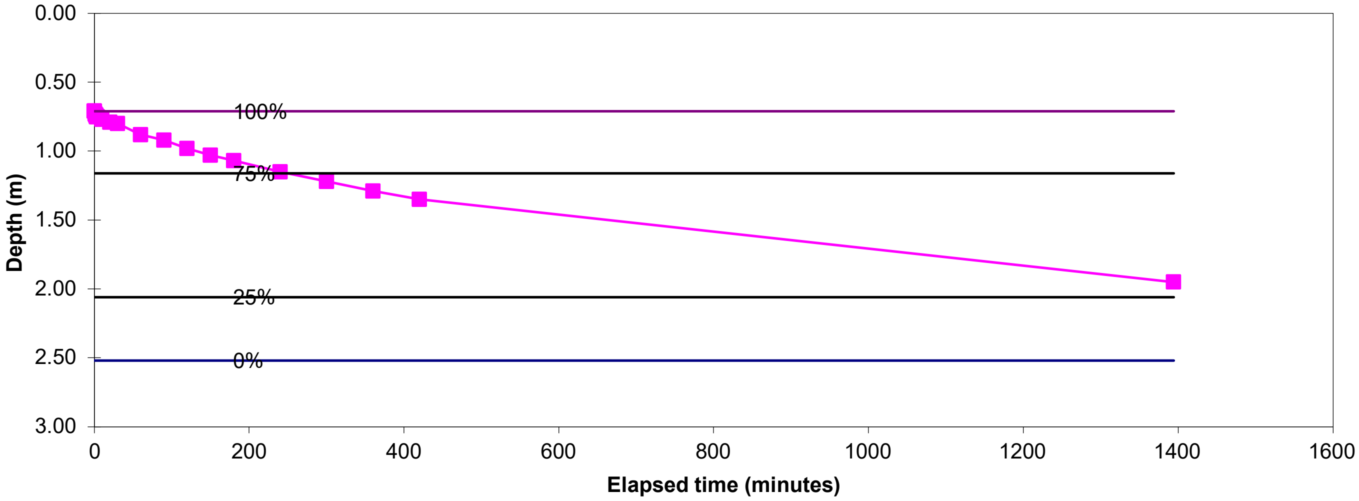
Soakaway Test

Trial Pit No: 3F7510IT
Test No: 1
Date: 07/05/2024

Length (m): 3.20
Width (m): 0.80
Depth (m): 2.52

Datum height: 0.00 m agl
Granular infill: None

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.71	180	1.07
0.5	0.71	240	1.15
1	0.73	300	1.22
2	0.74	360	1.29
2.5	0.74	420	1.35
3	0.75	1394	1.95
4	0.75		
10	0.77		
20	0.79		
30	0.80		
60	0.88		
90	0.92		
120	0.98		
150	1.03		



Start water depth for analysis (mbgl): 0.71
75% effective depth (mbgl): 1.16
Elapsed time (mins): 248.6
50% effective depth (mbgl): 1.61
25% effective depth (mbgl): 2.06
Base of soakage zone (mbgl): 2.52

Volume outflow between 75% and 25% effective depth (m3):
Mean surface area of outflow (m^2): 9.84
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins):

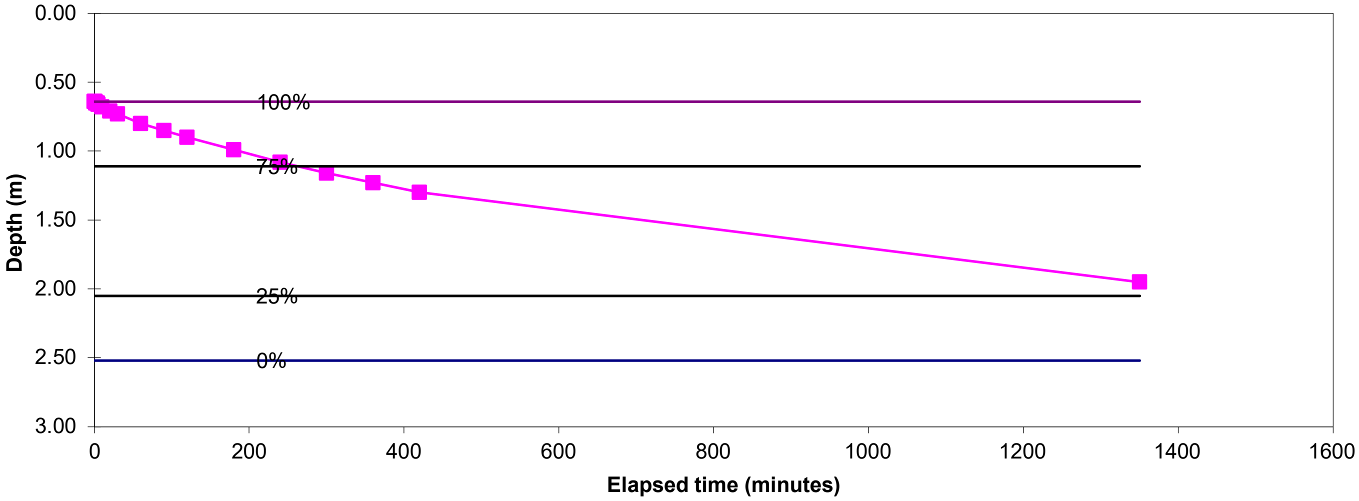
Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**
Remarks	Results processed following BRE DG 365 (2016).

Testing: JB Checked: Approved:	Notes:	Project Project No. Carried out for	WFL Hampshire Water Transfer and Water Recycling Project G4011-24 Phase 3B/C Clancy Docwra on behalf on Southern Water	Figure **SKWY/3F7510IT/1**

Soakaway Test

Trial Pit No: 3F7510IT
Test No: 2
Date: 08/05/2024
Length (m): 3.20
Datum height: 0.00 m agl
Width (m): 0.80
Granular infill: None
Depth (m): 2.52

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.64	240	1.08
0.5	0.64	300	1.16
1	0.64	360	1.23
2	0.65	420	1.30
3	0.65	1350	1.95
4	0.65		
5	0.66		
10	0.68		
20	0.71		
30	0.73		
60	0.80		
90	0.85		
120	0.90		
180	0.99		



Start water depth for analysis (mbgl): 0.64
75% effective depth (mbgl): 1.11
Elapsed time (mins): 262.5
50% effective depth (mbgl): 1.58
25% effective depth (mbgl): 2.05
Base of soakage zone (mbgl): 2.52
Volume outflow between 75% and 25% effective depth (m3):
Mean surface area of outflow (m^2): 10.08
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**
Remarks	Results processed following BRE DG 365 (2016).

Testing: JB
Checked:
Approved:

Notes:

Project WFL Hampshire Water Transfer and Water Recycling Project
Project No. G4011-24 Phase 3B/C
Carried out for Clancy Docwra on behalf on Southern Water

Figure
SKWY/3F7510IT/2

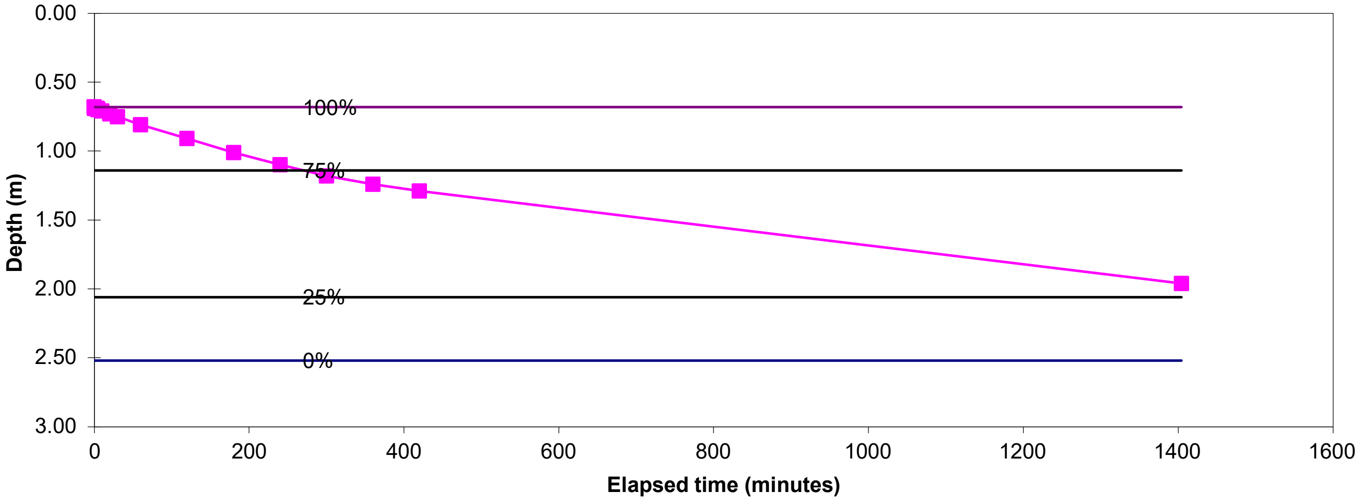
Soakaway Test

Trial Pit No: 3F7510IT
Test No: 3
Date: 08/05/2024

Length (m): 3.20
Width (m): 0.80
Depth (m): 2.52

Datum height: 0.00 m agl
Granular infill: None

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.68	300	1.18
0.5	0.69	360	1.24
1	0.69	420	1.29
2	0.69	1404	1.96
3	0.69		
4	0.69		
5	0.70		
10	0.71		
20	0.73		
30	0.75		
60	0.81		
120	0.91		
180	1.01		
240	1.10		



Start water depth for analysis (mbgl):	0.68
75% effective depth (mbgl):	1.14
50% effective depth (mbgl):	1.60
25% effective depth (mbgl):	2.06
Base of soakage zone (mbgl):	2.52

Elapsed time (mins): 270.0

Volume outflow between 75% and 25% effective depth (m3):

Mean surface area of outflow (m^2): 9.92
(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins):

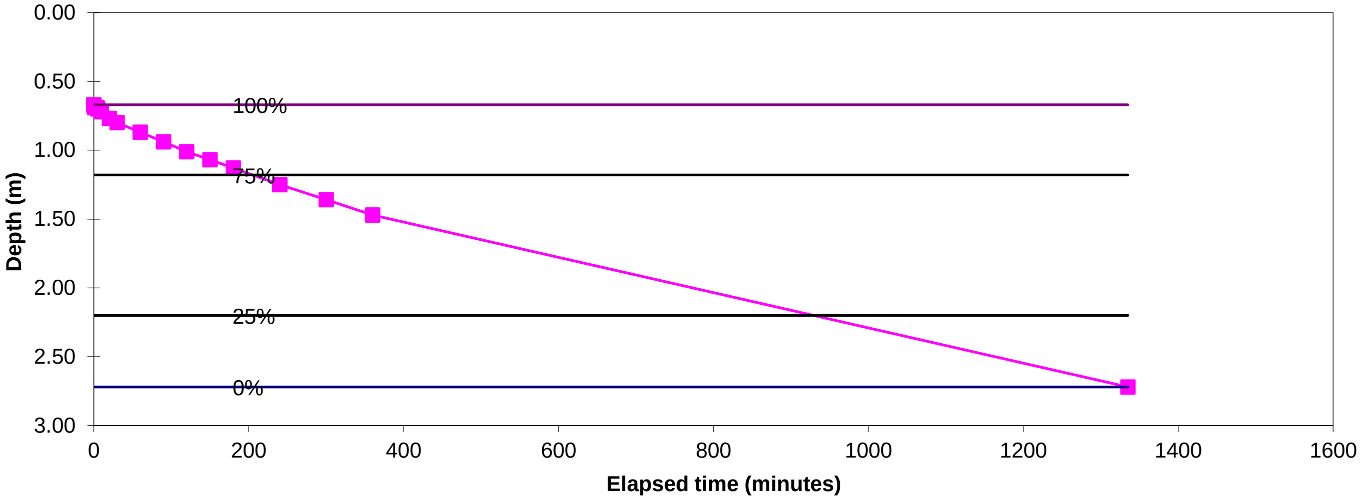
Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**
Remarks	Results processed following BRE DG 365 (2016).

Testing: JB Checked: Approved:	Notes:	**Project** **Project No.** **Carried out for**	**WFL Hampshire Water Transfer and Water Recycling Project** **G4011-24 Phase 3B/C** **Clancy Docwra on behalf on Southern Water**	**Figure** **SKWY/3F7510IT/3**

Soakaway Test

Trial Pit No: 3F7512IT
Test No: 3
Date: 07/05/2024
Length (m): 3.00
Datum height: 0.00 m agl
Width (m): 0.80
Granular infill: None
Depth (m): 2.72

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.67	180	1.13
0.5	0.68	240	1.25
1	0.69	300	1.36
2	0.69	360	1.47
3	0.69	1335	2.72
4	0.69		
5	0.70		
10	0.72		
20	0.77		
30	0.80		
60	0.87		
90	0.94		
120	1.01		
150	1.07		



Start water depth for analysis (mbgl):	0.67		
75% effective depth (mbgl):	1.18	Elapsed time (mins):	205.0
50% effective depth (mbgl):	1.69		
25% effective depth (mbgl):	2.20	Elapsed time (mins):	929.4
Base of soakage zone (mbgl):	2.72		

Volume outflow between 75% and 25% effective depth (m3):	2.448
Mean surface area of outflow (m^2): (side area at 50% effective depth + base area)	10.23
Time for outflow between 75% and 25% effective depth (mins):	724.4

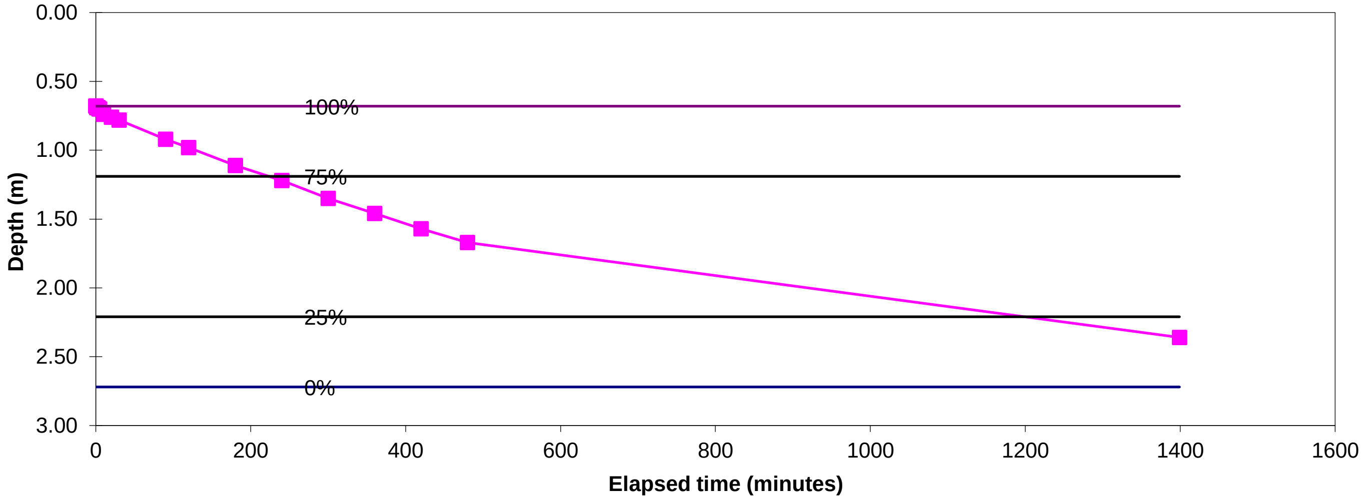
Soil infiltration rate: **(for depth range 1.18 m to 2.20 m)**	**5.5E-6 m/s**
Remarks	Results processed following BRE DG 365 (2016).

Testing: JB Checked: Approved:	Notes:	**Project** **Project No.** **Carried out for**	**WFL Hampshire Water Transfer and Water Recycling Project** **G4011-24 Phase 3B/C** **Clancy Docwra on behalf on Southern Water**	**Figure** **SKWY/3F7512IT**

Soakaway Test

Trial Pit No:	3F7512IT	Test No:	2	Date:	08/05/2024
Length (m):	3.00	Datum height:	0.00	m agl	
Width (m):	0.80	Granular infill:	None		
Depth (m):	2.72				

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.68	300	1.35
0.5	0.68	360	1.46
1	0.69	420	1.57
2	0.69	480	1.67
3	0.69	1399	2.36
4	0.70		
5	0.70		
10	0.74		
20	0.76		
30	0.78		
90	0.92		
120	0.98		
180	1.11		
240	1.22		



Start water depth for analysis (mbgl):	0.68		
75% effective depth (mbgl):	1.19	Elapsed time (mins):	223.6
50% effective depth (mbgl):	1.70		
25% effective depth (mbgl):	2.21	Elapsed time (mins):	1199.2
Base of soakage zone (mbgl):	2.72		

Volume outflow between 75% and 25% effective depth (m3): 2.448

Mean surface area of outflow (m^2): 10.15
(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins): 975.6

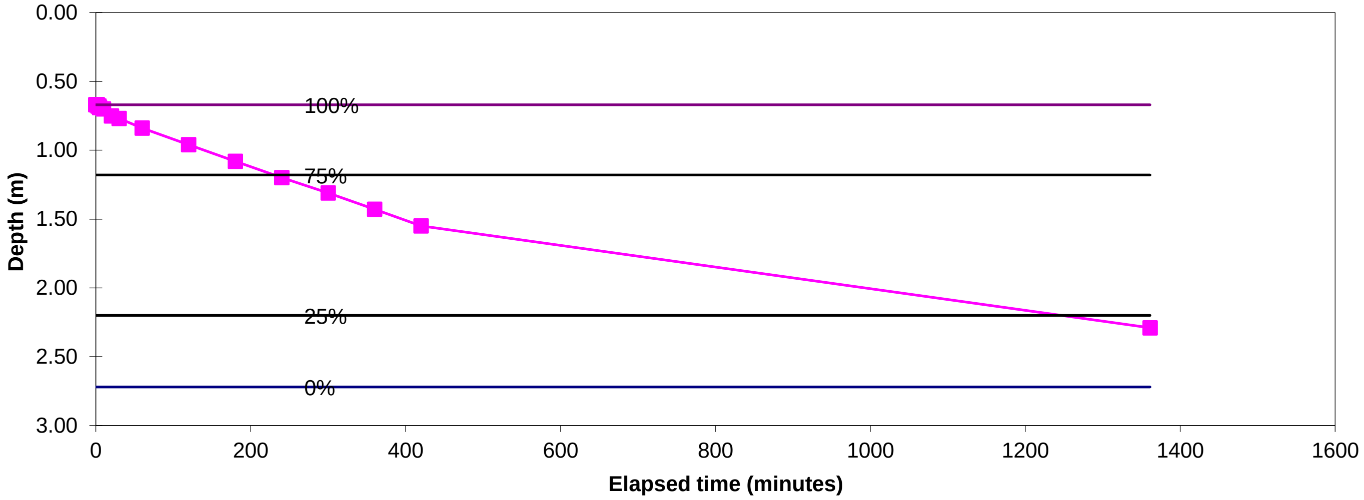
Soil infiltration rate: **(for depth range 1.19 m to 2.21 m)**	**4.1E-6 m/s**
Remarks	Results processed following BRE DG 365 (2016).

Testing: 0 Checked: Approved:	Notes:	**Project** **Project No.** **Carried out for**	**WFL Hampshire Water Transfer and Water Recycling Project** **G4011-24 Phase 3B/C** **Clancy Docwra on behalf on Southern Water**	**Figure** **SKWY/3F7512IT/2**

Soakaway Test

Trial Pit No:	3F7512IT	Test No:	3	Date:	09/05/2024
Length (m):	3.00	Datum height:	0.00	m agl	
Width (m):	0.80	Granular infill:	None		
Depth (m):	2.72				

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.67	300	1.31
0.5	0.67	360	1.43
1	0.67	420	1.55
2	0.67	1361	2.29
3	0.68		
4	0.68		
5	0.69		
10	0.70		
20	0.75		
30	0.77		
60	0.84		
120	0.96		
180	1.08		
240	1.20		



Start water depth for analysis (mbgl):	0.67		
75% effective depth (mbgl):	1.18	Elapsed time (mins):	230.0
50% effective depth (mbgl):	1.69		
25% effective depth (mbgl):	2.20	Elapsed time (mins):	1246.6
Base of soakage zone (mbgl):	2.72		

Volume outflow between 75% and 25% effective depth (m3): 2.448

Mean surface area of outflow (m^2): 10.23

(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins): 1016.6

Soil infiltration rate: **(for depth range 1.18 m to 2.20 m)**	**3.9E-6 m/s**
Remarks	Results processed following BRE DG 365 (2016).

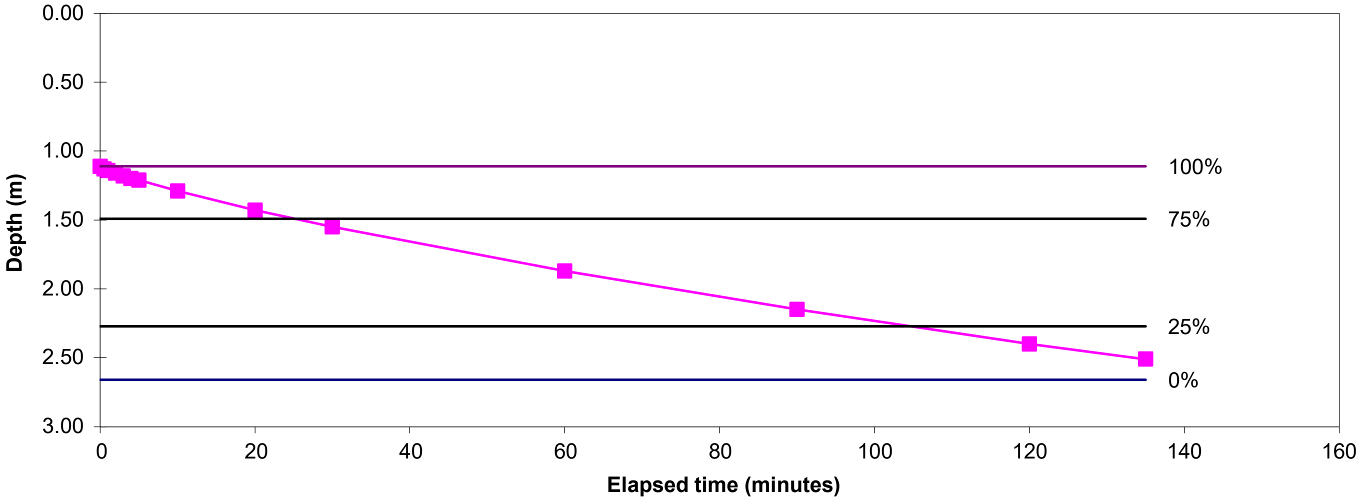
Testing: JB Checked: Approved:	Notes:	**Project** **Project No.** **Carried out for**	**WFL Hampshire Water Transfer and Water Recycling Project** **G4011-24 Phase 3B/C** **Clancy Docwra on behalf on Southern Water**	**Figure** **SKWY/3F7512IT/3**

Soakaway Test

Trial Pit No: 3F7513IT
Test No: 1
Date: 07/05/2024

Length (m):	2.90	Datum height:	0.00 m agl
Width (m):	0.80	Granular infill:	None
Depth (m):	2.66		

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	1.11		
0.5	1.13		
1	1.14		
2	1.16		
3	1.18		
4	1.20		
5	1.21		
10	1.29		
20	1.43		
30	1.55		
60	1.87		
90	2.15		
120	2.40		
135	2.51		



Start water depth for analysis (mbgl):	1.11		
75% effective depth (mbgl):	1.49	Elapsed time (mins):	25.0
50% effective depth (mbgl):	1.88		
25% effective depth (mbgl):	2.27	Elapsed time (mins):	104.4
Base of soakage zone (mbgl):	2.66		

Volume outflow between 75% and 25% effective depth (m3): 1.810

Mean surface area of outflow (m^2): 8.09
(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins): 79.4

Soil infiltration rate: **(for depth range 1.49 m to 2.27 m)**	**4.7E-5 m/s**
Remarks	Results processed following BRE DG 365 (2016).

Testing: JB Checked: Approved:	Notes:	Project Project No. Carried out for	WFL Hampshire Water Transfer and Water Recycling Project G4011-24 Phase 3B/C Clancy Docwra on behalf on Southern Water	Figure **SKWY/3F7513IT/1**

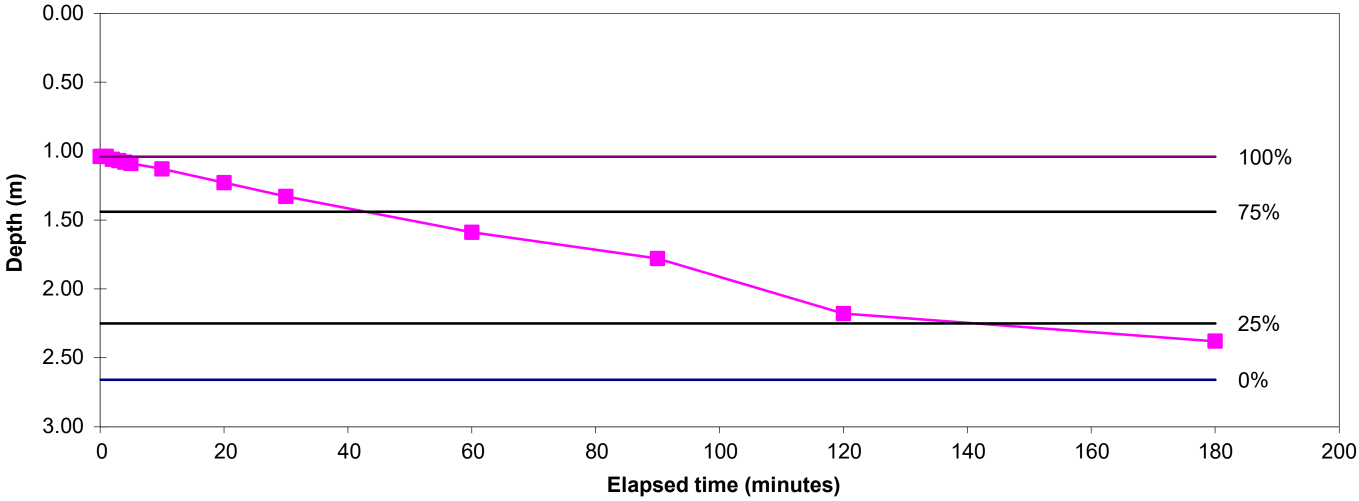
Soakaway Test

Trial Pit No: 3F7513IT
Test No: 2
Date: 07/05/2024

Length (m): 2.90
Width (m): 0.80
Depth (m): 2.66

Datum height: 0.00 m agl
Granular infill: None

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	1.04		
0.5	1.04		
1	1.04		
2	1.06		
3	1.07		
4	1.08		
5	1.09		
10	1.13		
20	1.23		
30	1.33		
60	1.59		
90	1.78		
120	2.18		
180	2.38		



Start water depth for analysis (mbgl):	1.04		
75% effective depth (mbgl):	1.44	Elapsed time (mins):	42.7
50% effective depth (mbgl):	1.85		
25% effective depth (mbgl):	2.25	Elapsed time (mins):	141.0
Base of soakage zone (mbgl):	2.66		

Volume outflow between 75% and 25% effective depth (m3): 1.879
Mean surface area of outflow (m^2): 8.31
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins): 98.3

Soil infiltration rate: **(for depth range 1.44 m to 2.25 m)**	**3.8E-5 m/s**

Remarks: Results processed following BRE DG 365 (2016).

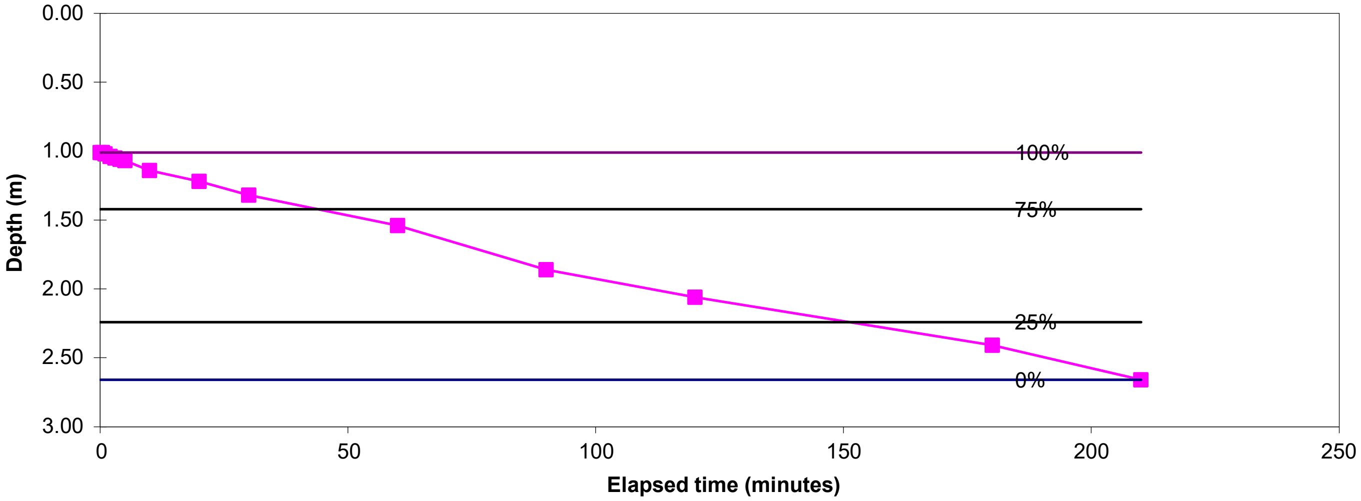
Testing: JB Checked: Approved:	Notes:	Project Project No. Carried out for	WFL Hampshire Water Transfer and Water Recycling Project G4011-24 Phase 3B/C Clancy Docwra on behalf on Southern Water	Figure SKWY/3F7513IT/2

Soakaway Test

Trial Pit No: 3F7513IT
Test No: 3
Date: 08/05/2024

Length (m):	2.90	Datum height:	0.00 m agl
Width (m):	0.80	Granular infill:	None
Depth (m):	2.66		

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	1.01	210	2.66
0.5	1.01		
1	1.02		
2	1.04		
3	1.05		
4	1.06		
5	1.07		
10	1.14		
20	1.22		
30	1.32		
60	1.54		
90	1.86		
120	2.06		
180	2.41		



Start water depth for analysis (mbgl):	1.01		
75% effective depth (mbgl):	1.42	Elapsed time (mins):	43.6
50% effective depth (mbgl):	1.83		
25% effective depth (mbgl):	2.24	Elapsed time (mins):	150.9
Base of soakage zone (mbgl):	2.66		

Volume outflow between 75% and 25% effective depth (m3): 1.902

Mean surface area of outflow (m^2): 8.46
(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins): 107.3

Soil infiltration rate: (for depth range 1.42 m to 2.24 m)	**3.5E-5 m/s**

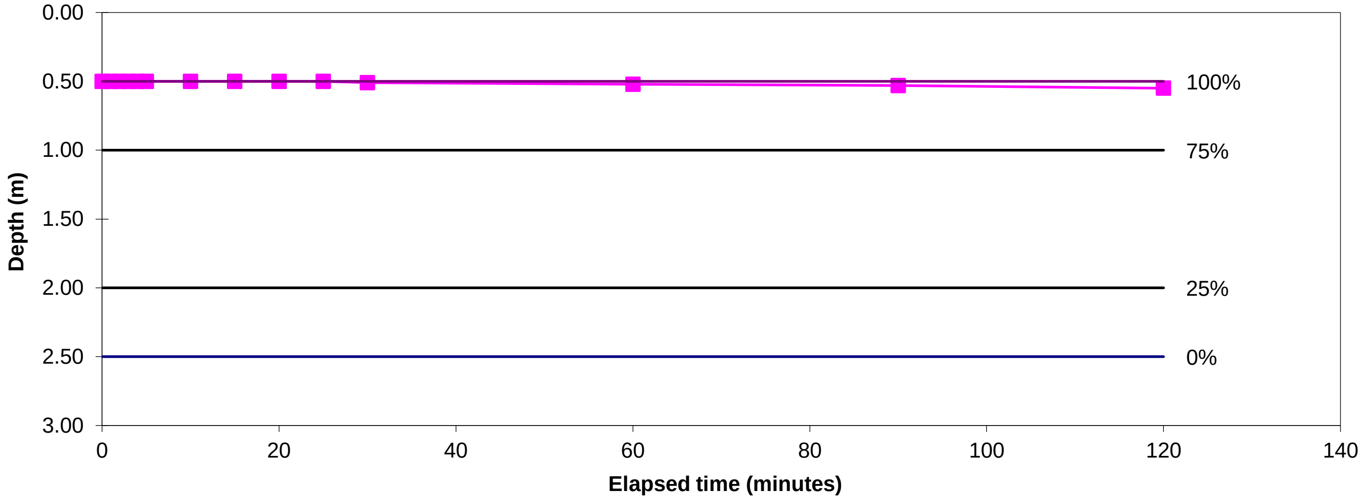
Remarks: Results processed following BRE DG 365 (2016).

Testing: JB Checked: Approved:	Notes:	Project Project No. Carried out for	WFL Hampshire Water Transfer and Water Recycling Project G4011-24 Phase 3B/C Clancy Docwra on behalf on Southern Water	Figure **SKWY/3F7513IT/3**

Soakaway Test

Trial Pit No: 3K7541IT
Test No: 1
Date: 26/10/2023
Length (m): 3.50
Width (m): 0.65
Depth (m): 2.50
Datum height: 0.00 m agl
Granular infill: None

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.50		
1	0.50		
2	0.50		
3	0.50		
4	0.50		
5	0.50		
10	0.50		
15	0.50		
20	0.50		
25	0.50		
30	0.51		
60	0.52		
90	0.53		
120	0.55		



Start water depth for analysis (mbgl): 0.50
75% effective depth (mbgl): 1.00
50% effective depth (mbgl): 1.50
25% effective depth (mbgl): 2.00
Base of soakage zone (mbgl): 2.50

Volume outflow between 75% and 25% effective depth (m3):
Mean surface area of outflow (m^2): 10.58
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**

Remarks Results processed following BRE DG 365 (2016).

Approx 3000 litres added in 11 minutes 25 seconds. Test terminated at 115 mins due to Face D partially collapsing. Dimensions of TP at end of test: Length 3.70m, Width 1.20m and Depth 1.50m

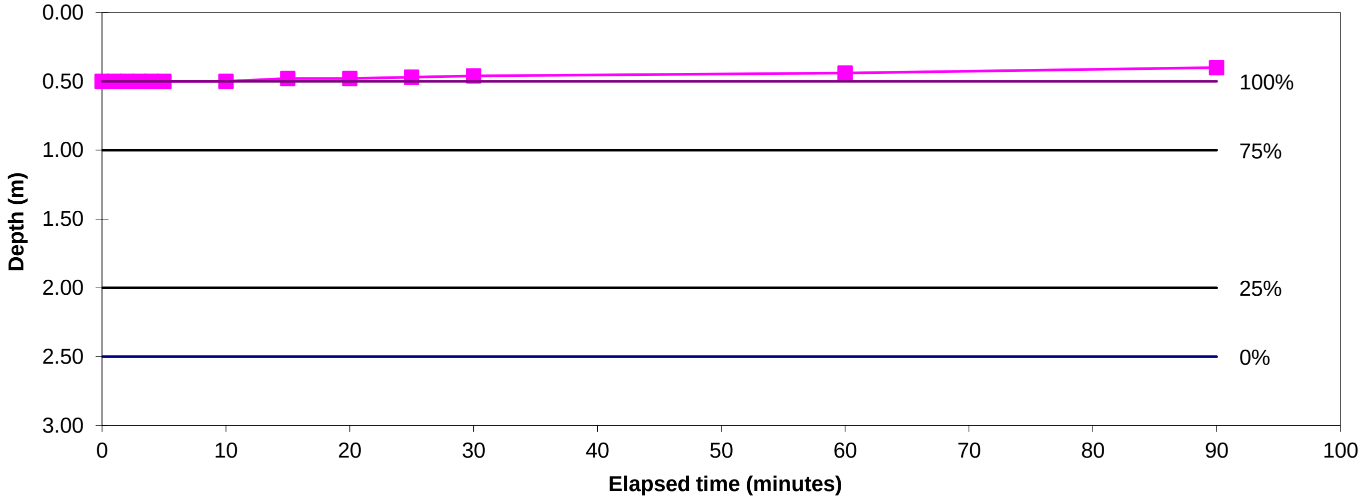
Testing: RAR Checked: EC Approved:	Notes:	Project Project No. Carried out for	WFL Hampshire Water Transfer and Water Recycling Project (Phase 1) G2034-22 Clancy Docwra on behalf of Southern Water	Figure **SKWY/3K7541IT/1**

Soakaway Test

SOCOTEC

Trial Pit No: 3K7543IT
Test No: 1
Date: 30/10/2023
Length (m): 3.40
Width (m): 0.70
Depth (m): 2.50
Datum height: 0.00 m agl
Granular infill: None

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.50		
1	0.50		
2	0.50		
3	0.50		
4	0.50		
5	0.50		
10	0.50		
15	0.48		
20	0.48		
25	0.47		
30	0.46		
60	0.44		
90	0.40		



Start water depth for analysis (mbgl): 0.50
75% effective depth (mbgl): 1.00
50% effective depth (mbgl): 1.50
25% effective depth (mbgl): 2.00
Base of soakage zone (mbgl): 2.50
Volume outflow between 75% and 25% effective depth (m3):
Mean surface area of outflow (m^2): 10.58
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**

Remarks Results processed following BRE DG 365 (2016).

Approx 3000 litres added in 52 seconds. Test terminated at 90 mins due to Face D partially collapsing.
Dimensions of TP at end of test: Length 3.70, Width 1.10, Depth 1.60m.

Testing: RAR Checked: EC Approved:	Notes:	**Project** **Project No.** **Carried out for**	**WFL Hampshire Water Transfer and Water Recycling Project (Phase 1)** **G2034-22** **Clancy Docwra on behalf of Southern Water**	**Figure** **SKWY/3K7543IT/1**

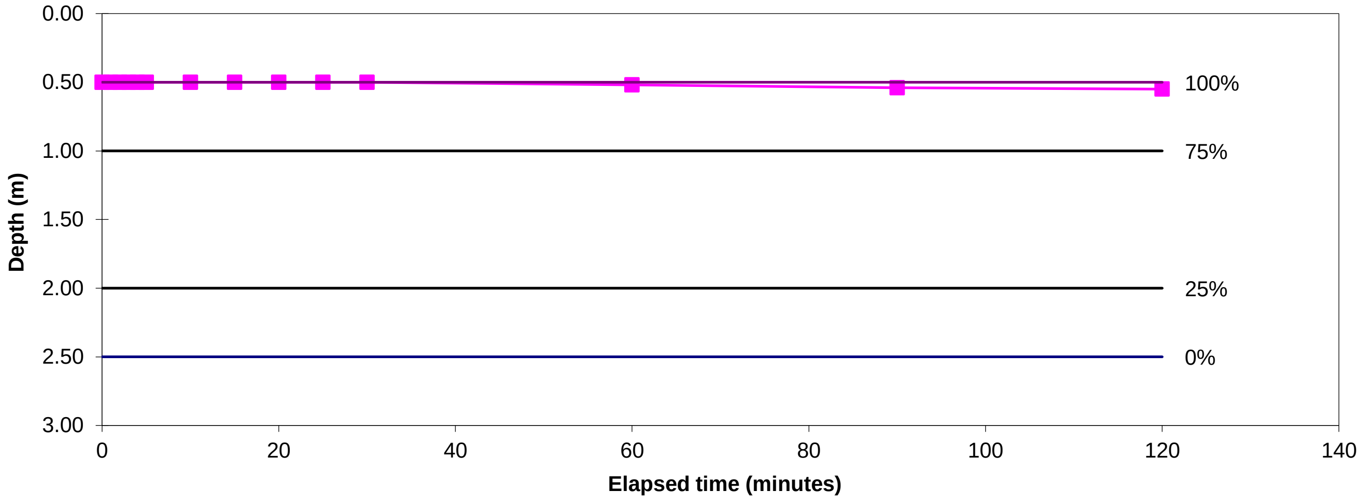
Soakaway Test

Trial Pit No: 3K7544IT
Test No: 1
Date: 26/10/2023

Length (m): 3.60
Width (m): 0.60
Depth (m): 2.50

Datum height: 0.00 m agl
Granular infill: None

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.50		
1	0.50		
2	0.50		
3	0.50		
4	0.50		
5	0.50		
10	0.50		
15	0.50		
20	0.50		
25	0.50		
30	0.50		
60	0.52		
90	0.54		
120	0.55		



Start water depth for analysis (mbgl): 0.50
75% effective depth (mbgl): 1.00
50% effective depth (mbgl): 1.50
25% effective depth (mbgl): 2.00
Base of soakage zone (mbgl): 2.50

Volume outflow between 75% and 25% effective depth (m3):
Mean surface area of outflow (m^2): 10.56
(side area at 50% effective depth + base area)
Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**

Remarks: Results processed following BRE DG 365 (2016).

Added approx 3500 litres in 17 minutes and 27 seconds. After 120 minutes the test was terminated by Stantec. Dimesnions of pit after test: Length 3.80m, Width 1.00m, Depth 1.50m

Testing: RAR Checked: EC Approved:	Notes:	**Project** **WFL Hampshire Water Transfer and Water Recycling Project (Phase 1)** **Project No.** **G2034-22** **Carried out for** **Clancy Docwra on behalf of Southern Water**	**Figure** **SKWY/3K7544IT**

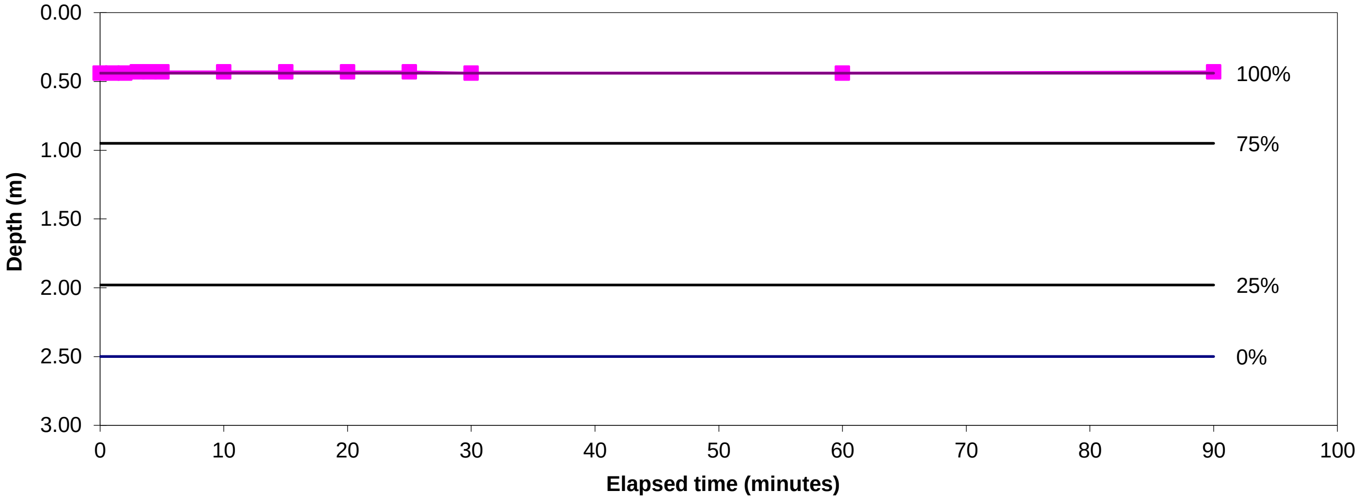
Soakaway Test

SOCOTEC

Trial Pit No: 3K7545IT
Test No: 1
Date: 31/10/2023

Length (m):	3.40	Datum height:	0.00 m agl
Width (m):	0.75	Granular infill:	None
Depth (m):	2.50		

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.44		
1	0.44		
2	0.44		
3	0.43		
4	0.43		
5	0.43		
10	0.43		
15	0.43		
20	0.43		
25	0.43		
30	0.44		
60	0.44		
90	0.43		



Start water depth for analysis (mbgl):	0.44
75% effective depth (mbgl):	0.95
50% effective depth (mbgl):	1.47
25% effective depth (mbgl):	1.98
Base of soakage zone (mbgl):	2.50

Volume outflow between 75% and 25% effective depth (m3):

Mean surface area of outflow (m^2): 11.10
(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**

Remarks Results processed following BRE DG 365 (2016).

Added approx 3500 litres in 13 minutes 25 seconds. After 90 minutes the test was terminated by Stantec.
Dimensions of pit after test: Length 3.80m, Width 1.00m, Depth 1.50m

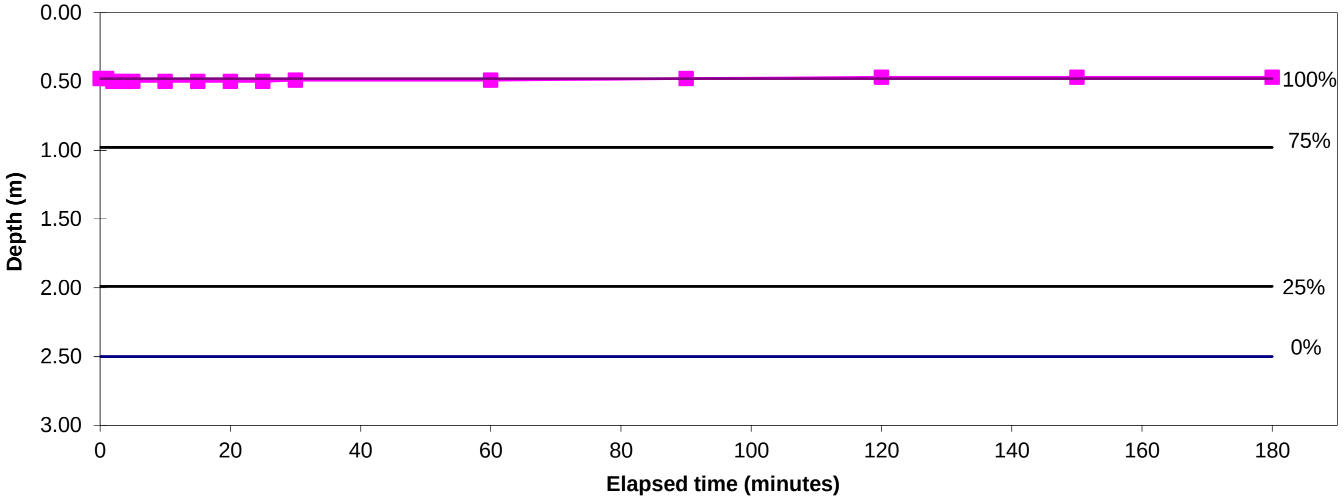
Testing: RAR Checked: EC Approved:	Notes:	**Project** **Project No.** **Carried out for**	**WFL Hampshire Water Transfer and Water Recycling Project (Phase 1)** **G2034-22** **Clancy Docwra on behalf of Southern Water**	**Figure** **SKWY/3K7545IT**

Soakaway Test

Trial Pit No: 3K7546IT
Test No: 1
Date: 31/10/2023

Length (m):	3.40	Datum height:	0.00 m agl
Width (m):	0.70	Granular infill:	None
Depth (m):	2.50		

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.48	150	0.47
1	0.48	180	0.47
2	0.50		
3	0.50		
4	0.50		
5	0.50		
10	0.50		
15	0.50		
20	0.50		
25	0.50		
30	0.49		
60	0.49		
90	0.48		
120	0.47		



Start water depth for analysis (mbgl):	0.48
75% effective depth (mbgl):	0.98
50% effective depth (mbgl):	1.49
25% effective depth (mbgl):	1.99
Base of soakage zone (mbgl):	2.50

Volume outflow between 75% and 25% effective depth (m3):

Mean surface area of outflow (m^2): 10.66
(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins):

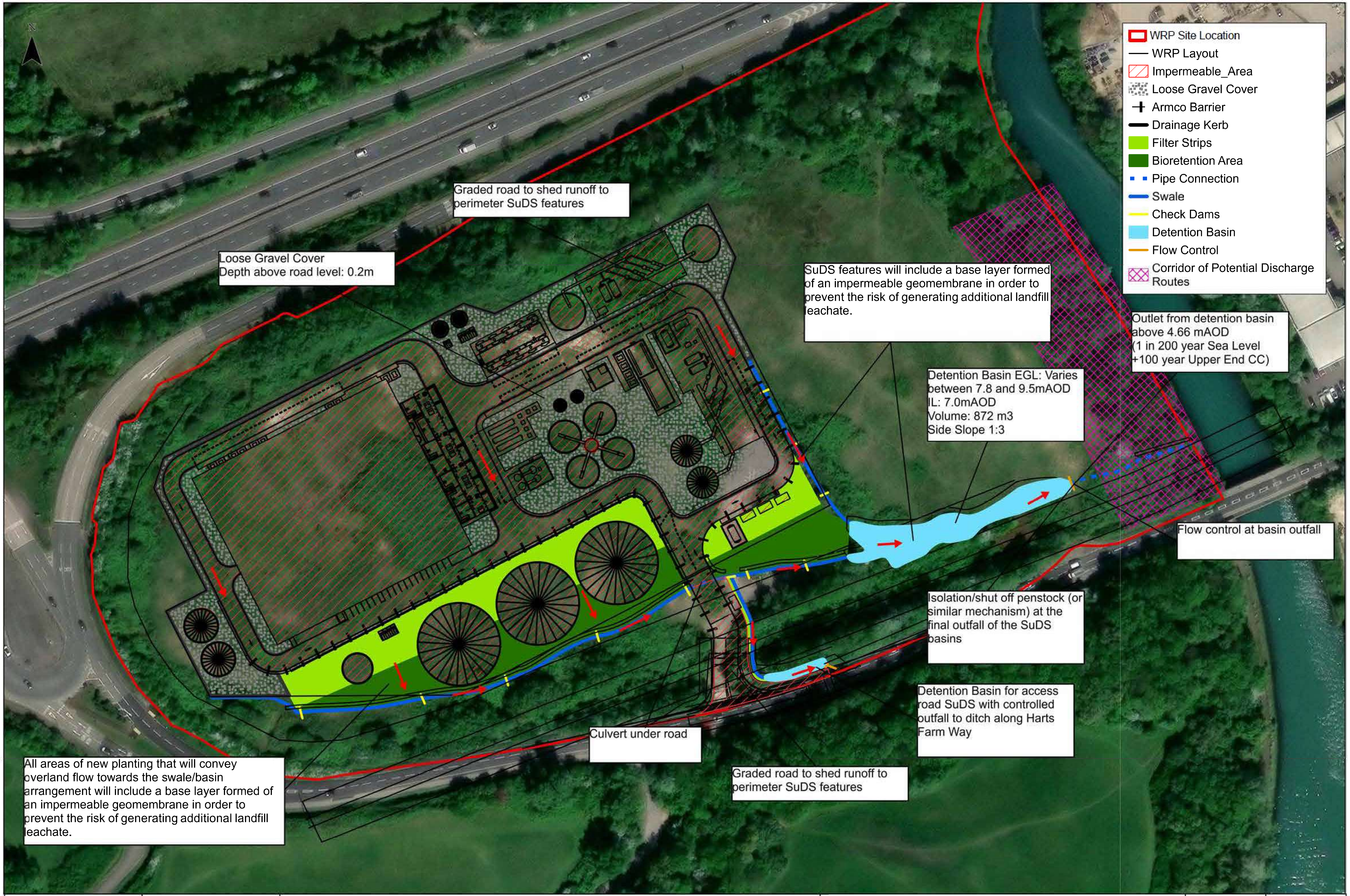
Soil infiltration rate:	**Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.**

Remarks Results processed following BRE DG 365 (2016).

Added approx 3500 litre in 1 minute. After 180 minutes the test was terminated by Stantec. Dimensions of pit after test: Length 3.70m Width 1.10m, Depth 1.40m

Testing: RAR Checked: EC Approved:	Notes:	**Project** **Project No.** **Carried out for**	**WFL Hampshire Water Transfer and Water Recycling Project (Phase 1)** **G2034-22** **Clancy Docwra on behalf of Southern Water**	**Figure** **SKWY/3K7546IT**

Appendix B Sustainable drainage systems indicative designs



Graded road to shed runoff to perimeter SuDS features

Loose Gravel Cover
Depth above road level: 0.2m

SuDS features will include a base layer formed of an impermeable geomembrane in order to prevent the risk of generating additional landfill leachate.

Outlet from detention basin above 4.66 mAOD
(1 in 200 year Sea Level +100 year Upper End CC)

Detention Basin EGL: Varies between 7.8 and 9.5mAOD
IL: 7.0mAOD
Volume: 872 m3
Side Slope 1:3

Flow control at basin outfall

Isolation/shut off penstock (or similar mechanism) at the final outfall of the SuDS basins

Detention Basin for access road SuDS with controlled outfall to ditch along Harts Farm Way

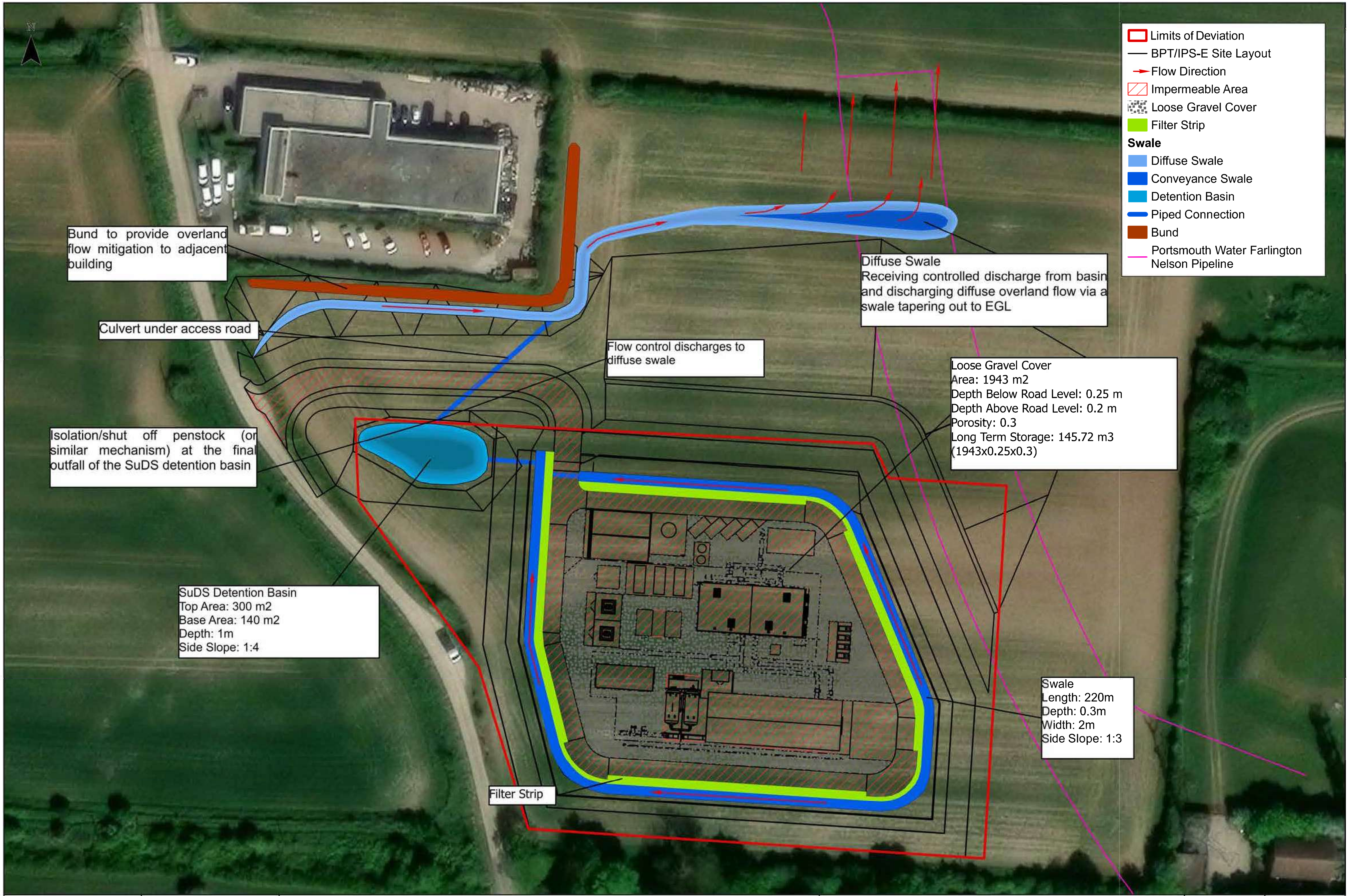
Culvert under road

Graded road to shed runoff to perimeter SuDS features

All areas of new planting that will convey overland flow towards the swale/basin arrangement will include a base layer formed of an impermeable geomembrane in order to prevent the risk of generating additional landfill leachate.

Stantec	Client WATER forLIFE from Southern Water	WRP SuDS Indicative Design	0 70 140 m Microsoft, Vantor	1:1,402 @ A3	Date: 06/03/2026
				Drawn: WB	Checked: KL
				Figure: 01	Rev:

Document Path: C:\HWTWRP WRP SuDS Design\HWTWRP WRP SuDS Design.aprx



Limits of Deviation

BPT/IPS-E Site Layout

Flow Direction

Impermeable Area

Loose Gravel Cover

Filter Strip

Swale

Diffuse Swale

Conveyance Swale

Detention Basin

Piped Connection

Bund

Portsmouth Water Farlington Nelson Pipeline

Bund to provide overland flow mitigation to adjacent building

Culvert under access road

Isolation/shut off penstock (or similar mechanism) at the final outfall of the SuDS detention basin

SuDS Detention Basin
Top Area: 300 m2
Base Area: 140 m2
Depth: 1m
Side Slope: 1:4

Flow control discharges to diffuse swale

Diffuse Swale
Receiving controlled discharge from basin and discharging diffuse overland flow via a swale tapering out to EGL

Loose Gravel Cover
Area: 1943 m2
Depth Below Road Level: 0.25 m
Depth Above Road Level: 0.2 m
Porosity: 0.3
Long Term Storage: 145.72 m3
(1943x0.25x0.3)

Swale
Length: 220m
Depth: 0.3m
Width: 2m
Side Slope: 1:3

Filter Strip

Stantec

Client

WATER forLIFE from Southern Water.

BPT/IPS-E SuDS Indicative Design

Microsoft, Vantor

1:750 @ A3

Date: 16/12/2025

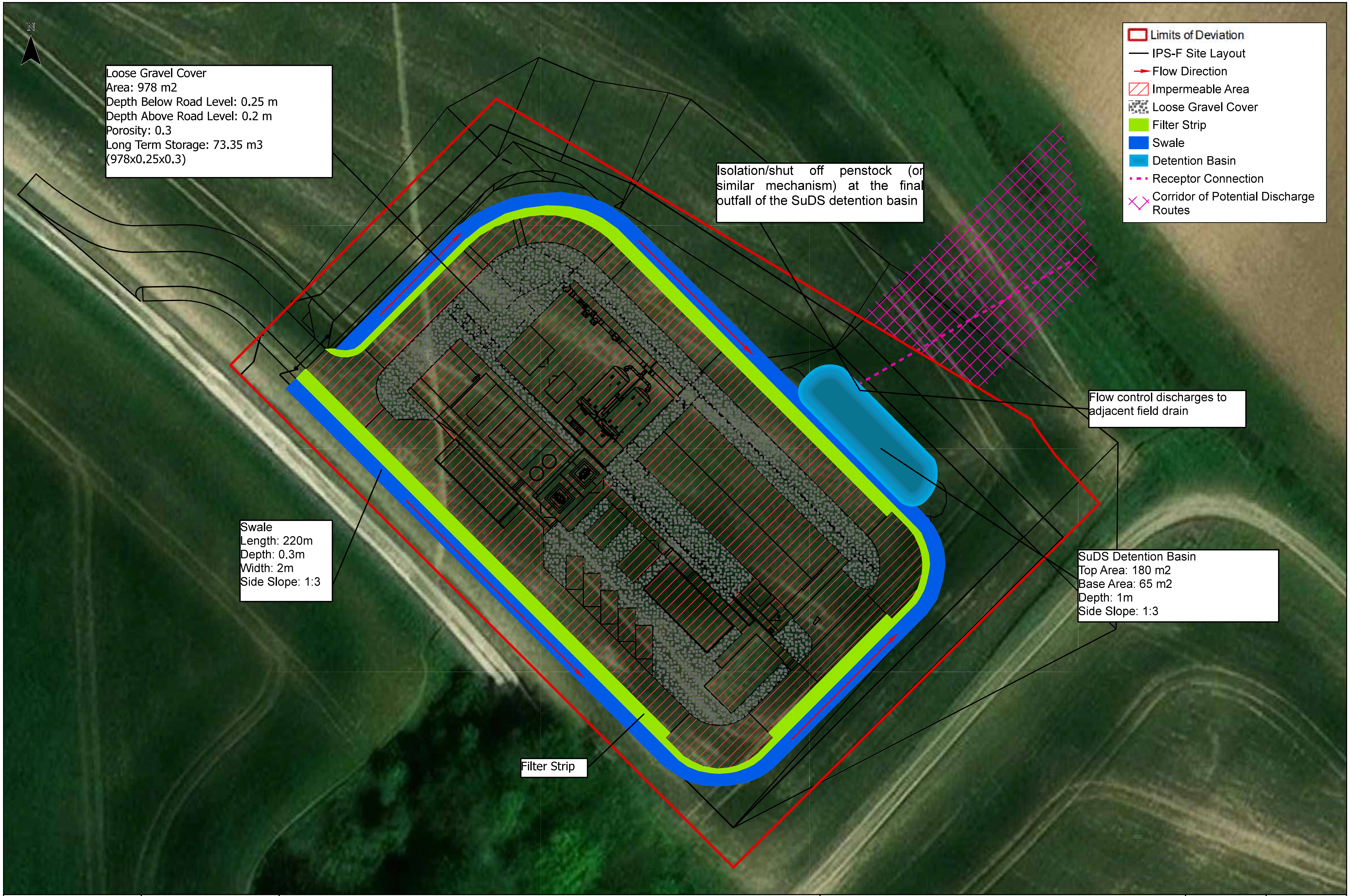
Drawn: WB

Checked: KL

Figure: 2

Rev: 2

Document Path: C:\HWTWRP BPTIPS-E SuDS Design\HWTWRP BPTIPS-E SuDS Design.aprx



Loose Gravel Cover
Area: 978 m2
Depth Below Road Level: 0.25 m
Depth Above Road Level: 0.2 m
Porosity: 0.3
Long Term Storage: 73.35 m3
(978x0.25x0.3)

Isolation/shut off penstock (or similar mechanism) at the final outfall of the SuDS detention basin

Flow control discharges to adjacent field drain

Swale
Length: 220m
Depth: 0.3m
Width: 2m
Side Slope: 1:3

SuDS Detention Basin
Top Area: 180 m2
Base Area: 65 m2
Depth: 1m
Side Slope: 1:3

Filter Strip

Stantec

Client

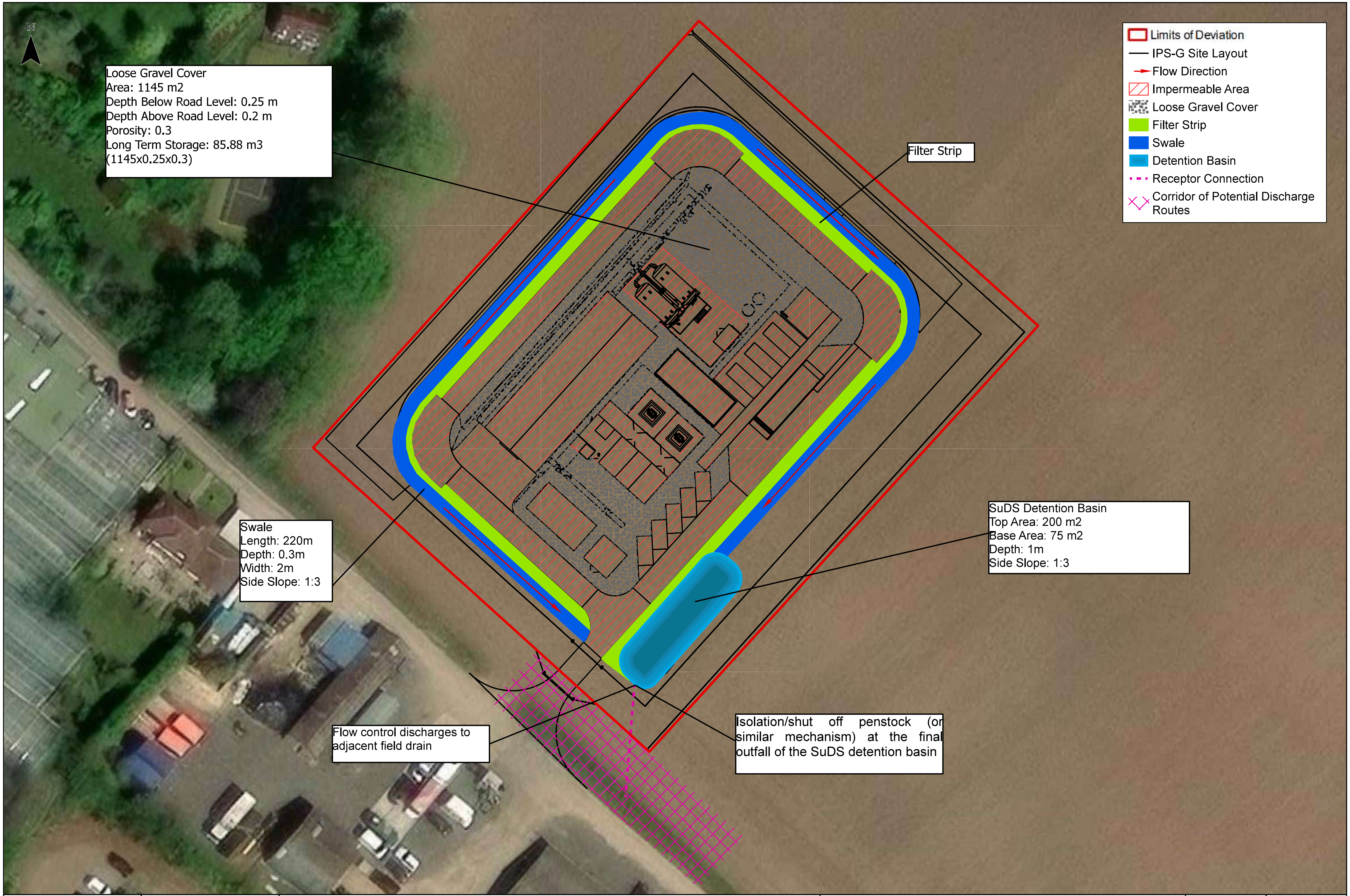
IPS-F SuDS Indicative Design

0 20 40 m

Microsoft, Vantor

1:483 @ A3
Date: 22/10/2025
Drawn: WB
Checked: KL
Figure: 3
Rev: 1

Document Path: C:\HWTWRP IPS-F SuDS Design\HWTWRP IPS-F SuDS Design.aprx



Loose Gravel Cover
Area: 1145 m2
Depth Below Road Level: 0.25 m
Depth Above Road Level: 0.2 m
Porosity: 0.3
Long Term Storage: 85.88 m3
(1145x0.25x0.3)

Filter Strip

Swale
Length: 220m
Depth: 0.3m
Width: 2m
Side Slope: 1:3

SuDS Detention Basin
Top Area: 200 m2
Base Area: 75 m2
Depth: 1m
Side Slope: 1:3

Flow control discharges to adjacent field drain

Isolation/shut off penstock (or similar mechanism) at the final outfall of the SuDS detention basin

Stantec

Client

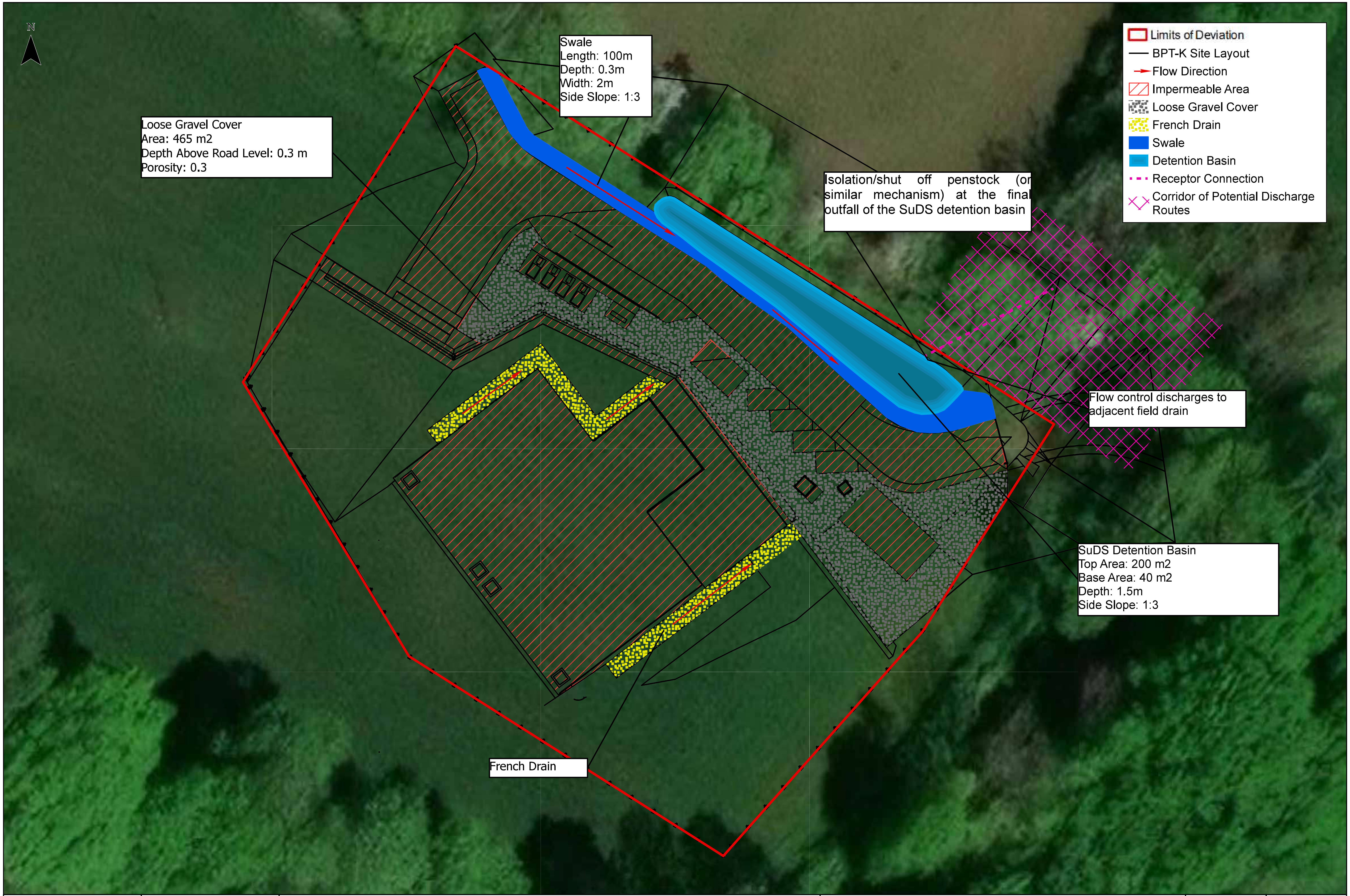
IPS-G SuDS Indicative Design

0 25 50 m

Microsoft, Vantor

1:550 @ A3	Date: 23/10/2025
Drawn: KL	Checked: WB
Figure: 4	Rev: 1

Document Path: C:\HWTWRP IPS-G SuDS Design\HWTWRP IPS-G SuDS Design.aprx



Stantec

Client: Water for Life from Southern Water

BPT-K SuDS Indicative Design

1:385 @ A3

Date: 23/10/2025

Drawn: WB

Checked: KL

Figure: 5

Rev: 1

Document Path: C:\HWTWRP BPT-K SuDS Design\HWTWRP BPT-K SuDS Design.aprx

Appendix C ICM Direct rainfall modelling

Hampshire Water Transfer and Water Recycling Project

SuDS ICM Direct Rainfall Modelling

March 24, 2026

Prepared for:

Southern Water Limited

Prepared by:

Stantec

Revision	**Description**	**Author**		**Quality Check**		**Independent Review**	
01	FINAL	Mohit Jani/ Beaver Wesley	18/03/26	Beaver Wesley/ Shirish Gokhale	20/03/26	Dr. Kelvin Limbrick	24/03/26

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Prepared by:
Mohit Jani/ Wesley Beaver

Reviewed by:
Shirish Gokhale

Approved by:
Dr. Kelvin Limbrick

1 Introduction

This report details the methodology and results for direct rainfall modelling undertaken using InfoWorks Integrated Catchment Modelling (ICM). ICM has been used to assess the performance of Sustainable Drainage Systems (SuDS) for the proposed Above Ground Plant (AGP) and Water Recycling Plant (WRP) as part of the wider Hampshire Water Transfer and Water Recycling Project (HWTWRP). The SuDS features have been tested under the 1 in 2-year, 1 in 30-year and 1 in 100-year rainfall events, all with an appropriate upper end climate change allowance. The AGP and WRP, for which SuDS have been designed as part of their surface water management strategy, include:

- Water Recycling Plant (WRP),
- Break Pressure Tank (BPT) and Intermediate Pumping Station E (IPS-E),
- IPS-F,
- IPS-G, and
- BPT-K.

The proposed outline site layouts, including the SuDS features, have been incorporated into the terrain model to simulate overland flow routing. The model outputs demonstrate how rainfall runoff is managed across the sites, with results showing expected water depths, velocities, and hazard ratings. The baseline pre-development models were used to determine the greenfield runoff rates for the areas of each catchment that currently drain through the footprint of each AGP site. The 1 in 2-year and 1 in 30-year rainfall events have been modelled to ensure that the discharge from the SuDS do not exceed the greenfield runoff rates for these lower order events.

The modelling illustrates pre and post development exceedance flow routes, to show how surface water is conveyed across the sites before and after development. To ensure a controlled discharge of surface water runoff from the proposed developments and to reduce downstream flood risk, a hydro-brake system or similar flow control will be implemented to limit the proposed discharge to the downstream receptors. The SuDS design and performance testing has been developed in full accordance with the best practice information as set out in the Non-Statutory Technical Guidance, the CIRIA SuDS Manual (C753) (Construction Industry Research and

Information Association (CIRIA), 2015) and the National Standards for Sustainable Drainage Systems (SuDS) (Department for Environment, 2025).

2 Basis of Design & Modelling Approach

2.1 Development Concept

The overall model development approach involves establishing both baseline and proposed simulation scenarios. These simulations are evaluated for the 2-year, 30-year, and 100-year return periods. The WRP site has assessed the 100-year design event only, as the site discharges to a tidal receiving waterbody and is therefore not constrained by greenfield runoff rate criteria. An appropriate climate change uplift has been applied to the proposed scenarios. The climate change uplift was not applied when determining the baseline greenfield runoff rate. Where the proposed development site includes a contributing upstream catchment flowing into the site, and therefore contributing to the proposed SuDS, the associated local catchment is also included in this assessment.

The baseline scenario incorporates existing rainfall conditions and terrain, while the proposed scenario applies updated rainfall data that includes climate change allowances, along with the modified terrain associated with the proposed development and SuDS features.

The objective of the modelling is to ensure that the proposed development does not result in an increase in surface water rates or volumes being discharged when compared with baseline greenfield conditions. The SuDS features including: loose gravel cover, filter strips, swales and detention basins have been designed in accordance with the CIRIA SuDS Manual. The outline design for the AGP and WRP and associated SuDS layouts were used as the basis for the proposed terrain and model configuration and have been incorporated into the ICM.

2.2 Design Criteria

To develop the ICM model for both baseline and proposed conditions, rainfall datasets and terrain modifications were incorporated. The design rainfall descriptor parameters (FEH22) were derived using the FEH Web Services (UK Centre for Ecology & Hydrology, 2026) and subsequently used in the ICM rainfall generator for detailed analysis. The resulting rainfall dataset, generated within the ICM, includes event durations of 30, 60, 120, 180, 240, 360, 480, 720, 960, and 1440 minutes. An additional 40% uplift was applied to the 2-year and 30-year design events and a 45% uplift was applied to the 100-year design event to account for projected climate change impacts. The 40% and 45% uplift represents the upper end allowance for the East Hampshire Management Catchment for the 2070s epoch (the 2070s epoch is applied to developments with a lifetime between 2061 and 2125). All the AGP sites and the WRP are located within the East Hampshire Management Catchment.

The terrain data used in this analysis is sourced from LiDAR Digital Terrain Model (DTM) data (Department for Environment, Food & Rural Affairs (DEFRA), 2022), providing a spatial resolution of 1 meter. The terrain was subsequently refined and modified using the HEC-RAS RAS Mapper tool to ensure accurate representation of existing and proposed site conditions.

The following section presents the FEH22 design rainfall data, along with the terrain modifications and catchment delineation details for the AGP sites and the WRP.

Water Recycling Plant (WRP)

Design Rainfall

The FEH22 design rainfall parameters for the WRP site have been derived from the relevant point descriptors. Table 2-1 below summarises the corresponding rainfall depths for each event for baseline and climate change (45% CC) scenario.

Table 2-1 Design rainfall for the WRP

Design Event	Rainfall Depth (mm) Baseline	Rainfall Depth (mm) +45% Climate Change
M100-30	27.02	39.19
M100-360	60.30	87.43
M100-1440	81.10	117.60

Proposed Terrain Modification

Figure 2-1 below illustrates the pre and post development site conditions. As the site is situated at a higher elevation relative to the surrounding area, delineation of the local catchment is not considered necessary. The proposed terrain modifications have been implemented by stamping the terrain in accordance with the outline design inputs.

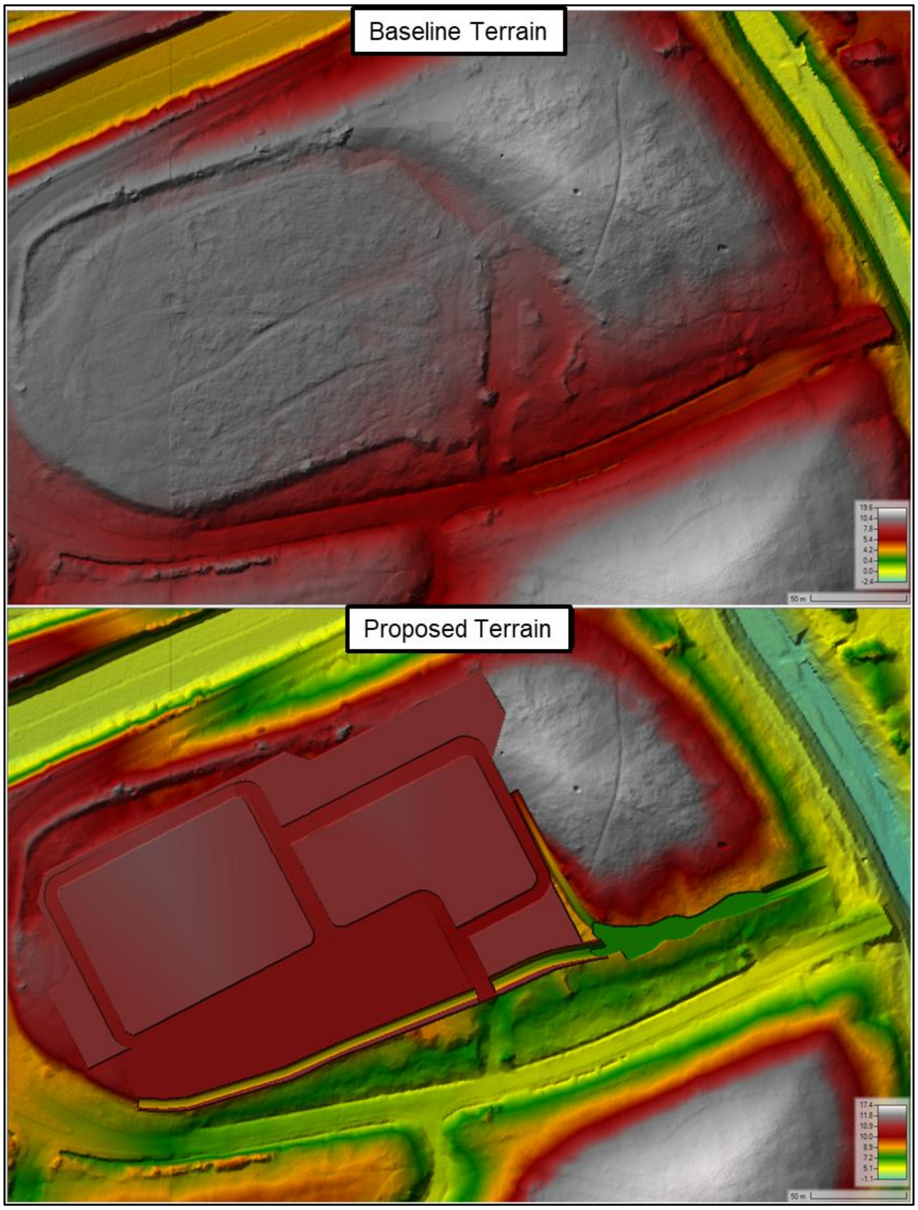

Figure 2-1 Terrain modifications for the WRP

Brake pressure Tank/Intermediate Pumping Station – E

Design Rainfall

The FEH22 design rainfall parameters for the site have been derived from the relevant point descriptors. Table 2-2 below summarises the corresponding rainfall depths for each event for baseline and climate change (45% CC) scenario. A 45% climate uplift has been applied to all design events for BPT/IPS-E.

Table 2-2 Design rainfall for BPT/IPS - E

Design Event	Rainfall Depth (mm) Baseline	Rainfall Depth (mm) +45% Climate Change
M2-30	9.89	14.34
M2-120	17.16	24.88
M2-180	20.17	29.25
M2-360	25.85	37.48
M30-30	25.10	36.40
M30-120	38.27	55.49
M30-180	42.31	61.35
M30-360	49.92	72.38
M100-30	31.85	46.18
M100-120	47.87	69.41
M100-180	52.43	76.02
M100-360	61.27	88.84
M100-1440	81.84	118.67

Proposed Terrain Modification

Figure 2-2 below illustrates the pre and post development site conditions. As the site is situated at a higher elevation relative to the surrounding area, delineation of the local catchment is not considered necessary. The proposed terrain modifications have been implemented by stamping the terrain in accordance with the outline design inputs.

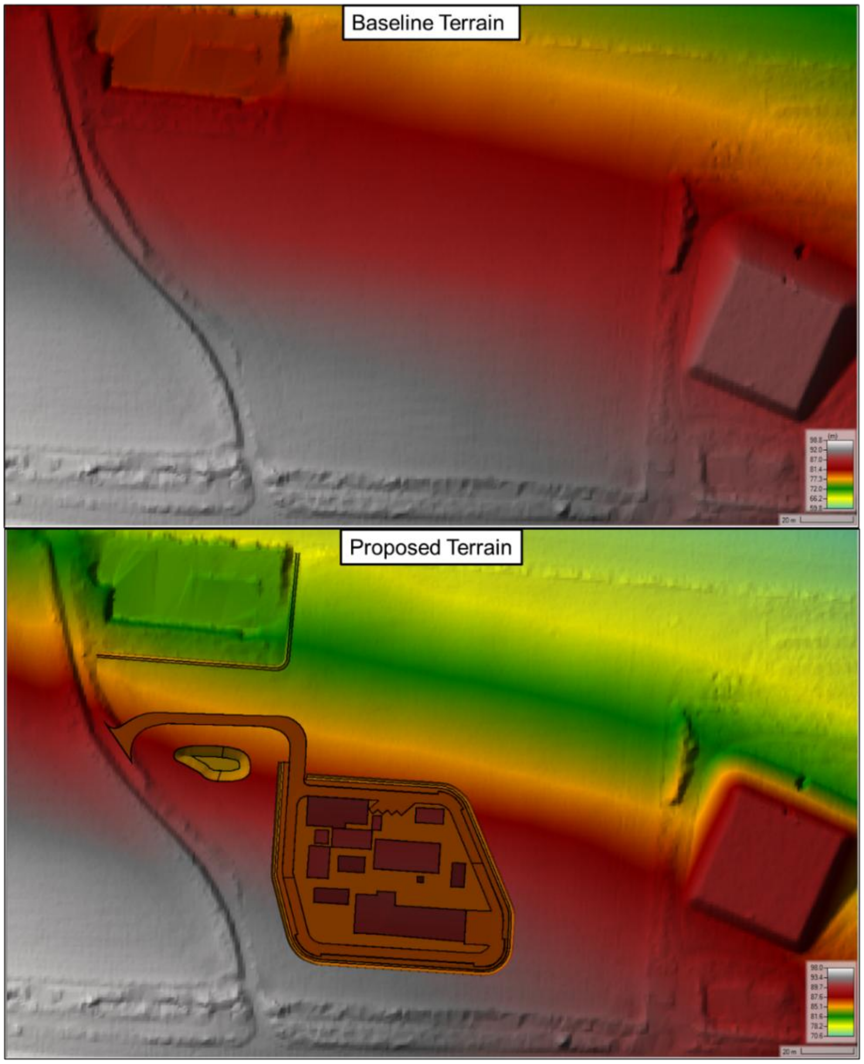

Figure 2-2 Terrain modifications for BPT/IPS – E

Intermediate Pumping Station – F

Design Rainfall

The FEH22 design rainfall parameters for the site have been derived from the relevant point descriptors. Table 2-3 below summarises the corresponding rainfall depths for each event for baseline and climate change scenario. For the design rainfall, a 40% climate change allowance has been applied to the 2-year and 30-year return periods, while a 45% allowance has been applied to the 100-year return period.

Table 2-3 Design rainfall for IPS - F

Design Event	Rainfall Depth (mm) Baseline	Rainfall Depth (mm) Climate Change
M2-30	10.12	14.16
M2-120	17.26	24.17
M2-180	20.05	28.07
M2-360	25.25	35.35
M30-30	25.19	35.27
M30-120	37.90	53.06
M30-180	41.49	58.08
M30-360	48.27	67.58
M100-30	31.87	46.21
M100-120	47.31	68.60

M100-180	51.36	74.47
M100-360	59.05	85.62
M100-1440	77.83	112.85

Proposed Terrain Modification

Figure 2-3 and Figure 2-4 below illustrates the pre and post development site conditions. As the site is situated at a lower elevation relative to the surrounding area, delineation of the local catchment is considered necessary. The local catchment is delineated from the baseline terrain and the proposed terrain modifications have been implemented by stamping the terrain in accordance with the outline design inputs.

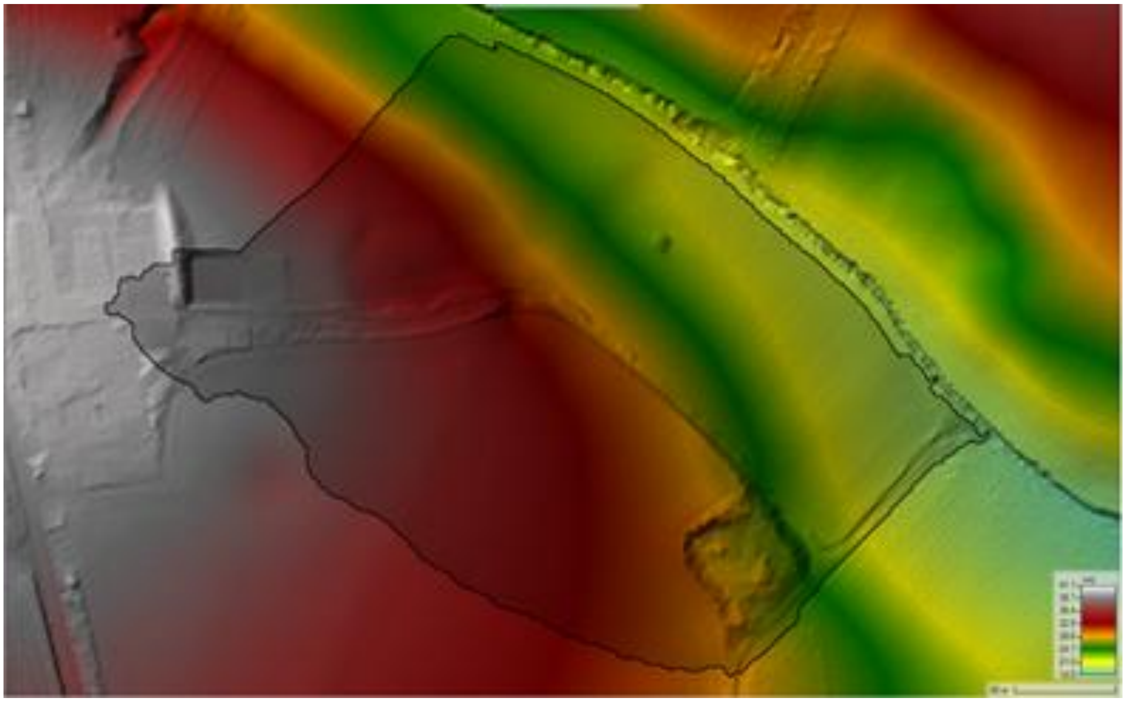

Figure 2-3 Local catchment delineation for IPS – F

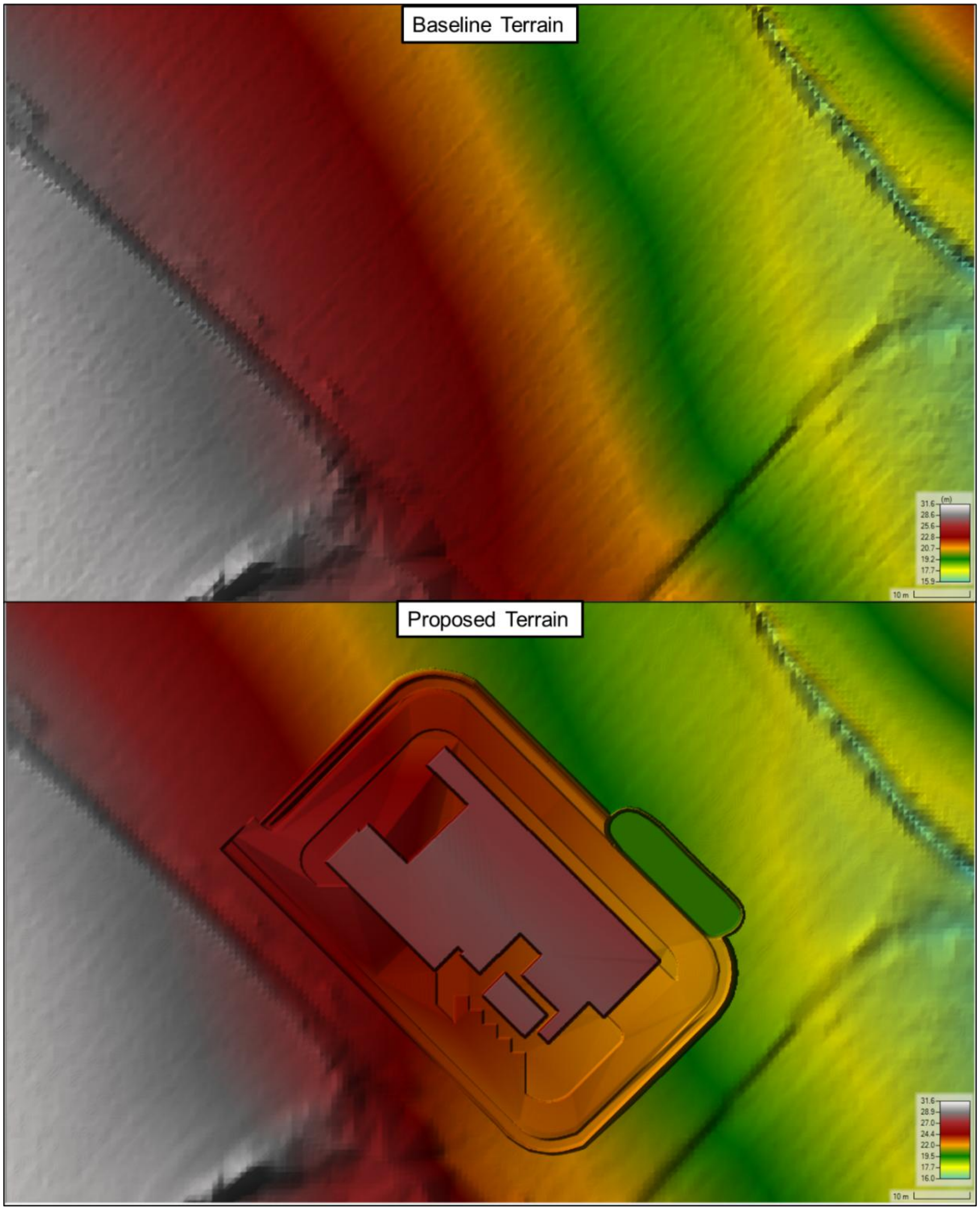

Figure 2-4 Terrain modifications for IPS – F

Intermediate Pumping Station – G

Design Rainfall

The FEH22 design rainfall parameters for the site have been derived from the relevant point descriptors. Table 2-4 below summarises the corresponding rainfall depths for each event for baseline and climate change scenario. For the design rainfall, a 40% climate change allowance has been applied to the 2-year and 30-year return periods, while a 45% allowance has been applied to the 100-year return period.

Table 2-4 Design rainfall for IPS - G

Design Event	Rainfall Depth (mm) Baseline	Rainfall Depth (mm) Climate Change
M2-30	10.36	14.50
M2-120	17.49	24.48
M2-180	20.24	28.33
M2-360	25.41	35.57
M30-30	25.09	35.12
M30-120	37.72	52.81
M30-180	41.21	57.69
M30-360	47.82	66.95
M100-30	31.62	45.85
M100-120	47	68.15

M100-180	50.91	73.82
M100-360	58.46	84.77
M100-1440	77.15	111.87

Proposed Terrain Modification

Figure 2-5 and Figure 2-6 below illustrates the pre and post development site conditions. As the site is situated at a lower elevation relative to the surrounding area, delineation of the local catchment is considered necessary. The local catchment is delineated from the baseline terrain and the proposed terrain modifications have been implemented by stamping the terrain in accordance with the outline design inputs.

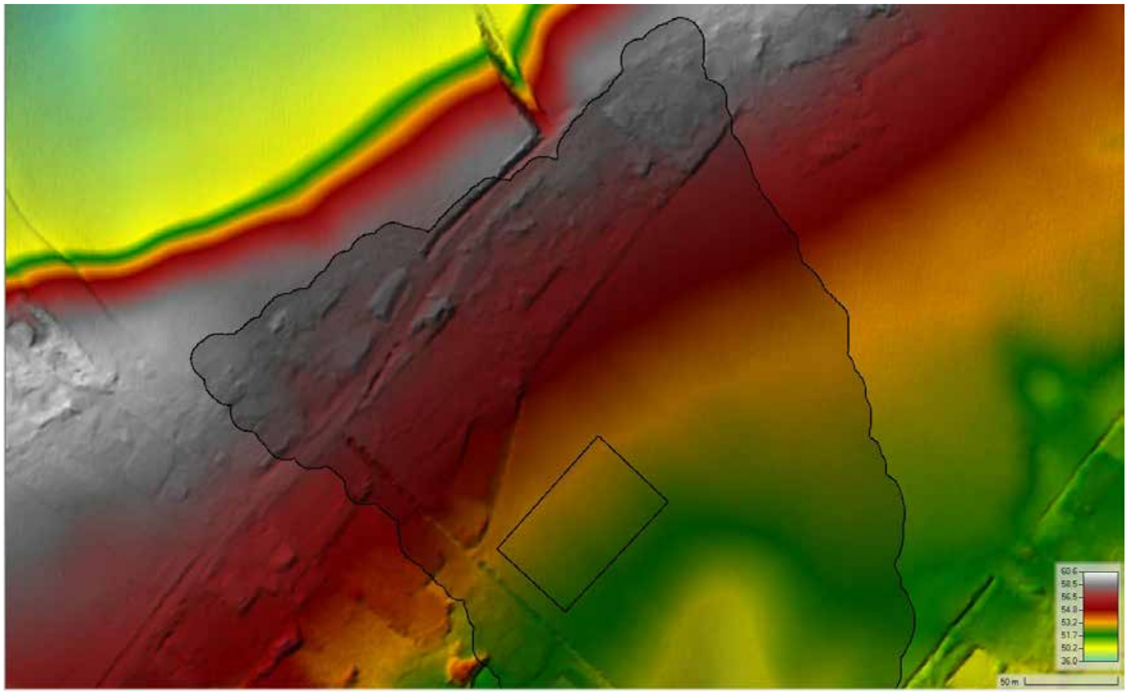

Figure 2-5 Local catchment delineation for IPS – G

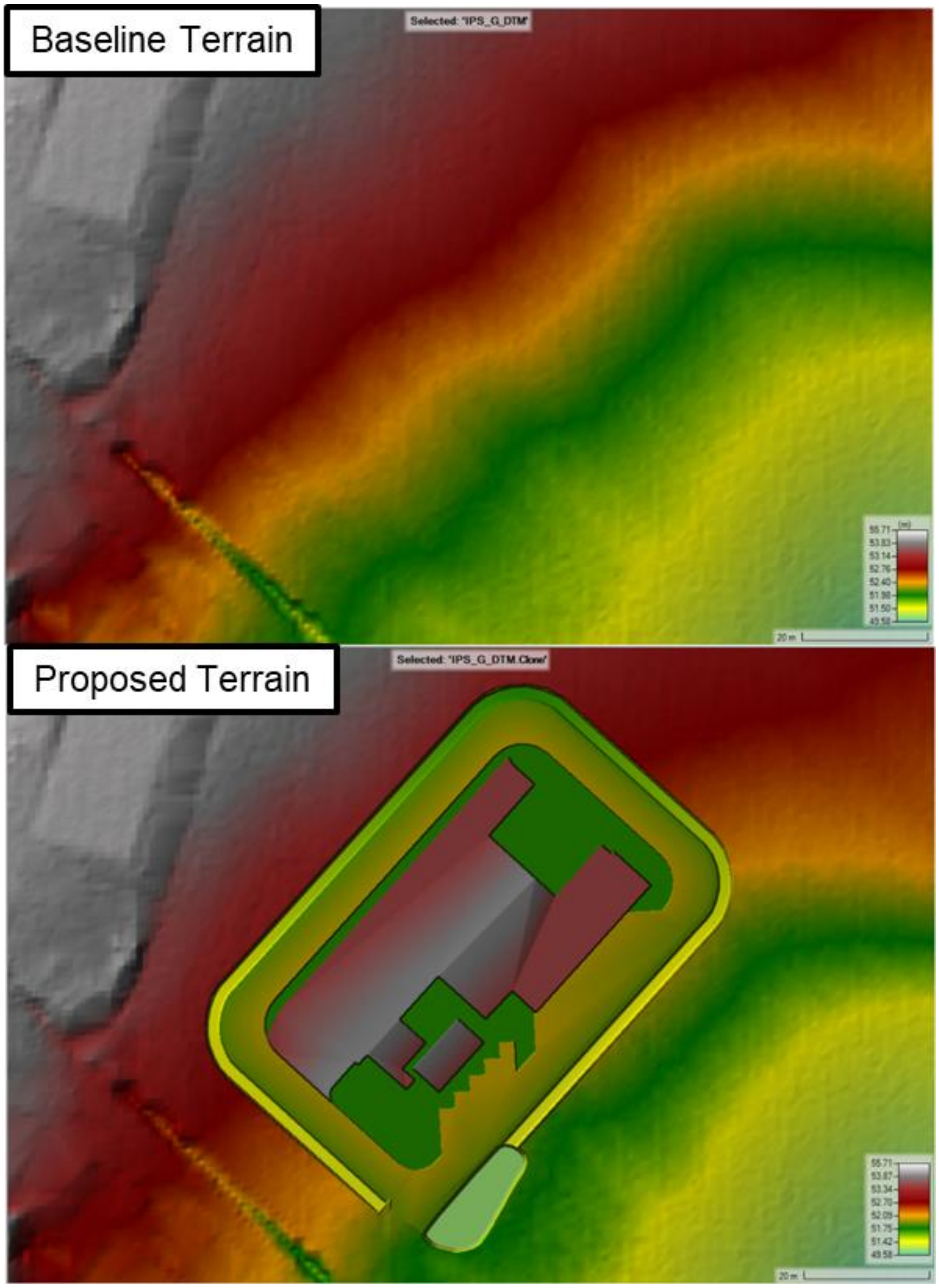

Figure 2-6 Terrain modifications for IPS – G

Brake Pressure Tank – K

Design Rainfall

The FEH22 design rainfall parameters for the site have been derived from the relevant point descriptors. Table 2-5 below summarises the corresponding rainfall depths for each event for baseline and climate change (45% CC) scenario. A 45% climate uplift has been applied to all design events for BPT-K.

Table 2-5 Design rainfall for BPT - K

Design Event	Rainfall Depth (mm) Baseline	Rainfall Depth (mm) +45% Climate Change
M2-30	10.53	15.27
M2-120	17.64	25.58
M2-180	20.34	29.49
M2-360	25.49	36.96
M2-1440	38.17	55.35
M30-30	25.07	36.35
M30-120	37.6	54.52
M30-180	41.05	59.52
M30-360	47.57	68.98
M30-1440	63.76	92.45
M100-30	31.52	45.70
M100-120	46.81	67.87
M100-180	50.68	73.49
M100-360	58.19	84.38
M100-1440	76.86	111.45

Proposed Terrain Modification

Figure 2-7 below illustrates the pre and post development site conditions. The BPT-K site is located at the top of a hillside and will be cut into the existing slope, nevertheless, a very small contributing upstream catchment immediately to the south of the site has been included within the ICM model, although due to the BPT-K location at the top of the hill its influence on flows and flood risk is minimal. The proposed terrain modifications have been implemented by stamping the terrain in accordance with the outline design inputs.

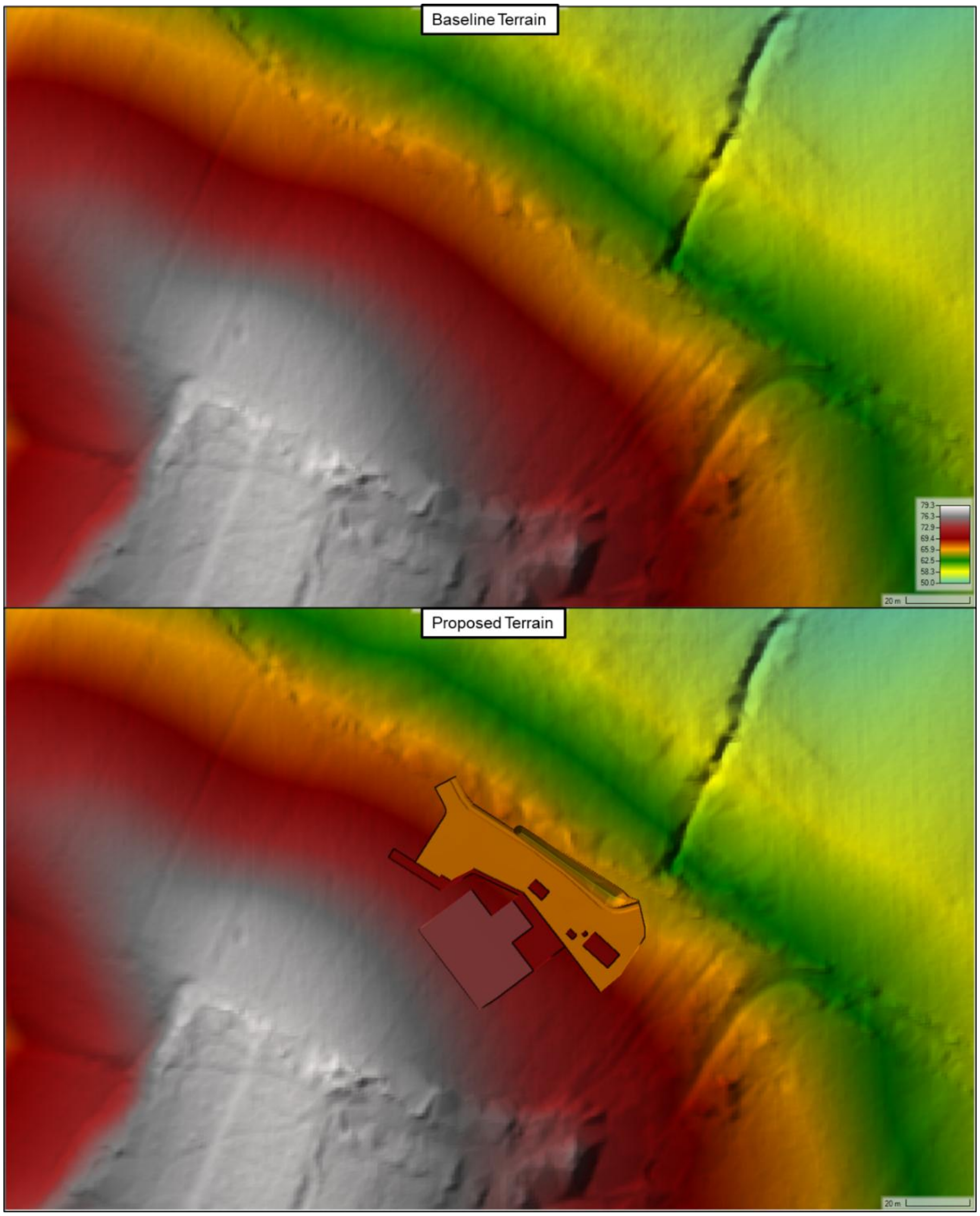

Figure 2-7 Terrain modifications for BPT - K

2.3 Modelling Approach

Water Recycling Plant (WRP)

The ICM model was developed using multiple spatial and hydraulic layers. The modelling process began with the preparation of a 2D zone using a 20m^2 - 5m^2 size triangular mesh resolution across the study area, with finer mesh refinements (up to 1m^2) applied at critical locations within the WRP.

A modified terrain surface derived from RAS Mapper, with a grid cell size of 0.5 m, was integrated into the ICM ground model. Outline design details of the WRP were imported into the model database after being converted from CAD drawings into georeferenced shapefiles. Following import, elevation adjustments were applied to each structure based on its vertex geometry to ensure accurate terrain representation. A graphical summary of these adjustments is provided in Figure 2-8.

In addition to the structural elements, the ICM database includes key SuDS features such as loose gravel cover (modelled as a porous zone), swales, bioretention area and a detention basin. Three hydraulic structures were further incorporated into the model: a culvert beneath the roadway, a hydro-brake device at the detention basin outlet, and a retention wall designed to prevent overtopping of the pond. The maximum discharge from the hydro-brake is set to 250 l/s, this is a significant betterment over the uncontrolled condition. As the site discharges to a tidal receiving waterbody, it is not constrained by the greenfield runoff rates.

Finally, mesh zones of varying resolutions were generated to suit the hydraulic and geometric requirements of the different polygons within the model domain.

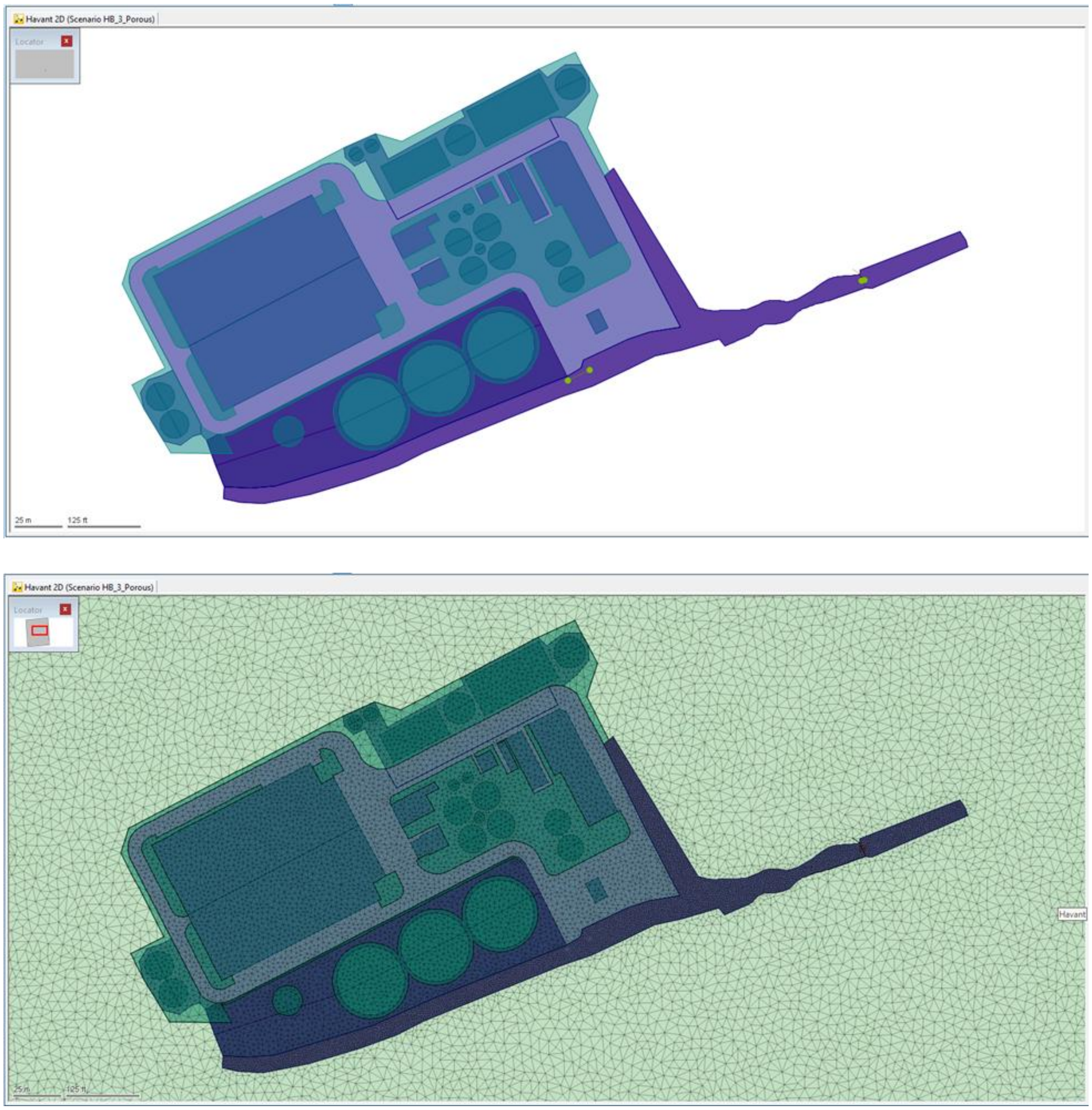

Figure 2-8 ICM model representation for the WRP

Brake pressure Tank/Intermediate Pumping Station – E

A 2D zone was prepared with a triangular mesh size 1m^2 - 5m^2 for all areas, with finer meshes generated (up to 1m^2) for specific areas within the site.

The ICM model incorporates a modified terrain from RAS Mapper with a cell size of 0.5m. Various structures based on the outline design were imported into the ICM model database. These structures were converted into shapefiles from CAD files and then imported. Elevation modifications were made to the imported structures based on the drawing of each structure.

Figure 2-9 provides a graphical representation of these modifications. The ICM dataset also included key SuDS features such as loose gravel cover (modelled as a porous zone), swales and a detention basin. A hydro-brake with a varying discharge rate at the outlet (through the stage-discharge relationship) of the detention basin was included. To allow water to drain from the loose gravel cover, several drainage holes are provided (shown as green dots in Figure 2-9). Finally, meshes of various sizes are generated for different polygons. The site includes structures, including a culvert situated beneath the road to convey flows through the swale, and an additional culvert that transfers runoff from the swale to the basin. A hydro-brake at the detention basin regulates discharge from the basin to the outer diffuse swale, with a maximum allowable flow rate of 5 l/s. A 5 l/s hydro-brake was sized for the outfall of the basin based on the baseline simulation flow to ensure that the discharge from the SuDS does not exceed greenfield rates for the 2-year, 30-year and 100-year events. The proposed SuDS for BPT/IPS-E will discharge from the detention basin as overland flow to the existing natural receptor via the diffuse swale that will convey the flow, with its outfall gradually tapering to the existing ground elevation to enable diffuse, non-concentrated discharge downslope. The existing receptor for BPT/IPS-E is the agricultural field located to the north of the site. Surface water will be discharged as overland flow down the site's slope, mimicking natural and existing flow conditions.

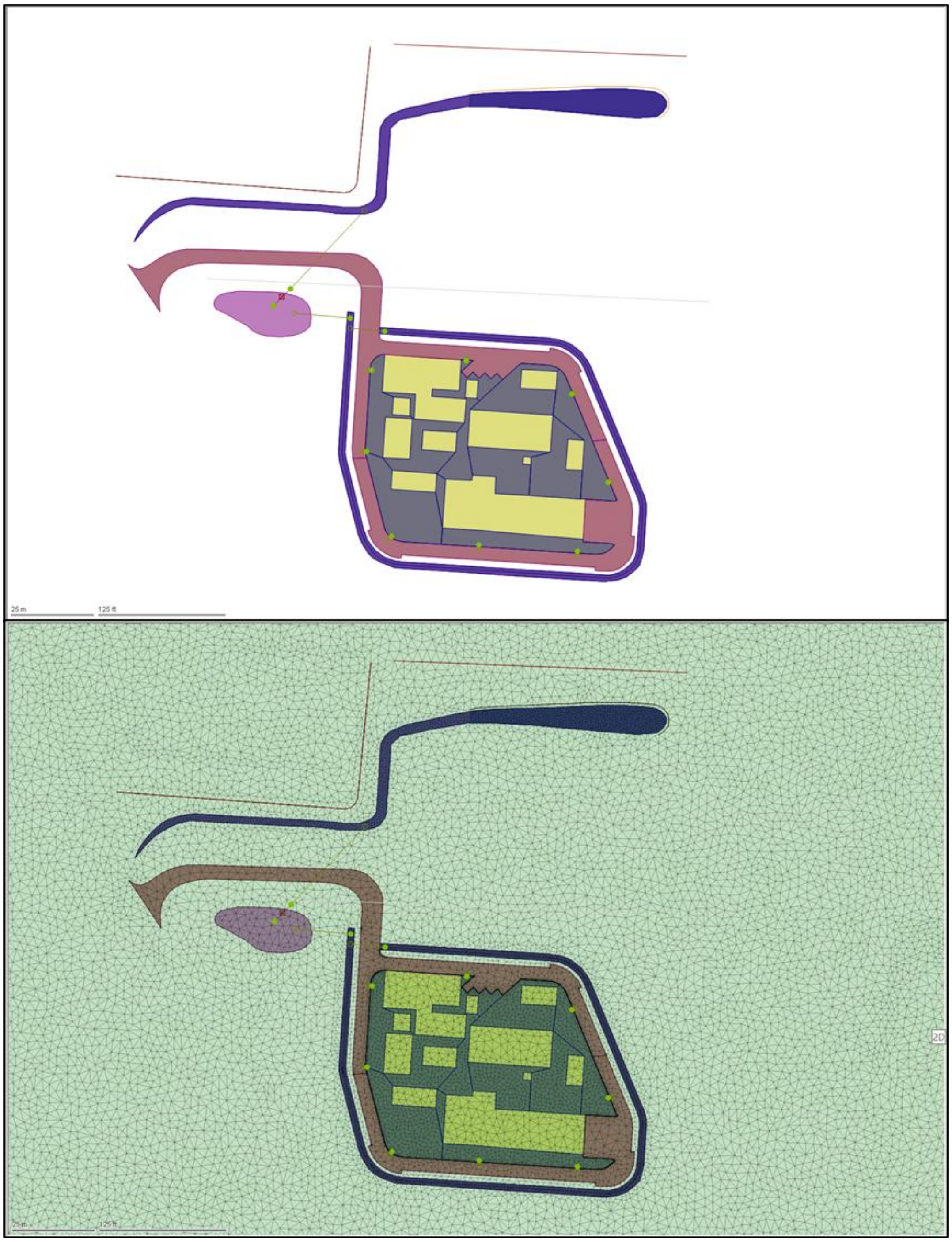

Figure 2-9 ICM model representation for BPT/IPS – E

Intermediate Pumping Station – F

The ICM model was developed using multiple spatial and hydraulic layers. The modelling process began with the preparation of a 2D zone using a 1m^2 - 5m^2 size triangular mesh resolution across the study area, with finer mesh refinements applied at critical locations within the site.

The ICM model utilises a modified terrain surface exported from RAS Mapper, generated at a 0.5-m cell resolution. Figure 2-10 illustrates these model enhancements.

The ICM dataset also included key SuDS features such as loose gravel cover (modelled as a porous zone), swales and a detention basin To allow water to drain from the loose gravel cover, several drainage holes are provided (shown as green dots in Figure 2-10). Two key hydraulic control structures were added to the database which included a culvert under the access road, and a hydro-brake located at the detention basin outlet. The hydro-brake of 5 l/s max discharge was sized for the outfall of the basin based on the baseline simulation flow to ensure that the discharge from the SuDS does not exceed greenfield rates for the 2-year, 30-year and 100-year events.

Following the inclusion of all design features, mesh zones of varying resolutions were generated for the respective polygonal areas to ensure appropriate spatial detail across the model domain shown in Figure 2-10.

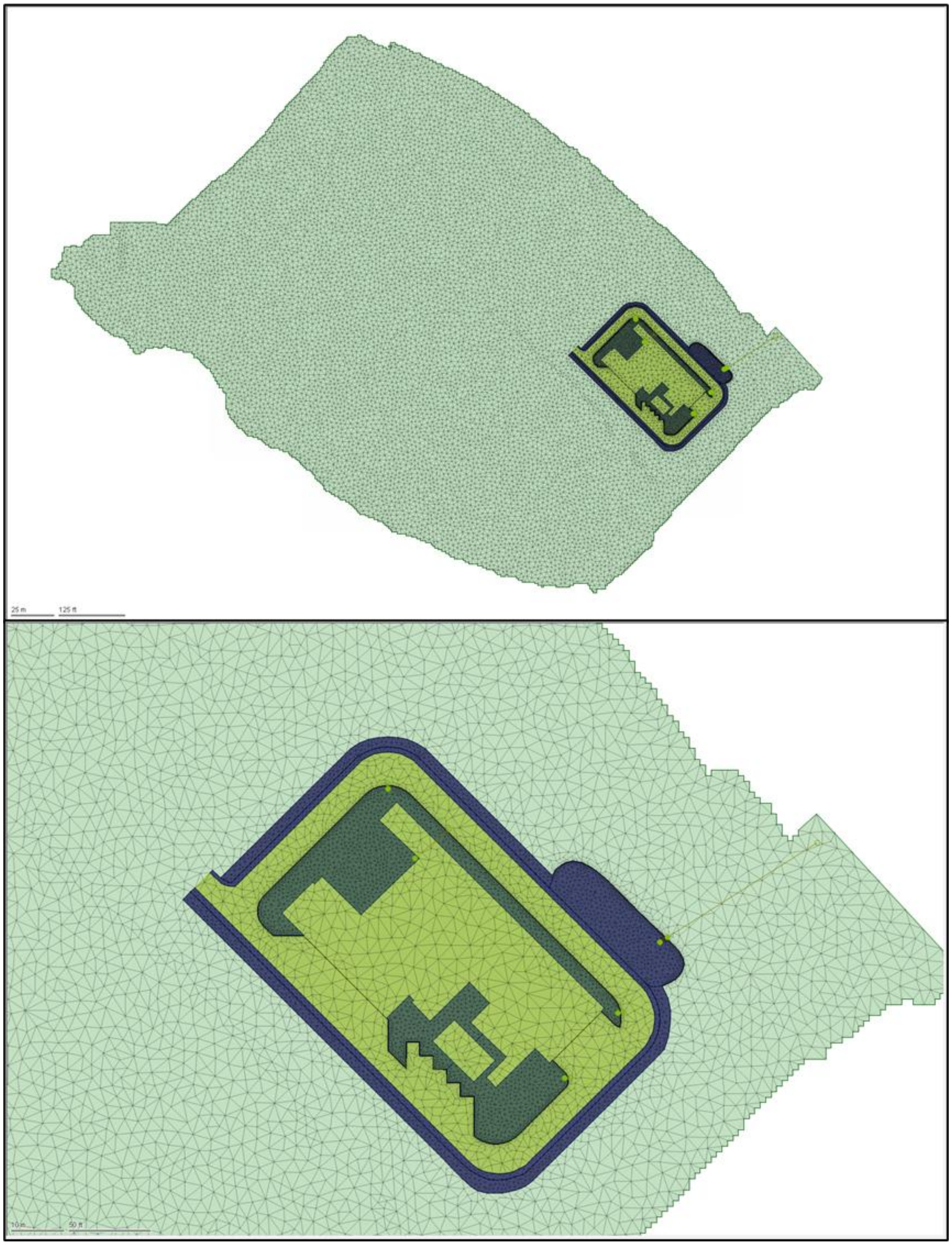

Figure 2-10 ICM Model representation for IPS – F

Intermediate Pumping Station – G

The ICM model was developed using multiple spatial and hydraulic layers. The modelling process began with the preparation of a 2D zone using a 1m^2 - 5m^2 size triangular mesh resolution across the study area, with finer mesh refinements applied at critical locations within the site.

The ICM model utilised a modified terrain surface exported from RAS Mapper, generated at a 0.5-m cell resolution. Figure 2-11 illustrates these model enhancements.

The ICM dataset also included key SuDS features such as loose gravel cover (modelled as a porous zone), swales and a detention basin. To allow water to drain from the loose gravel cover, several drainage holes are provided (shown as green dots in Figure 2-11). Two key hydraulic control structures were added to the database which included a culvert under the access road and a hydro-brake located at the detention basin outlet. The hydro-brake with max discharge of 20l/s was sized for the outfall of the basin based on the baseline simulation flow to ensure that the discharge from the SuDS does not exceed greenfield rates for the 2-year, 30-year and 100-year events.

Following the inclusion of all design features, mesh zones of varying resolutions were generated for the respective polygonal areas to ensure appropriate spatial detail across the model domain shown in Figure 2-11.

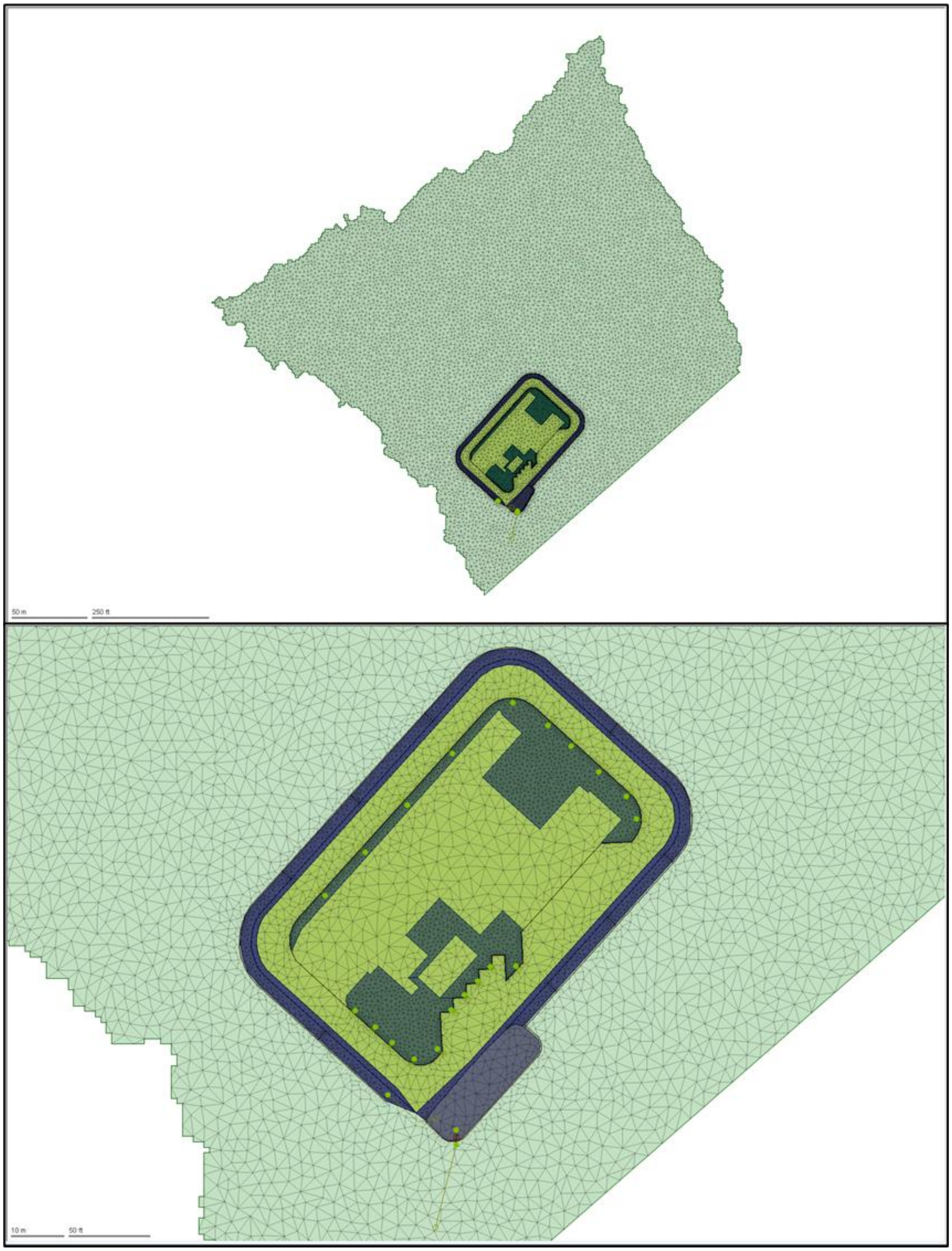

Figure 2-11 ICM Model representation for IPS – G

Brake Pressure Tank – K

The ICM model was developed using multiple spatial and hydraulic layers. The modelling process began with the preparation of a 2D zone using a 1m^2 - 5m^2 size triangular mesh resolution across the study area, with finer mesh refinements applied at critical locations within the site.

The ICM model incorporates a modified terrain from RAS Mapper with a cell size of 0.5m. Various structures based on the outline design drawings were imported into the ICM model database. Elevation modifications were made to the imported structures based on the drawing of each structure.

Figure 2-12 provides a graphical representation of these modifications. The ICM dataset also included key SuDS features such as loose gravel cover (modelled as a porous zone), swales and a detention basin. To allow water to drain from the loose gravel cover, several drainage holes are provided (shown as green dots in Figure 2-12). A hydro-brake with a maximum discharge rate of 10l/s was sized for the outfall of the basin based on the baseline simulation flow to ensure that the discharge from the SuDS does not exceed greenfield rates for the 2-year, 30-year and 100-year events. Finally, meshes of various sizes are generated for different polygons shown in Figure 2-12.

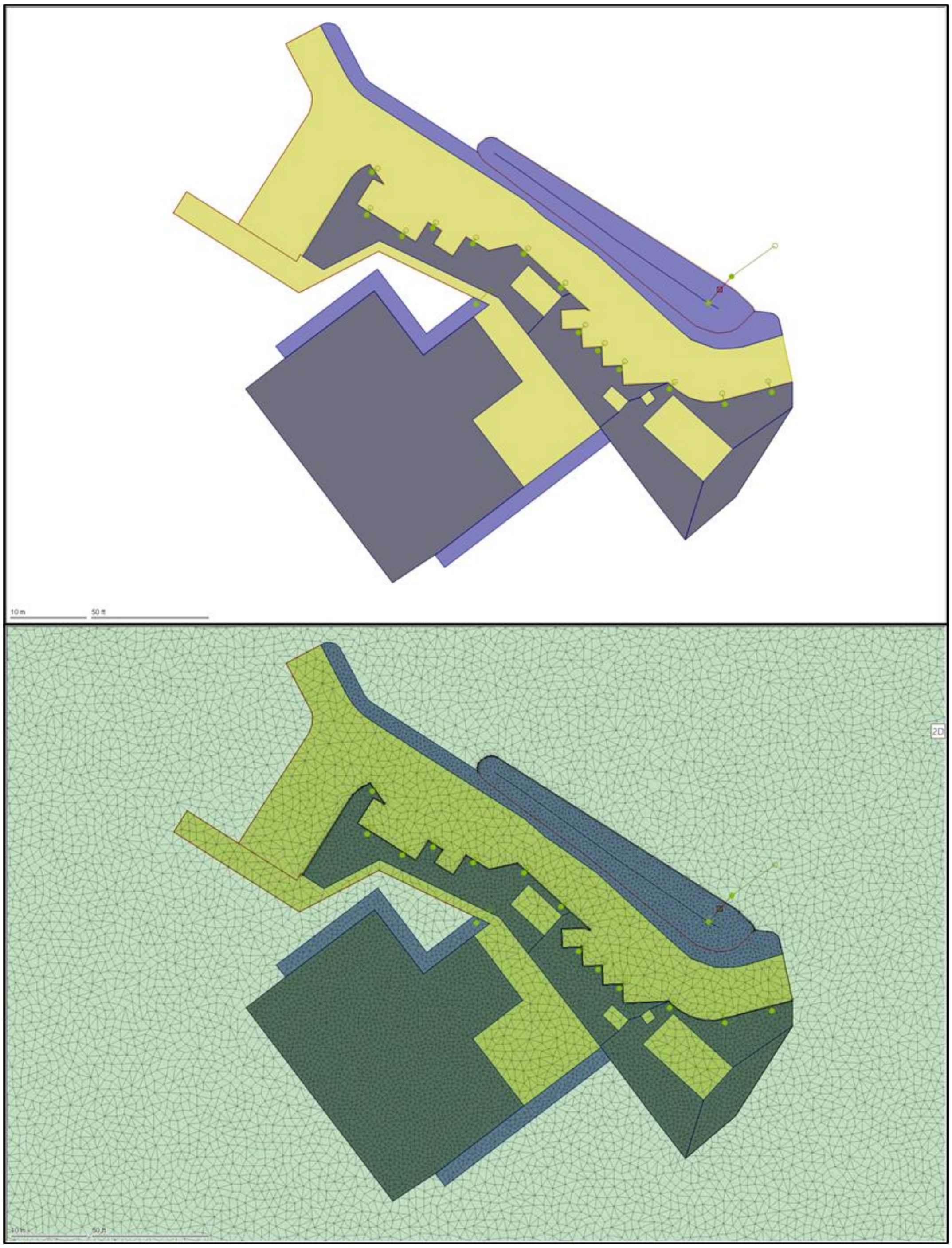

Figure 2-12 ICM Model representation for BPT – K

3 Modelling results and assesments

3.1 Baseline and Proposed Simulation Results

Water Recycling Plant (WRP)

The baseline flow at the proposed site has been evaluated, and a flow through a line downstream has been assessed using baseline rainfall conditions as shown in Figure 3-1.

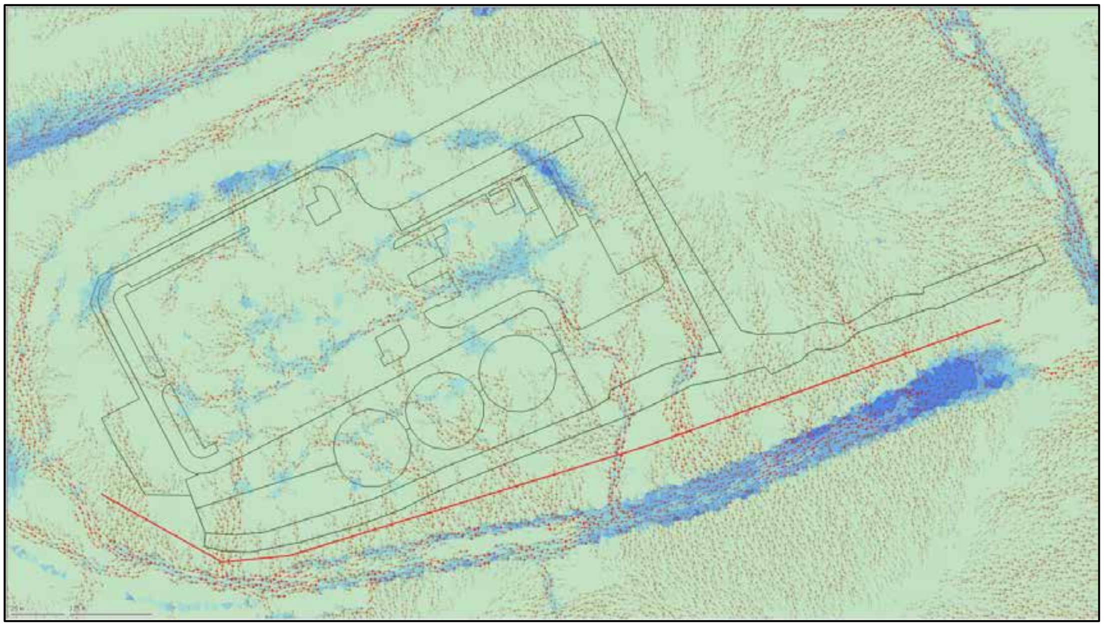

Figure 3-1 Baseline simulation flow-through line for the WRP

The proposed discharge from the SuDS is calculated at the hydro-brake for the proposed scenario simulation.

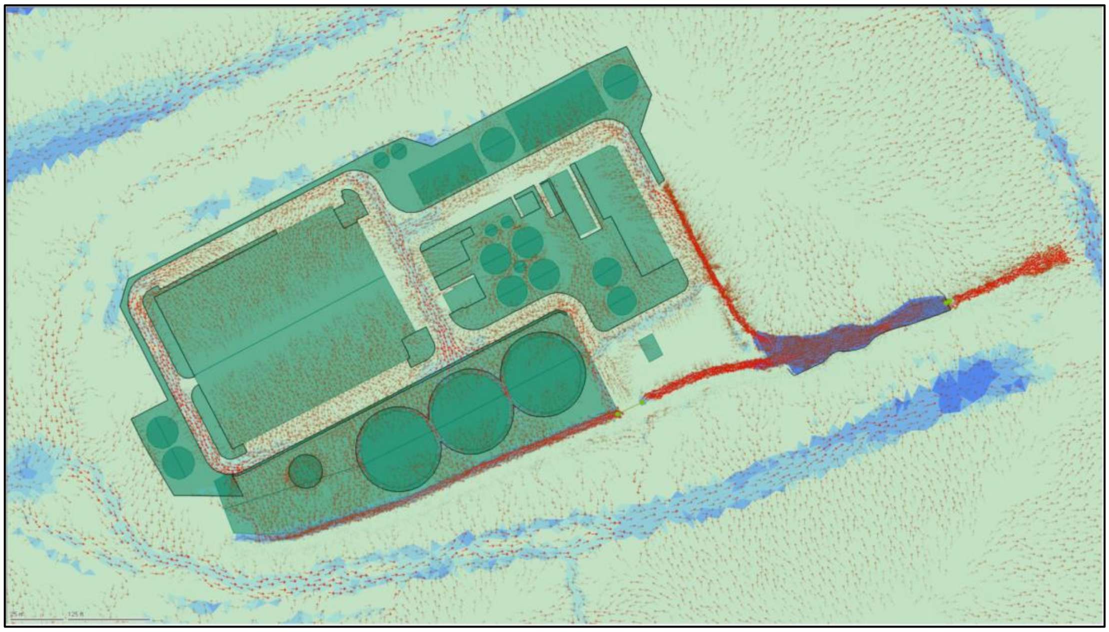

Figure 3-2 Proposed simulation for the WRP SuDS

The following table presents the results for the 100-year return period for the 30-minute, 360-minute and 1440-minute storm duration scenarios.

Table 3-1 WRP Discharge rate for baseline and proposed scenario

Scenario	Max flow through line for a given scenario in l/s	
	Baseline	Proposed (with 45% Climate Change uplift)
M100-30	600	250
M100-240	500	250
M100-360	382	250
M100-1440	190	186

Results showing expected water depths, velocities, and hazard ratings for the proposed development under the 100-year plus climate change event are shown in Appendix A.

Brake pressure Tank/Intermediate Pumping Station – E

The baseline flow at the proposed site has been evaluated, and a flow-through line (red highlighted) has been established downstream to assess the hydraulic performance of the system. This assessment has been carried out using baseline rainfall conditions.

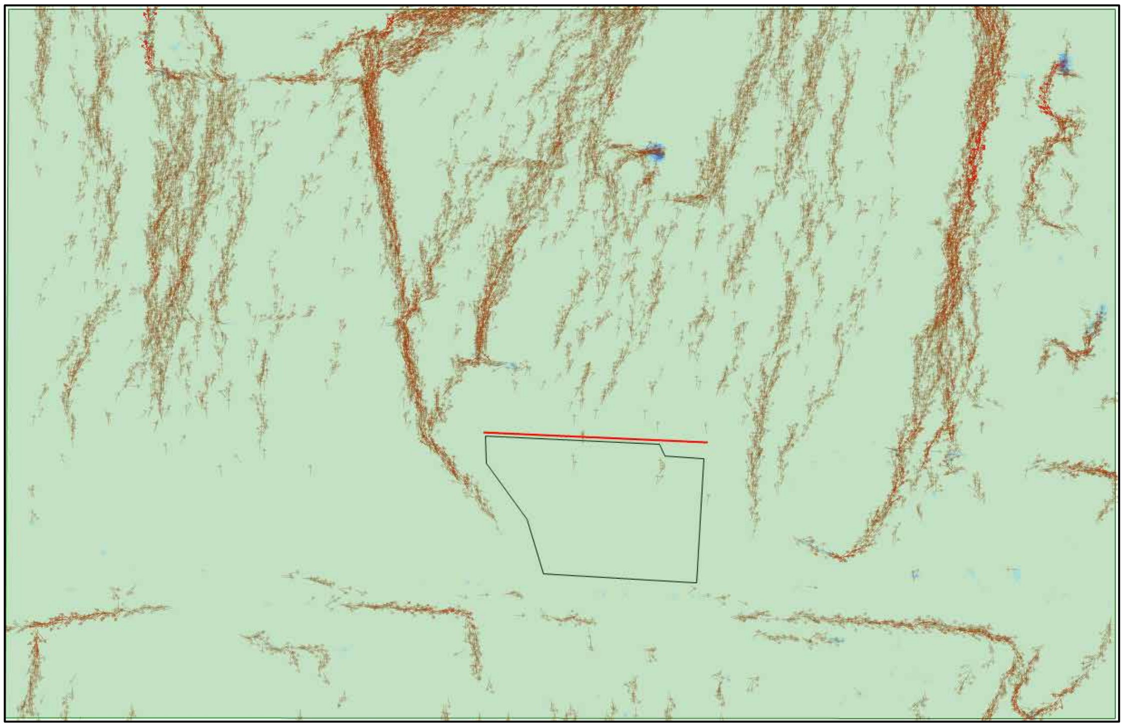

Figure 3-3 Baseline simulation flow-through line for BPT/IPS-E

The proposed discharge from the SuDS at BPT/IPS-E is calculated at the outer swale shown below for the proposed scenario simulation.

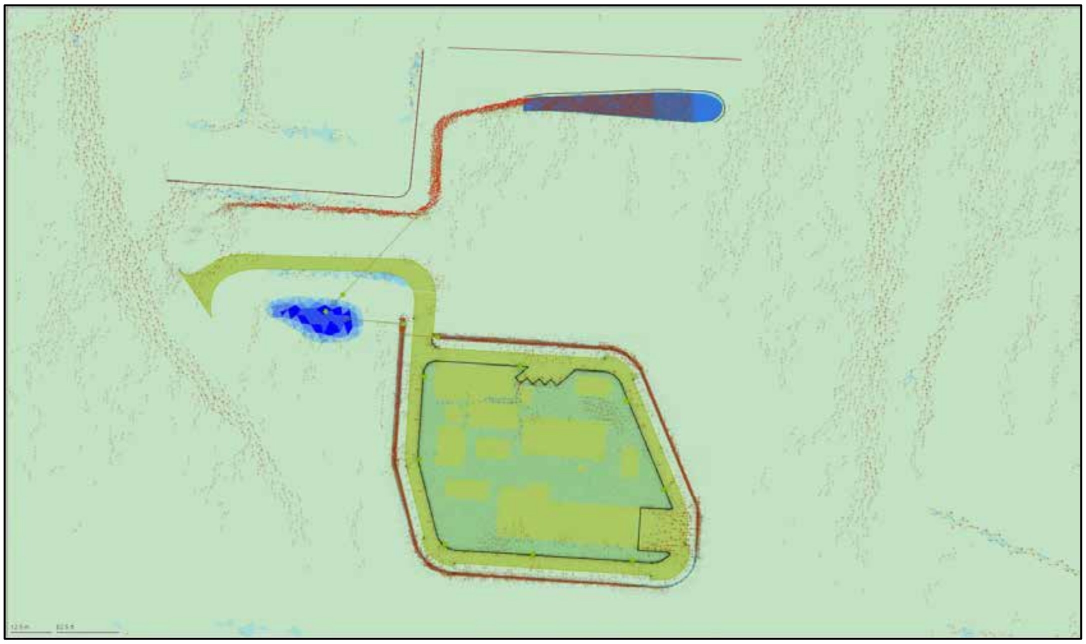

Figure 3-4 BPT/IPS-E proposed discharge from the diffuse swale as overland flow

The following table presents the results for the 2-year, 30-year, and 100-year return periods for both the 30-minute and 360-minute storm duration scenarios.

Table 3-2 BPT/IPS-E Discharge rate for baseline and proposed scenario

Scenario	Max flow through line for a given scenario in l/s	
	Baseline	Proposed (with Climate Change uplift)
M02-30	15.9	0
M02-360	9.6	3
M30-30	65	3
M30-360	18.8	8
M100-30	88.4	4
M100-360	23.1	14

It is noted that for all return periods and durations there is an overall reduction in discharge rate from the site when compared with baseline greenfield conditions.

Results showing expected water depths, velocities, and hazard ratings for the proposed development under the 100-year plus climate change event are shown in Appendix A. The pre-development runoff pathways are also shown in Appendix A.

Intermediate Pumping Station – F

The baseline flow at the proposed site has been evaluated, and a flow-through line (red highlighted) has been established downstream to assess the hydraulic performance of the system. This assessment has been carried out using baseline rainfall conditions.

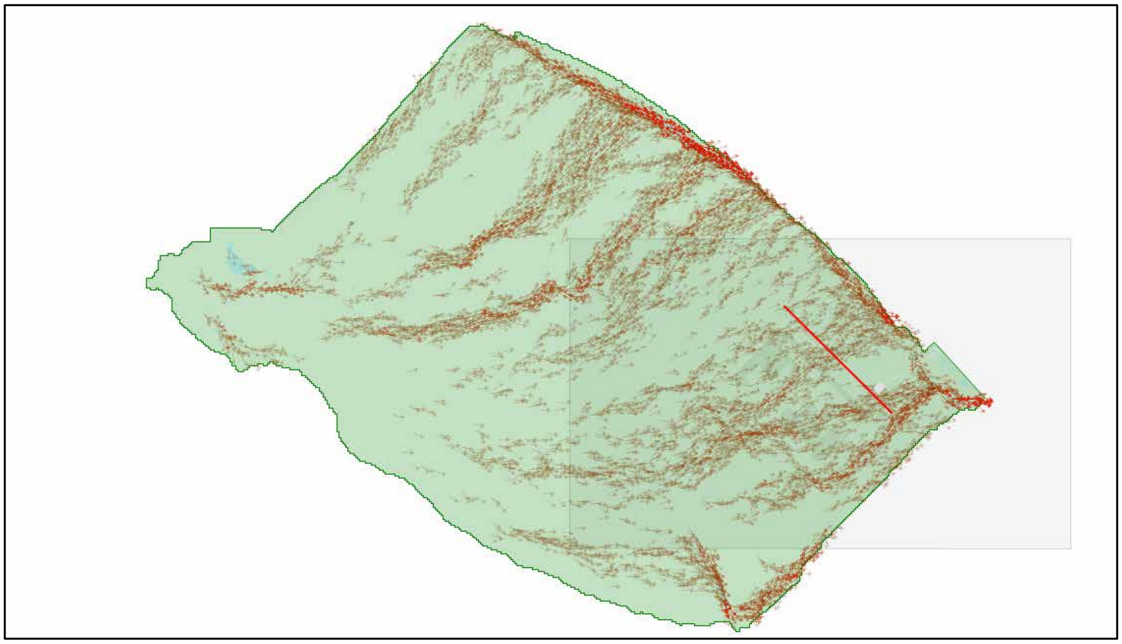

Figure 3-5 Baseline simulation flow-through line for IPS-F

The proposed discharge from the SuDS at IPS-F is calculated at the hydro-brake; shown below for the proposed simulation.

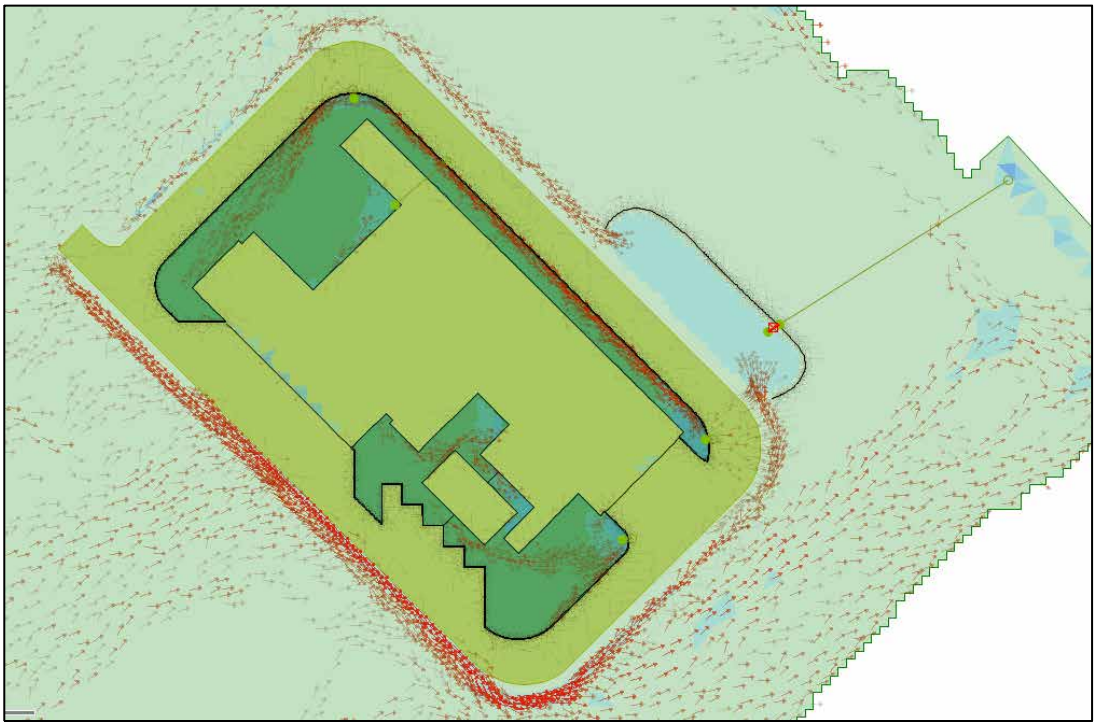

Figure 3-6 IPS-F proposed discharge from Hydro-brake

The following table presents the results for the 2-year, 30-year, and 100-year return periods for both the 30-minute and 360-minute storm duration scenarios.

Table 3-3 IPS-F Discharge rate for baseline and proposed scenario

Scenario	Max flow through line for a given scenario in l/s	
	Baseline	Proposed (with Climate Change uplift)
M02-30	4.1	0.2
M02-360	3.1	0.46
M30-30	22.88	0.43
M30-360	7.68	0.9
M100-30	63	0.7
M100-360	14	1.6

It is noted that for all return periods and durations there is an overall reduction in discharge rate from the site when compared with baseline greenfield conditions. Results showing expected water depths, velocities, and hazard ratings for the proposed development under the 100-year plus climate change event are shown in Appendix A. The pre-development runoff pathways are also shown in Appendix A.

Intermediate Pumping Station – G

The baseline flow at the proposed site has been evaluated, and a flow-through line (red highlighted) has been established downstream to assess the hydraulic performance of the system. This assessment has been carried out using baseline rainfall conditions.

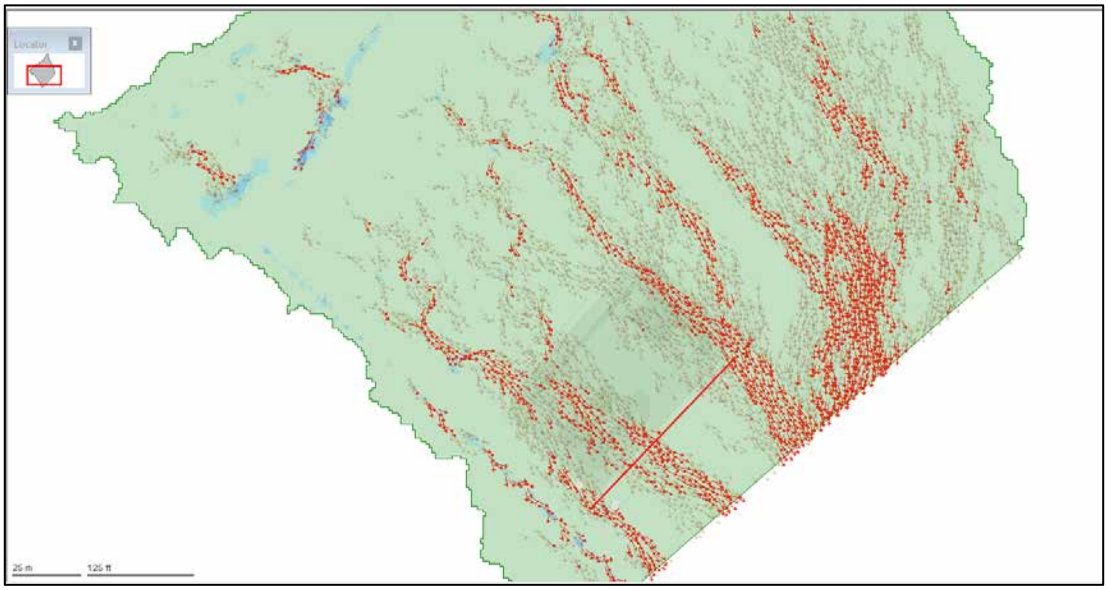

Figure 3-7 Baseline simulation flow-through line for IPS-G

The proposed discharge from the SuDS at IPS-G is calculated at the hydro-brake below for the proposed simulation.

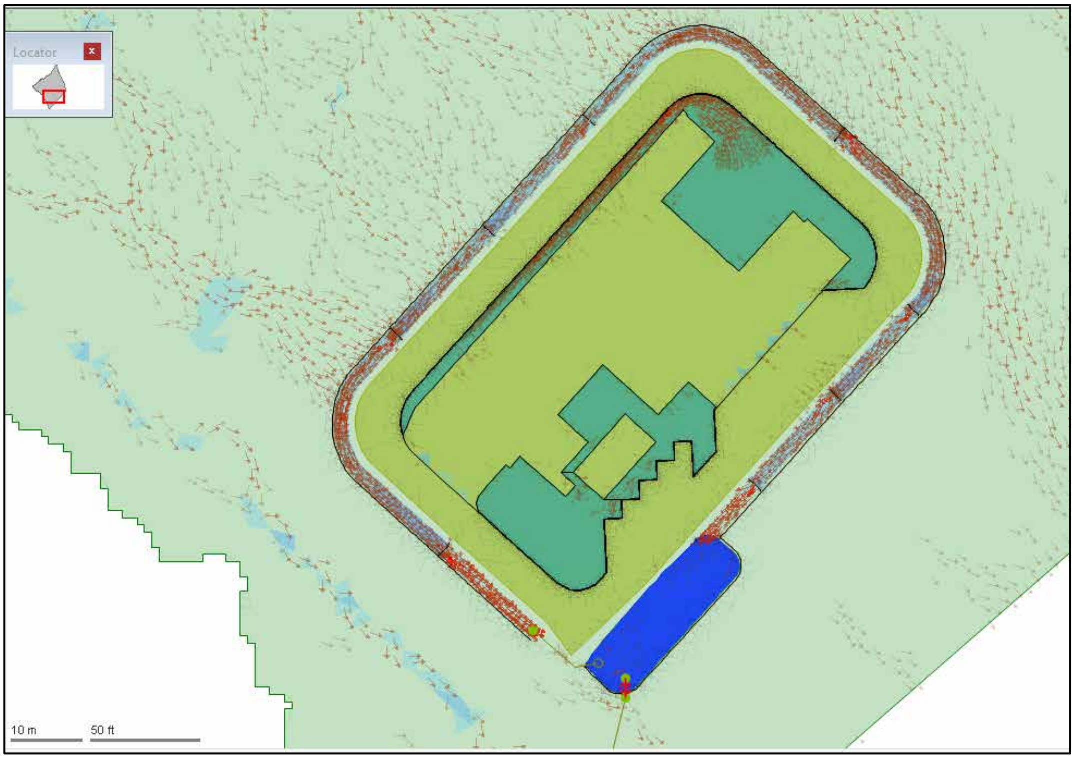

Figure 3-8 IPS-G proposed discharge from Hydro-brake

The following table presents the results for the 2-year, 30-year, and 100-year return periods for both the 30-minute and 360-minute storm duration scenarios.

Table 3-4 IPS-G Discharge rate for baseline and proposed scenario

Scenario	Max flow through line for a given scenario in l/s	
	Baseline	Proposed (with Climate Change uplift)
M02-30	18.8	3.13
M02-360	10.2	10.19
M30-30	91.1	15.82
M30-360	23.1	19.2
M100-30	217	19.41

Scenario	Max flow through line for a given scenario in l/s	
	Baseline	Proposed (with Climate Change uplift)
M100-360	55	19.87

It is noted that for all return periods and durations there is an overall reduction in discharge rate from the site when compared with baseline greenfield conditions. Results showing expected water depths, velocities, and hazard ratings for the proposed development under the 100-year plus climate change event are shown in Appendix A. The pre-development runoff pathways are also shown in Appendix A.

Brake Pressure Tank – K

The baseline flow at the proposed site has been evaluated, and a flow-through line (red highlighted) has been established downstream to assess the hydraulic performance of the system. This assessment has been carried out using baseline rainfall conditions.

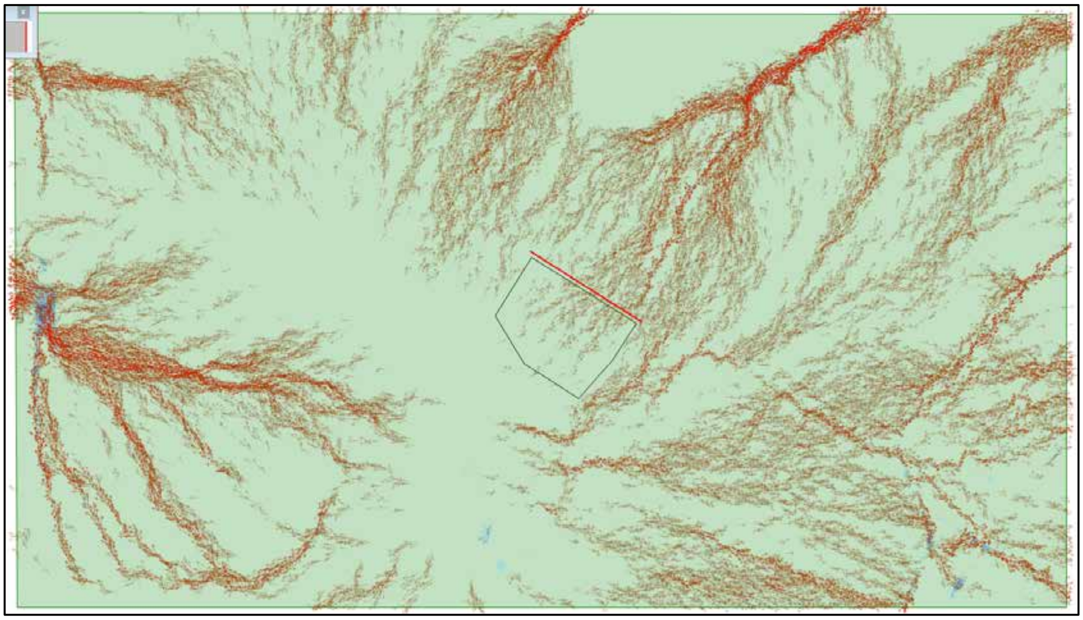

Figure 3-9 Baseline simulation flow-through line for BPT-K

The proposed discharge from the SuDS at BPT-K is calculated at the hydro-brake shown below for the proposed simulation.

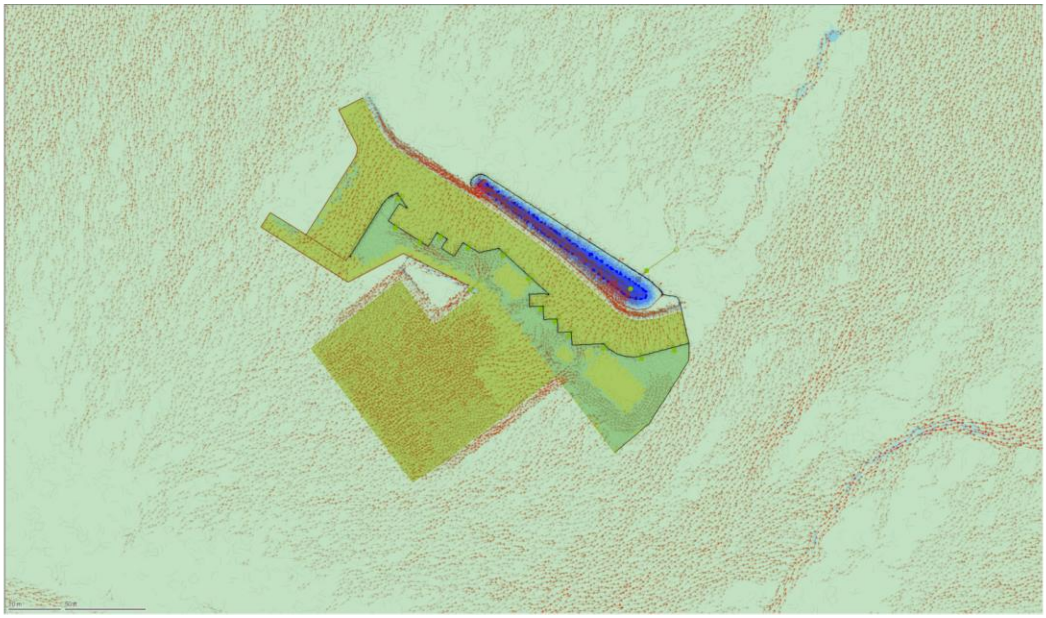

Figure 3-10 BPT-K Proposed discharge from Hydro-brake

The following table presents the results for the 2-year, 30-year, and 100-year return periods for both the 30-minute and 360-minute storm duration scenarios.

Table 3-5 BPT-K Discharge rate for baseline and proposed scenario

Scenario	Max flow for a given scenario in l/s	
	Baseline	Proposed (with Climate Change uplift)
M02-30	36.9	7
M02-360	13.1	8
M30-30	97.9	9
M30-360	24.7	9
M100-30	122.7	9
M100-360	30.4	9

It is noted that for all return periods and durations there is an overall reduction in discharge rate from the site when compared with baseline greenfield conditions.

Results showing expected water depths, velocities, and hazard ratings for the proposed development under the 100-year plus climate change event are shown in Appendix A. The pre-development runoff pathways are also shown in Appendix A.

4 Conclusion

This report has detailed the work undertaken in InfoWorks Integrated Catchment Modelling (ICM) to assess the performance of SuDS features for the proposed AGP and WRP associated with the Hampshire Water Transfer and Water Recycling Project. Specifically, this report has assessed the performance of the proposed SuDS under the 1 in 2-year, 1 in 30-year and 1 in 100-year rainfall events, all with an appropriate climate change allowance. The proposed site layouts including the SuDS, have been incorporated into the terrain model to simulate overland flow routing. The model outputs demonstrate how rainfall runoff is managed across the sites, with results showing expected water depths, velocities, and hazard ratings. The modelling confirms the effectiveness of the SuDS in mitigating surface water flood risk while also showing low water depths and a low hazard rating across the sites. Additionally, the modelling illustrates pre and post development exceedance flow routes, to show how surface water is conveyed across the sites before and after development. In the event of a storm exceeding the 1 in 100-year plus climate change design event, exceedance flows would continue to follow the same overland flow routes as identified by the pre and post development exceedance flow routes. All of the SuDS features are designed to discharge to the existing natural drainage receptor, consistent with the site’s baseline drainage condition. As there are no properties located immediately downstream of the natural receptor, exceedance events would be conveyed safely without increasing flood risk to third-party property or sensitive receptors. The baseline pre-development models were used to determine the greenfield runoff rates for the entire catchment draining to the sites. The 1 in 2-year and 1 in 30-year rainfall events have been modelled to ensure that the discharge from the SuDS do not exceed the greenfield runoff rates for these lower order events.

5 References

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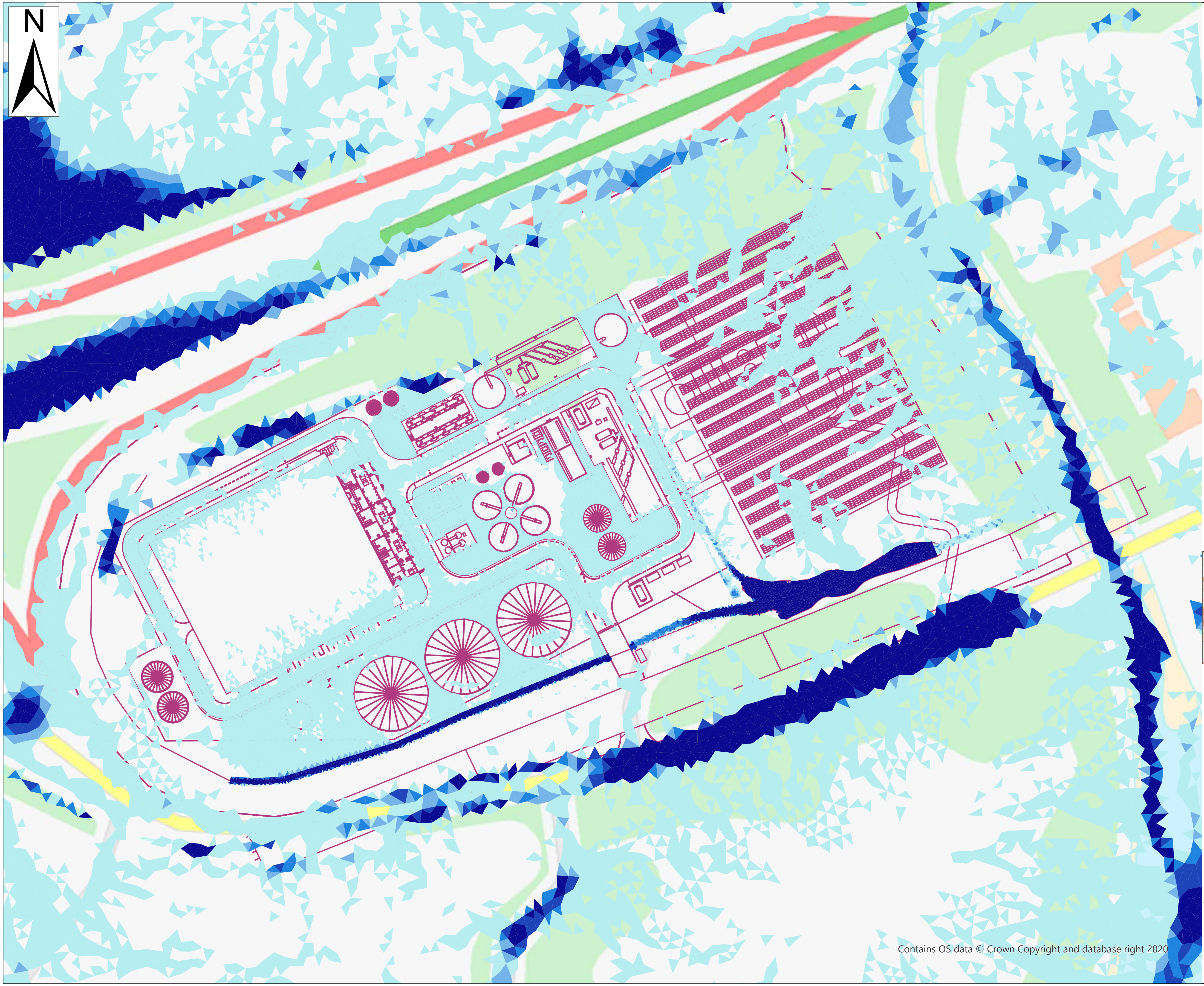
Appendix A



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🟦	0.101 - 0.150
🟦	0.151 - 0.200
🟦	0.201 - 0.250
🟦	0.251 - 1.250
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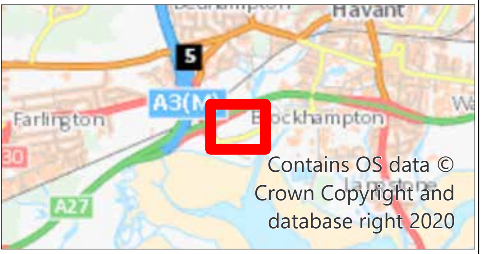

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Stantec Southern Water

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OS Reference: -
Page Size: A3
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Sub Process: N/A
Location: Harts Farm Way, Brockhampton, Bedhampton
Postcode: SU 70135 05676
Project Client: Southern Water Limited
Project Name: SWS Havant WRP
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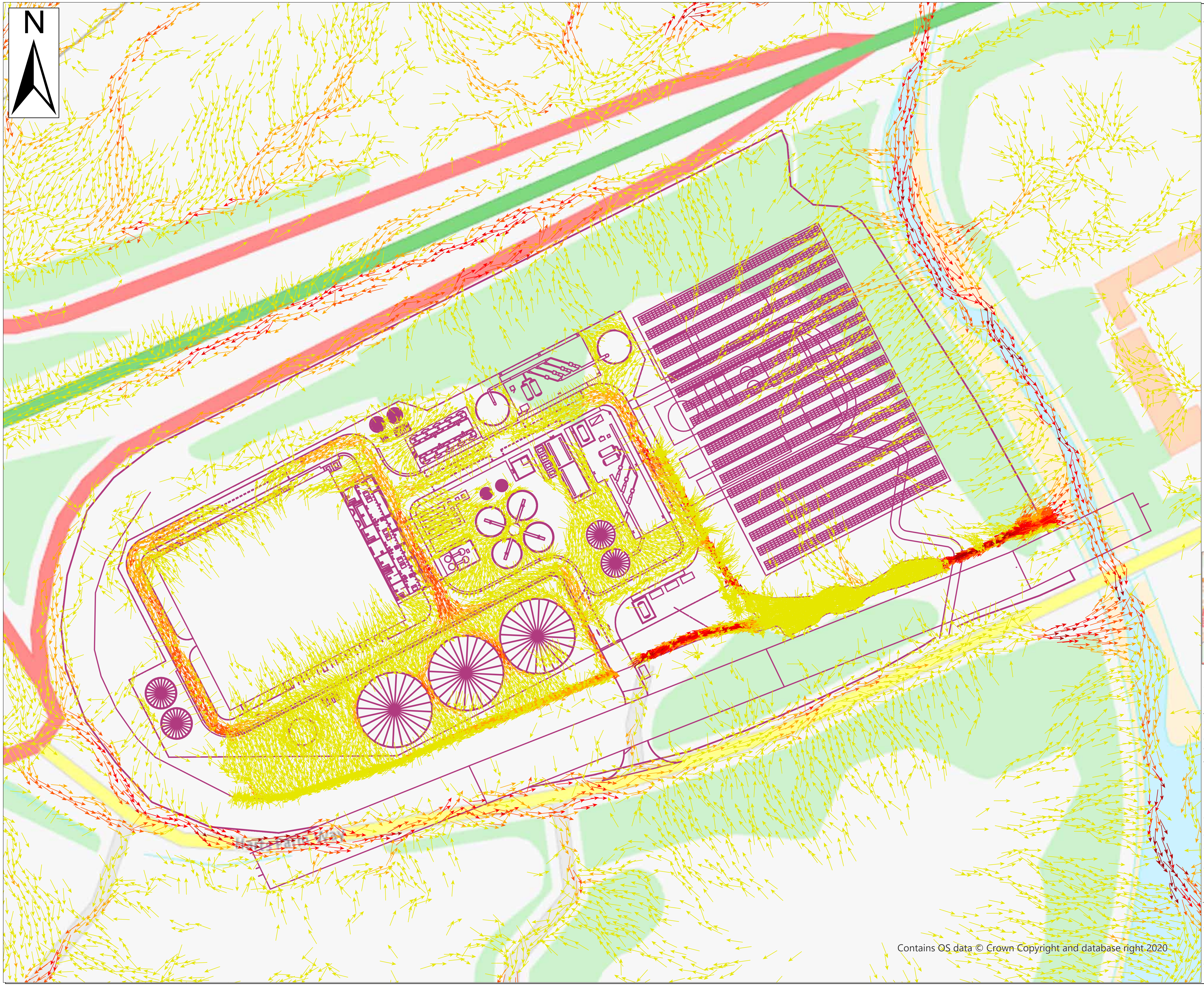
Drawing Title: Depth Map for M100-240+45CC
Drawing No.:



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↑	1.0 - 1.8
—	STRUCTURES

0 40 80 Meters

Current Version Information

Revision	Status	Suitability Description	Authored	Checked	Reviewed	Date
P01	S01	First Draft	MJ			01/29/2025

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Sub Process: N/A
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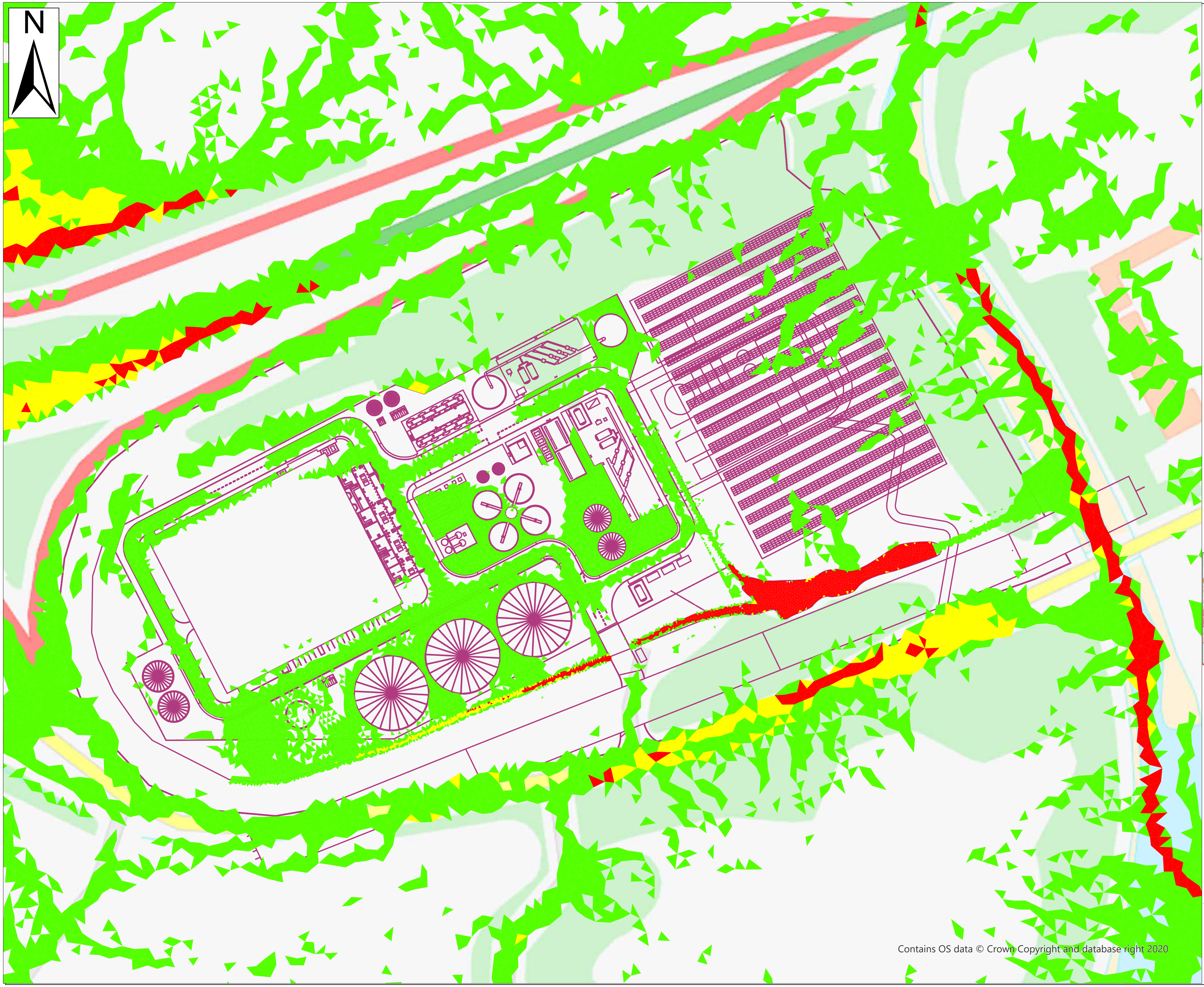

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LEGEND

HAZARD RATING

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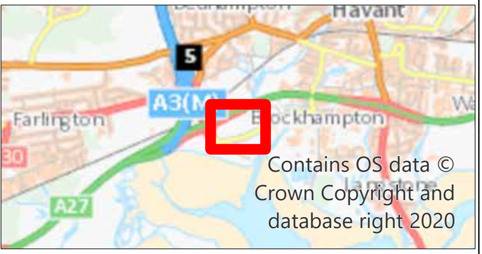
🟨	0.75 - 1.25 - MODERATE
🟥	1.25 - 2.50 - SIGNIFICANT
—	STRUCTURES



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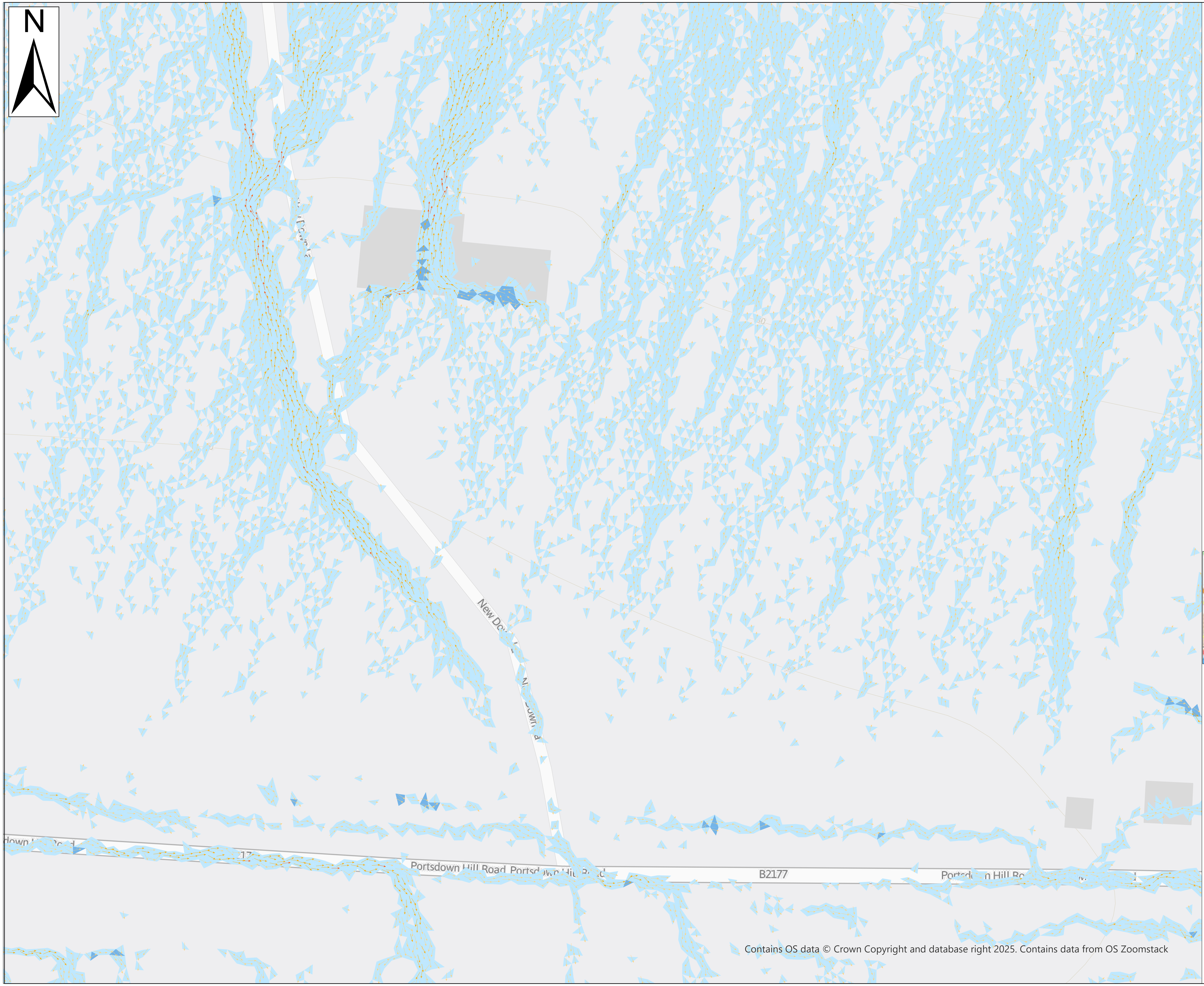
Drawing No.:



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↑	0.2 - 0.3
↑	0.3 - 0.4
↑	0.4 - 0.5
↑	0.5 - 0.8

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■	0.005 - 0.050
■	0.051 - 0.150
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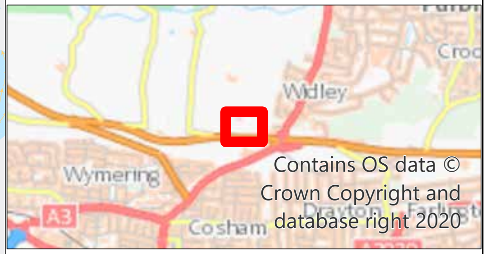
DEPTH (MAX) IN CENTIMETER IS PROVIDED IN PAVEMENTS

0 25 50 Meters



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Postcode: SU664065
Project Client: Southern Water Limited
Project Name: BPT/IPS-E SuDS Design
Drawing Title: DEPTH(MAX) AND VELOCITY (MAX) RESULTS FOR BASELINE SCENARIO
Drawing No.:

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LEGEND

SWALE

▨ DIFFUSE SWALE
▨ CONVEYANCE SWALE
🟫 BUND
▨ LOOSE GRAVEL COVER
▨ FILTER STRIP
▨ DETENTION BASIN
▨ IMPERMEABLE AREA
— PIPED CONNECTION

DEPTH (M)

🟦 0.005 - 0.050
🟦 0.051 - 0.150
🟦 0.151 - 0.200
🟦 0.201 - 0.250
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VELOCITY (M/S)

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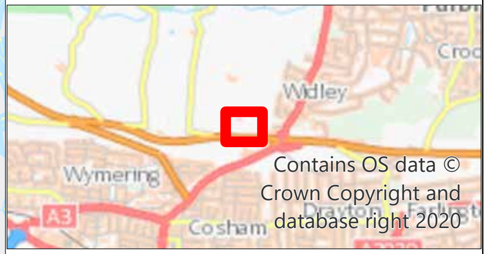
↑ 0.5 - 0.8

DEPTH (MAX) IN CENTIMETER IS PROVIDED IN PAVEMENTS

0 25 50 Meters



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Current Version Information

Revision	Status	Suitability Description	Authored	Checked	Reviewed	Date
P01	S01	First Draft	MJ			09 Jan 2026

Stantec Southern Water

Scale: 1:1,000
OS Reference: -
Page Size: A3
Project Group: N/A
Sub Process: N/A
Location: PORTSDOWN HILL ROAD, WYMERING
Postcode: SU664065
Project Client: Southern Water Limited
Project Name: BPT/IPS-E SuDS Design
Drawing Title: DEPTH(MAX) AND VELOCITY (MAX) RESULTS FOR M100-30MIN+45CC SCENARIO
Drawing No.:

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LEGEND

SWALE

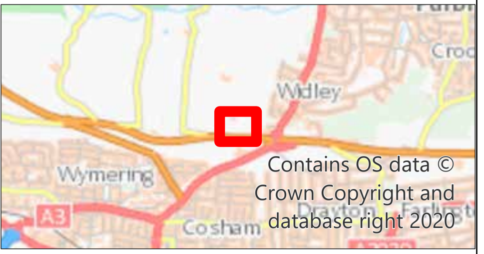
▨ DIFFUSE SWALE
▨ CONVEYANCE SWALE
■ BUND
▦ LOOSE GRAVEL COVER
▦ FILTER STRIP
▨ DETENTION BASIN
▨ IMPERMEABLE AREA
▬ PIPED CONNECTION

Hazard
HAZARD_M

🟩 0.00 - 0.75 - LOW
🟨 0.75 - 1.25 - MODERATE
🟥 1.25 - 2.50 - SIGNIFICANT

DEPTH (MAX) IN CENTIMETER IS PROVIDED IN PAVEMENTS

0 25 50 Meters



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Current Version Information

Revision	Status	Suitability Description	Authored	Checked	Reviewed	Date
P01	S01	First Draft	MJ			09 Jan 2026

Stantec   Southern Water

Scale: 1:1,000
OS Reference: -
Page Size: A3
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Sub Process: N/A
Location: PORTSDOWN HILL ROAD, WYMERING
Postcode: SU664065
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Project Name: BPT/IPS-E SuDS Design
Drawing Title: HAZARD INDEX RESULTS FOR M100-30+45CC SCENARIO
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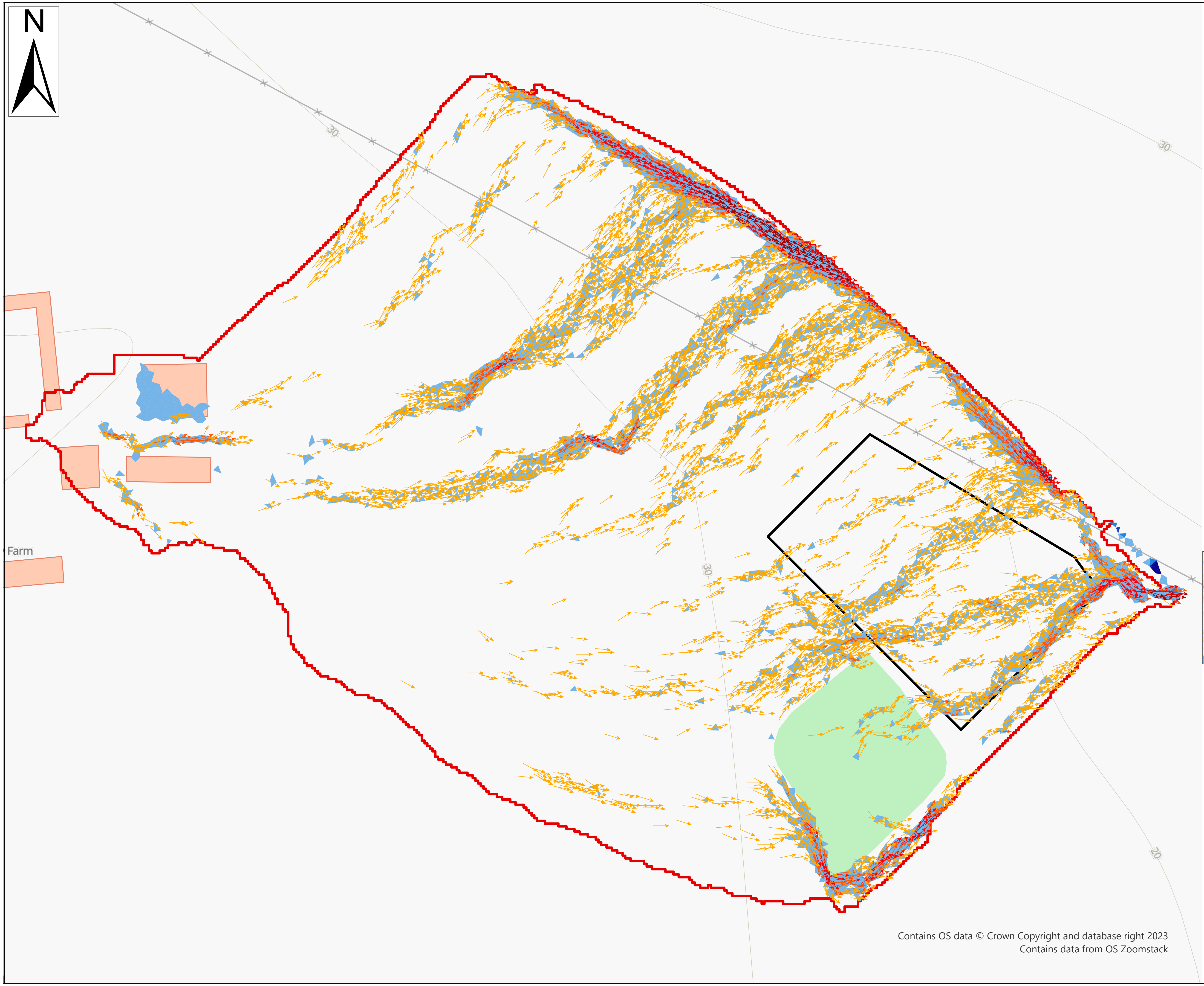

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LEGEND

🟥 SUBBASIN F

☐ SITE BOUNDARY

Depth
METERS

	0.005 - 0.015
🟦	0.015 - 0.15
🟦	0.15 - 0.20
🟦	0.20 - 0.25
🟦	0.251 - 1.250

Velocity
(M/S)

	0.05 - 0.1
↑	0.1 - 0.2
↑	0.2 - 0.3
↑	0.3 - 0.4
↑	0.4 - 0.5
↑	0.5 - 0.8

DEPTH (MAX) IN CENTIMETER IS PROVIDED IN PAVEMENTS

0 30 60 Meters

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Current Version Information

P01	S01	First Draft	MJ			02July2025
Revision	Status	Suitability Description	Authored	Checked	Reviewed	Date

Scale: 1:1,300
OS Reference: -
Page Size: A3
Project Group: N/A
Sub Process: N/A
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Postcode: SU579091
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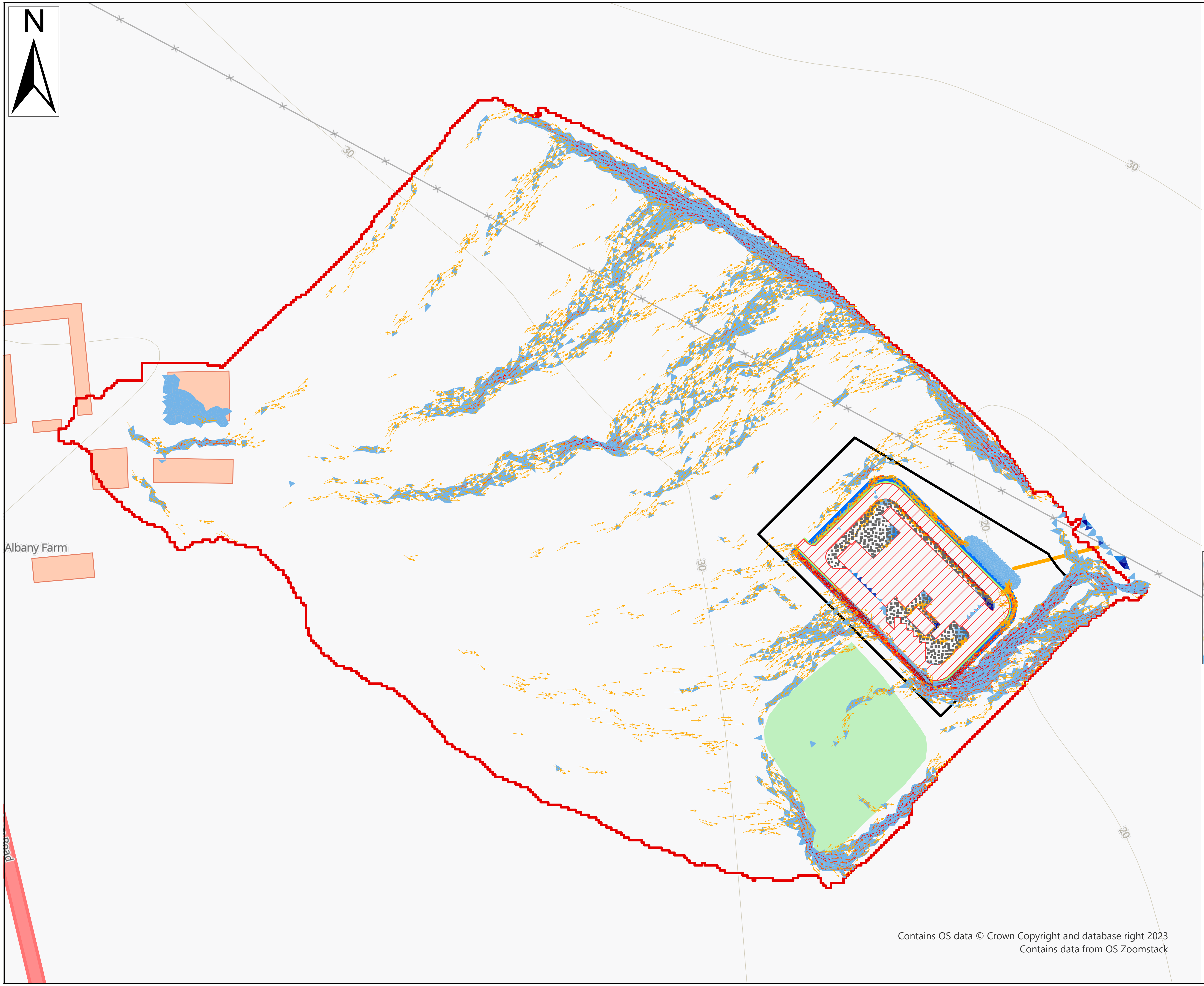
Project Name: Hampshire Water Transfer
Drawing Title: DEPTH (MAX) AND VELOCITY (MAX) RESULTS FOR BASELINE SCENARIO
Drawing No.:



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LEGEND

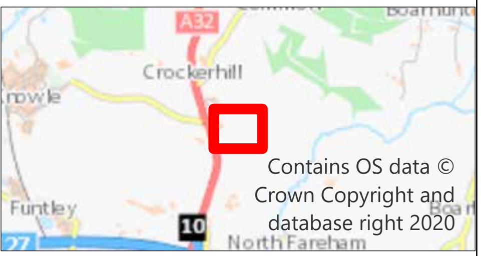
▨ LOOSE GRAVEL COVER
🟦 SWALE
— RECEPTOR CONNECTION
▨ IMPERMEABLE AREA
🟩 FILTER STRIPS
☐ SUBBASIN F

DEPTH (METERS)
0.005 - 0.015
🟦 0.016 - 0.150
🟦 0.151 - 0.200
🟦 0.201 - 0.250
🟦 0.251 - 1.250

Velocity
(M/S)
0.05 - 0.1
↑ 0.1 - 0.2
↑ 0.2 - 0.3
↑ 0.3 - 0.4
↑ 0.4 - 0.5
↑ 0.5 - 0.8
— RECEPTOR CONNECTION
☐ SITE BOUNDARY

DEPTH (MAX) IN CENTIMETER IS PROVIDED IN PAVEMENTS

0 30 60 Meters



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Current Version Information

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Revision	Status	Suitability Description	Authored	Checked	Reviewed	Date

Stantec Southern Water

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Project Name: Hampshire Water Transfer
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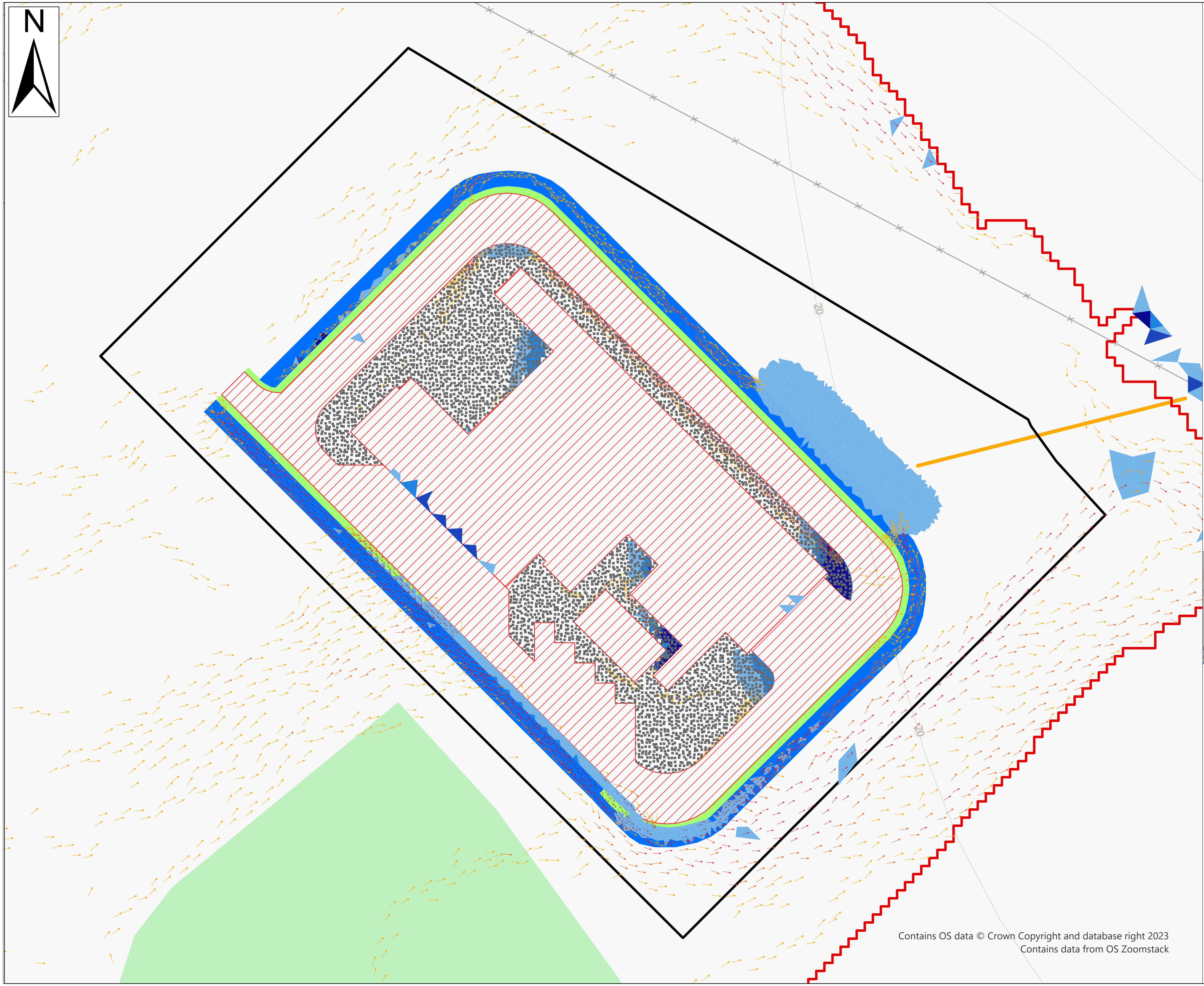
Drawing No.:



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LEGEND

- ▨ LOOSE GRAVEL COVER
- 🟦 SWALE
- ━ RECEPTOR CONNECTION
- ▨ IMPERMEABLE AREA
- 🟩 FILTER STRIPS
- ☐ SUBBASIN F

DEPTH (METERS)

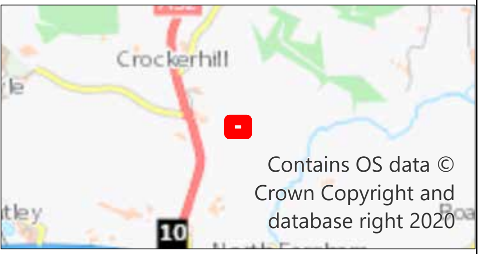
- 0.005 - 0.050
- 🟦 0.051 - 0.150
- 🟦 0.151 - 0.200
- 🟦 0.201 - 0.250
- 🟦 0.251 - 1.250

Velocity
(M/S)

- 0.05 - 0.1
- ↑ 0.1 - 0.2
- ↑ 0.2 - 0.3
- ↑ 0.3 - 0.4
- ↑ 0.4 - 0.5
- ↑ 0.5 - 0.8
- ━ RECEPTOR CONNECTION
- ☐ SITE BOUNDARY

DEPTH (MAX) IN CENTIMETER IS PROVIDED IN PAVEMENTS

0 10 20 Meters



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Current Version Information

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P01	S01	First Draft	MJ			02July2025

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Page Size: A3
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Sub Process: N/A
Location: FAREHAM, HAMPSHIRE, ENGLAND
Postcode: SU579091
Project Client: Southern Water Limited
Project Name: Hampshire Water Transfer
Drawing Title: DEPTH (MAX) AND VELOCITY (MAX) RESULTS FOR M100-30+45CC SCENARIO
Drawing No.:

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LEGEND

▨	LOOSE GRAVEL COVER
🟦	SWALE
—	RECEPTOR CONNECTION
▨	IMPERMEABLE AREA
🟩	FILTER STRIPS
🟦	BASIN

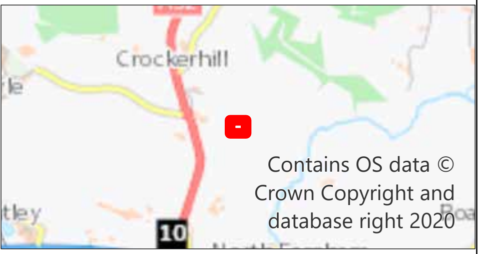
Hazard_Index

HAZARD_M

🟩	0.00 - 0.75 - LOW
🟨	0.75 - 1.25 - MODERATE
🟥	1.25 - 2.50 - SIGNIFICANT

DEPTH (MAX) IN CENTIMETER IS PROVIDED IN PAVEMENTS

0 10 20 Meters



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Current Version Information

Revision	Status	Suitability Description	Authored	Checked	Reviewed	Date
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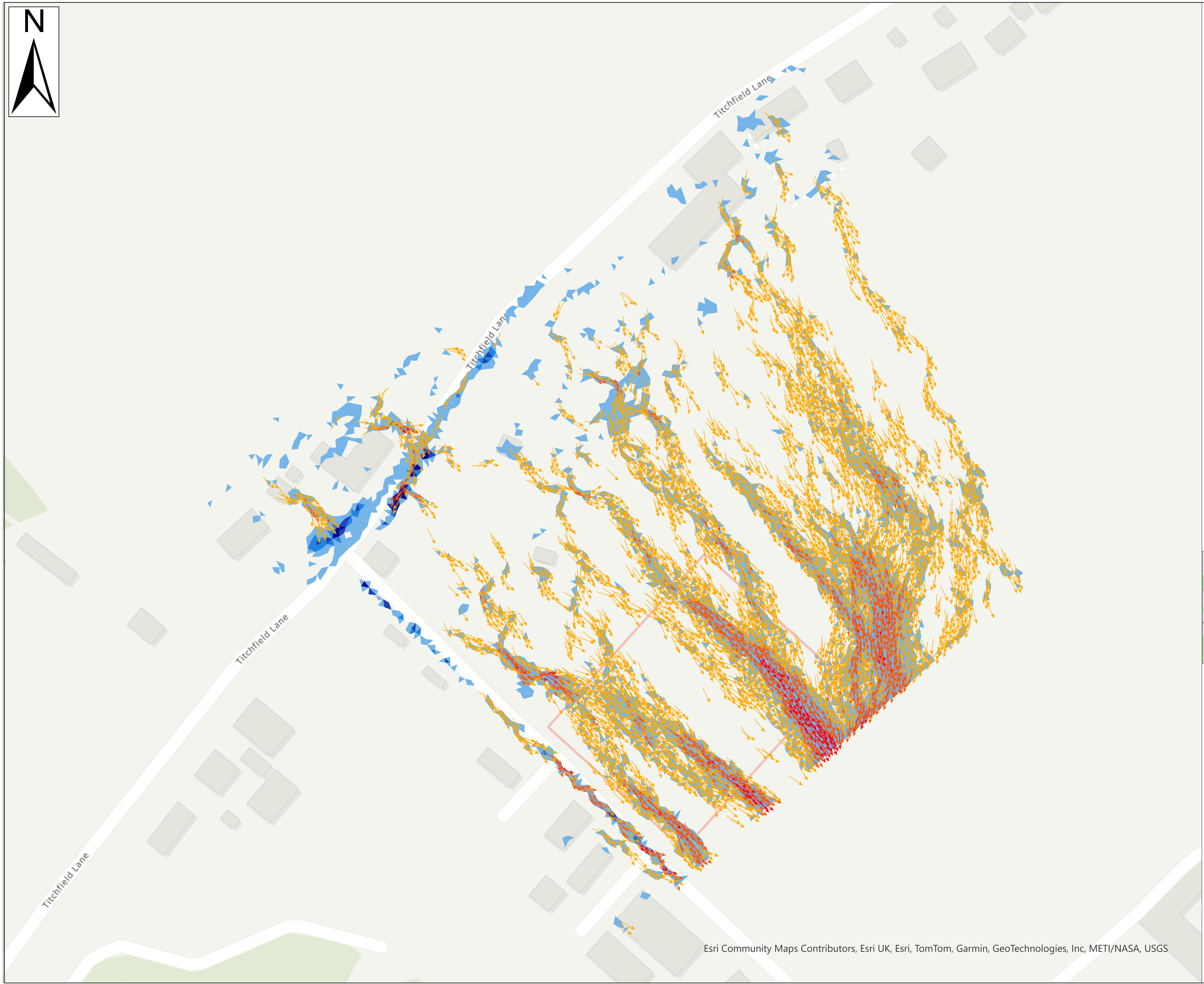
Project Client: Southern Water Limited
Project Name: Hampshire Water Transfer
Drawing Title: HAZARD INDEX RESULTS FOR M100-30+45CC SCENARIO
Drawing No.:



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LEGEND

🟥 SITE BOUNDARY

Depth (Meters)

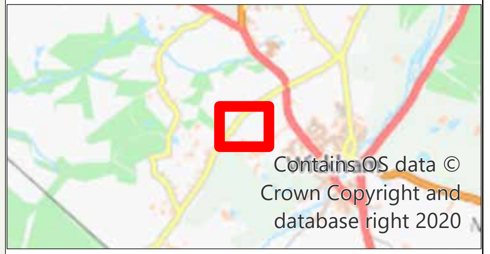
	0.005 - 0.015
▬	0.016 - 0.150
▬	0.151 - 0.200
▬	0.201 - 0.250
▬	0.251 - 1.400

Velocity
(M/S)

	0.05 - 0.1
↑	0.1 - 0.2
↑	0.2 - 0.3
↑	0.3 - 0.4
↑	0.4 - 0.5
↑	0.5 - 0.6

DEPTH (MAX) IN CENTIMETER IS PROVIDED IN PAVEMENTS

0 35 70 Meters



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Current Version Information

Revision	Status	Suitability Description	Authored	Checked	Reviewed	Date
P01	S01	First Draft	MJ			02July2025

Stantec Southern Water

Scale: 1:1,400
OS Reference: -
Page Size: A3
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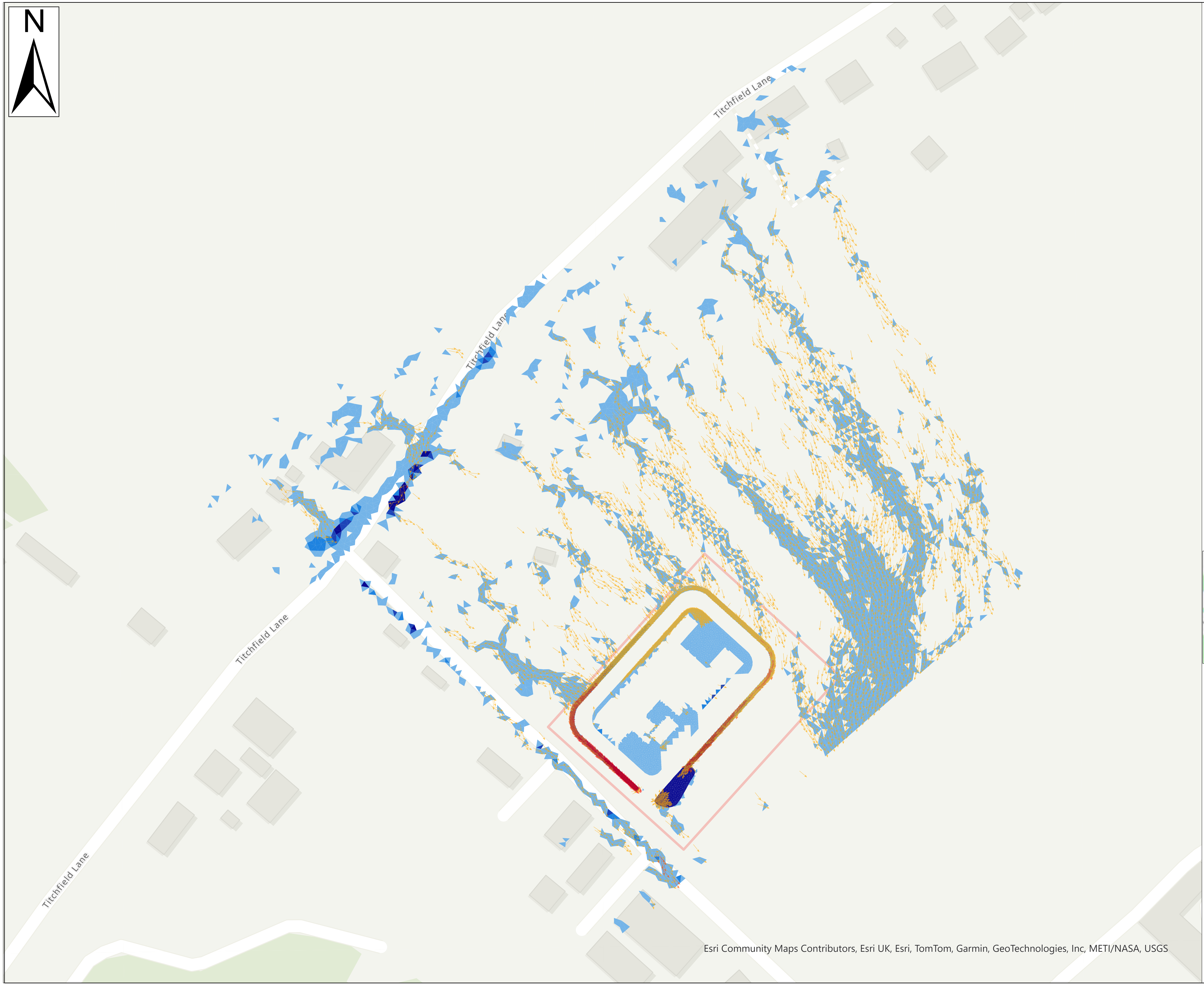
Project Name: Hampshire Water Transfer
Drawing Title: DEPTH (MAX) AND VELOCITY (MAX) RESULTS FOR BASELINE SCENARIO
Drawing No.:



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LEGEND

Depth
METERS

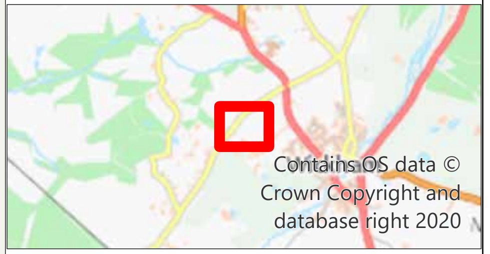
	0.005 - 0.015
🟦	0.016 - 0.150
🟦	0.151 - 0.200
🟦	0.201 - 0.250
🟦	0.251 - 1.400

Velocity
(M/S)

	0.005 - 0.1
↑	0.1 - 0.4
↑	0.4 - 0.6
↑	0.6 - 0.8
↑	0.8 - 1.0
↑	1.0 - 1.80
🟥	SITE BOUNDARY

DEPTH (MAX) IN CENTIMETER IS PROVIDED IN PAVEMENTS

0 35 70 Meters



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Current Version Information

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P01	S01	First Draft	MJ			02July2025

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Postcode: SU 56260 11557
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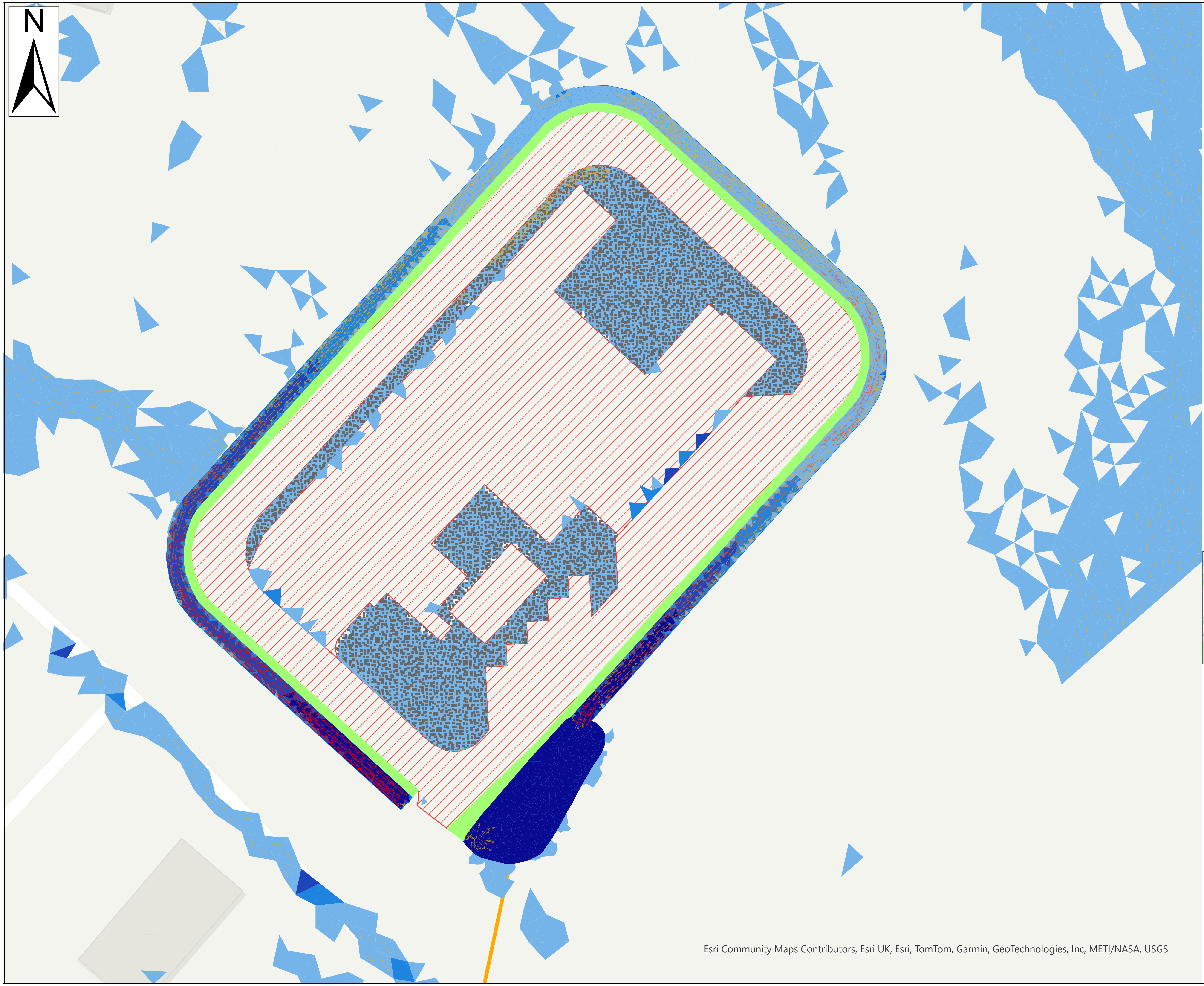
Drawing No.:



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LEGEND

🟧	RECEPTOR CONNECTION
🟩	FILTERSTRIPS
🟦	SWALE_V1
🟦	BASIN
▨	IMPERMEABLEAREA
▩	LOOSEGRAVELCOVER

Depth
METERS

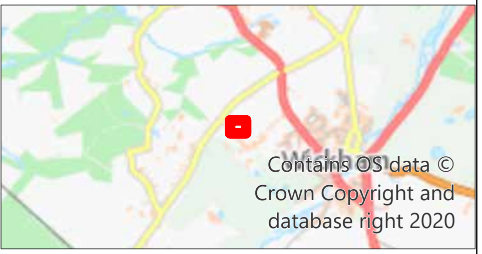
	0.005 - 0.015
🟦	0.016 - 0.150
🟦	0.151 - 0.200
🟦	0.201 - 0.250
🟦	0.251 - 1.400

Velocity
(M/S)

	0.005 - 0.2
↑	0.2 - 0.4
↑	0.4 - 0.6
↑	0.6 - 0.8
↑	0.8 - 1.0
↑	1.0 - 1.8

DEPTH (MAX) IN CENTIMETER IS PROVIDED IN PAVEMENTS

0 10 20 Meters



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Current Version Information

Revision	Status	Suitability Description	Authored	Checked	Reviewed	Date
P01	S01	First Draft	MJ			02July2025

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Southern Water

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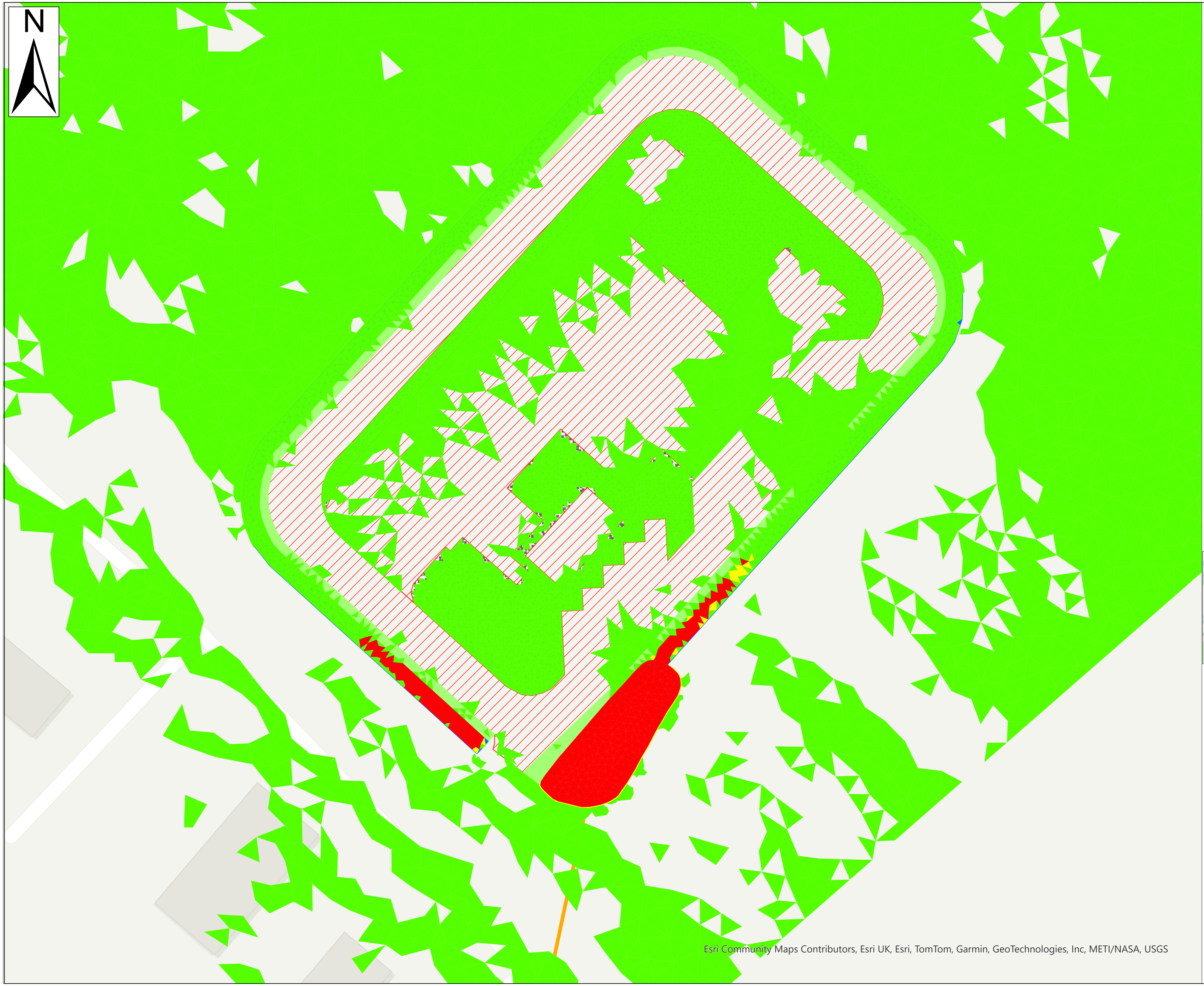

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LEGEND

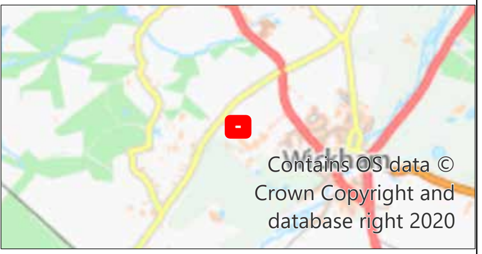
🟧	RECEPTOR CONNECTION
🟩	FILTERSTRIPS
🟦	SWALE_V1
🟦	BASIN
▨	IMPERMEABLEAREA
▒	LOOSEGRAVELCOVER

HAZARD INDEX

🟩	0.00 - 0.75 - LOW
🟨	0.75 - 1.25 - MODERATE
🟥	1.25 - 2.50 - SIGNIFICANT

DEPTH (MAX) IN CENTIMETER IS PROVIDED
IN PAVEMENTS

0 10 20 Meters



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Current Version Information

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P01	S01	First Draft	MJ			11/13/2024

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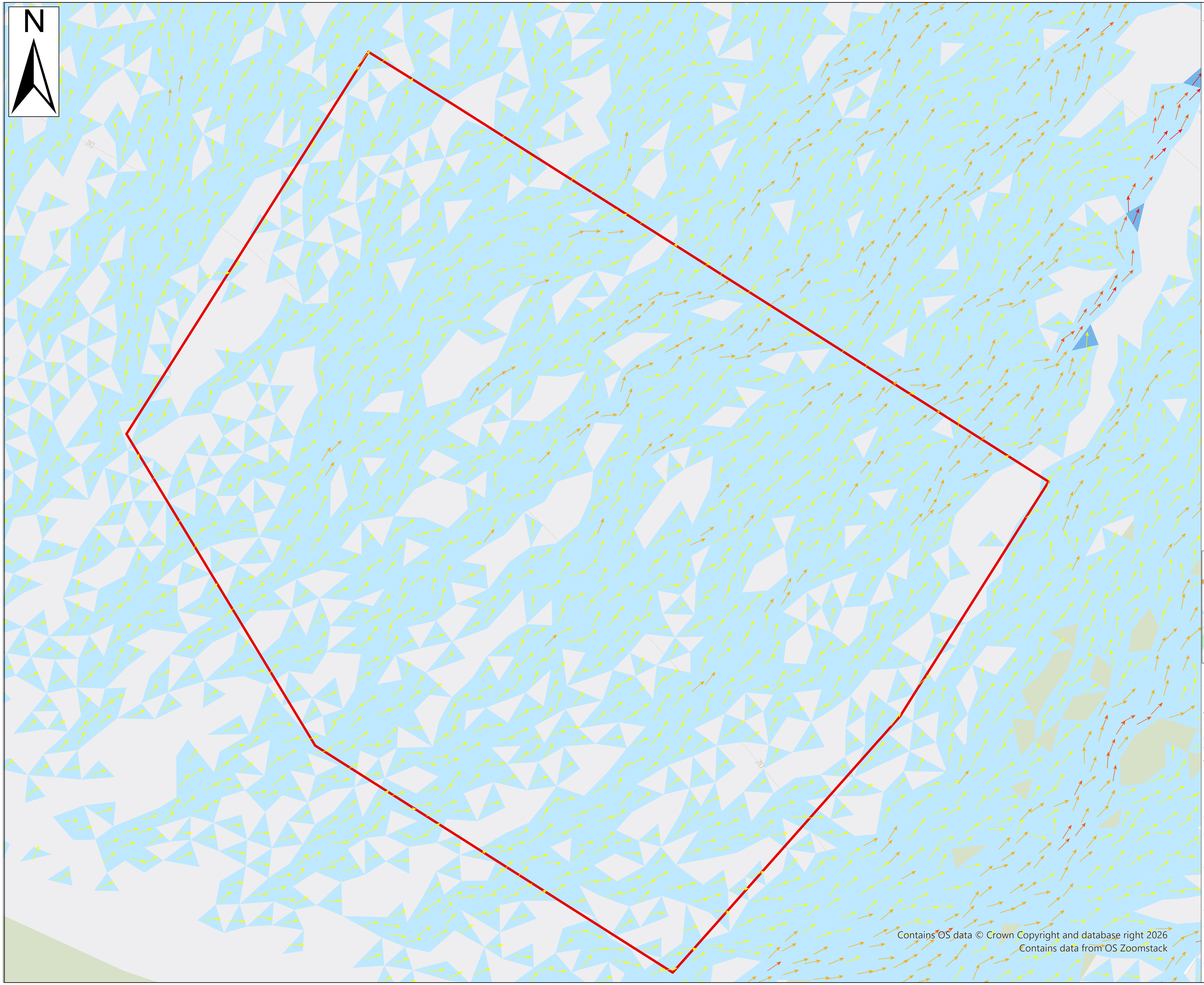
Drawing No.:



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LEGEND

🟥 SITE BOUNDARY

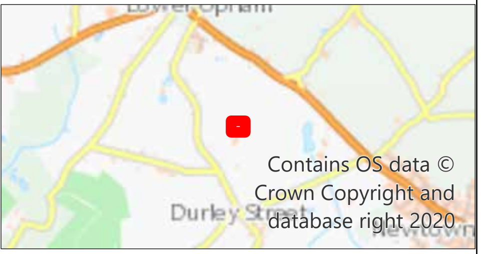
DEPTH (M)

■	0.005 - 0.050
■	0.051 - 0.150
■	0.151 - 0.200
■	0.201 - 0.250
■	0.251 - 1.250

VELOCITY (M/S)

↑	0.05 - 0.1
↑	0.1 - 0.2
↑	0.2 - 0.3
↑	0.3 - 0.4
↑	0.4 - 0.5
↑	0.5 - 0.8

0 5 10 Meters



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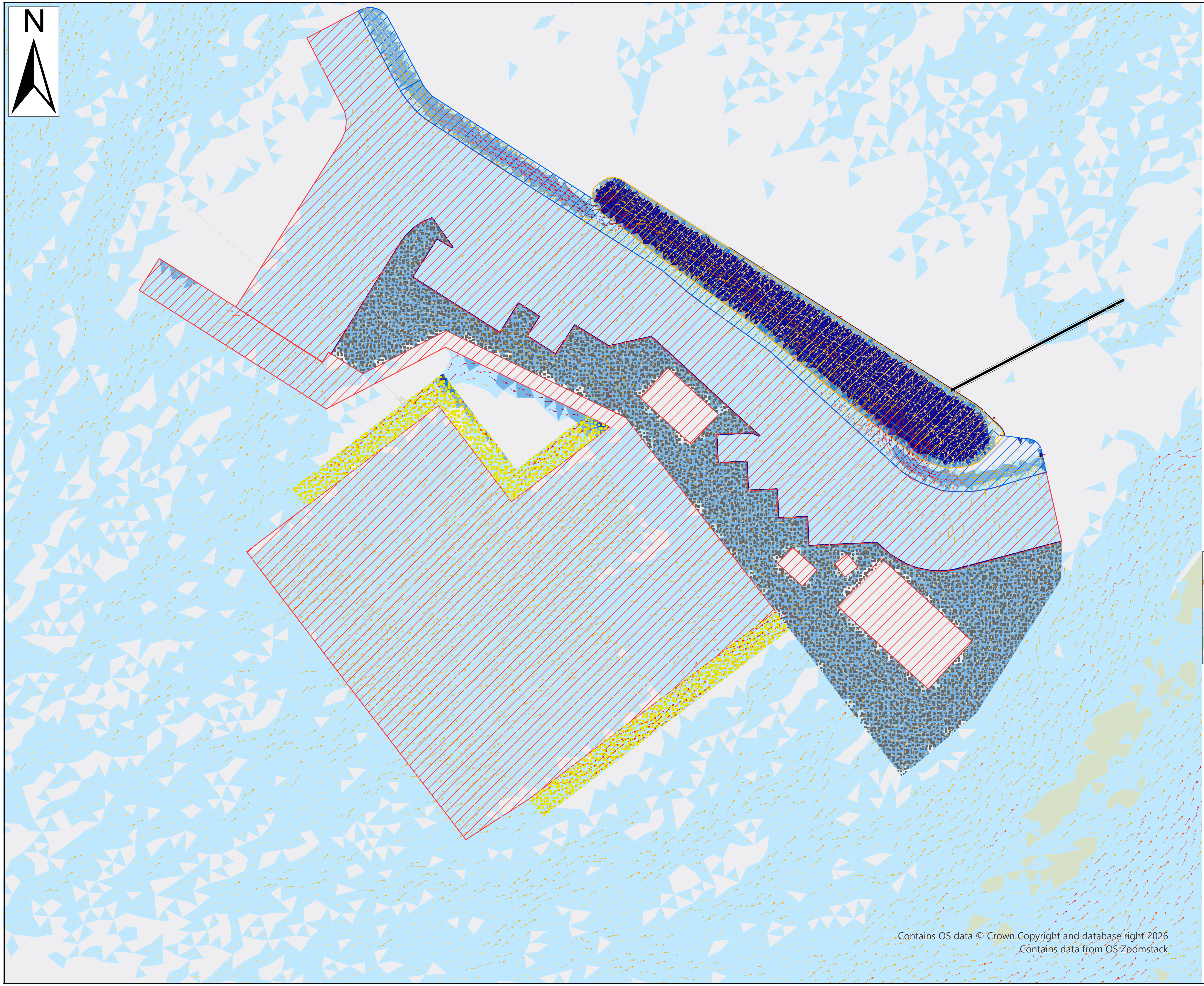
Current Version Information

P01	S01	First Draft	MJ			09 Jan 2026
Revision	Status	Suitability Description	Authored	Checked	Reviewed	Date

Stantec
Southern Water

Scale: 1:350
OS Reference: -
Page Size: A3
Project Group: N/A
Sub Process: N/A
Location: SCIVIERS LANE, UPHAM, LOWER UPHAM, WINCHESTER
Postcode: SO32 2AL
Project Client: Southern Water Limited
Project Name: IPS - K SuDS Design
Drawing Title: DEPTH(MAX) AND VELOCITY (MAX) RESULTS FOR BASELINE SCENARIO
Drawing No.:



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LEGEND

- ▬ RECEPTOR CONNECTION
- ▨ FRENCH DRAIN
- ▨ DETENTION BASIN
- ▨ SWALE
- ▨ LOOSE GRAVEL COVER
- 🟩 FILTER STRIP
- ▨ IMPERMEABLE AREA

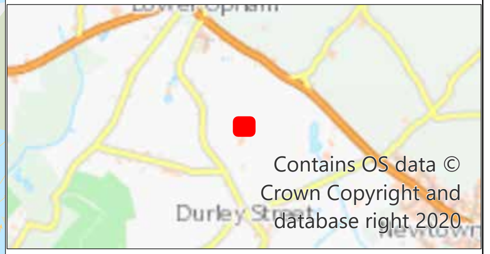
VELOCITY (M/S)

- ↑ 0.05 - 0.1
- ↑ 0.1 - 0.2
- ↑ 0.2 - 0.3
- ↑ 0.3 - 0.4
- ↑ 0.4 - 0.5
- ↑ 0.5 - 0.8

DEPTH (M)

- 🟦 0.005 - 0.050
- 🟦 0.051 - 0.150
- 🟦 0.151 - 0.200
- 🟦 0.201 - 0.250
- 🟦 0.251 - 1.500

0 5 10 Meters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Current Version Information

Revision	Status	Suitability Description	Authored	Checked	Reviewed	Date
P01	S01	First Draft	MJ			09 Jan 2026

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Scale: 1:300
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Sub Process: N/A
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Postcode: SO32 2AL
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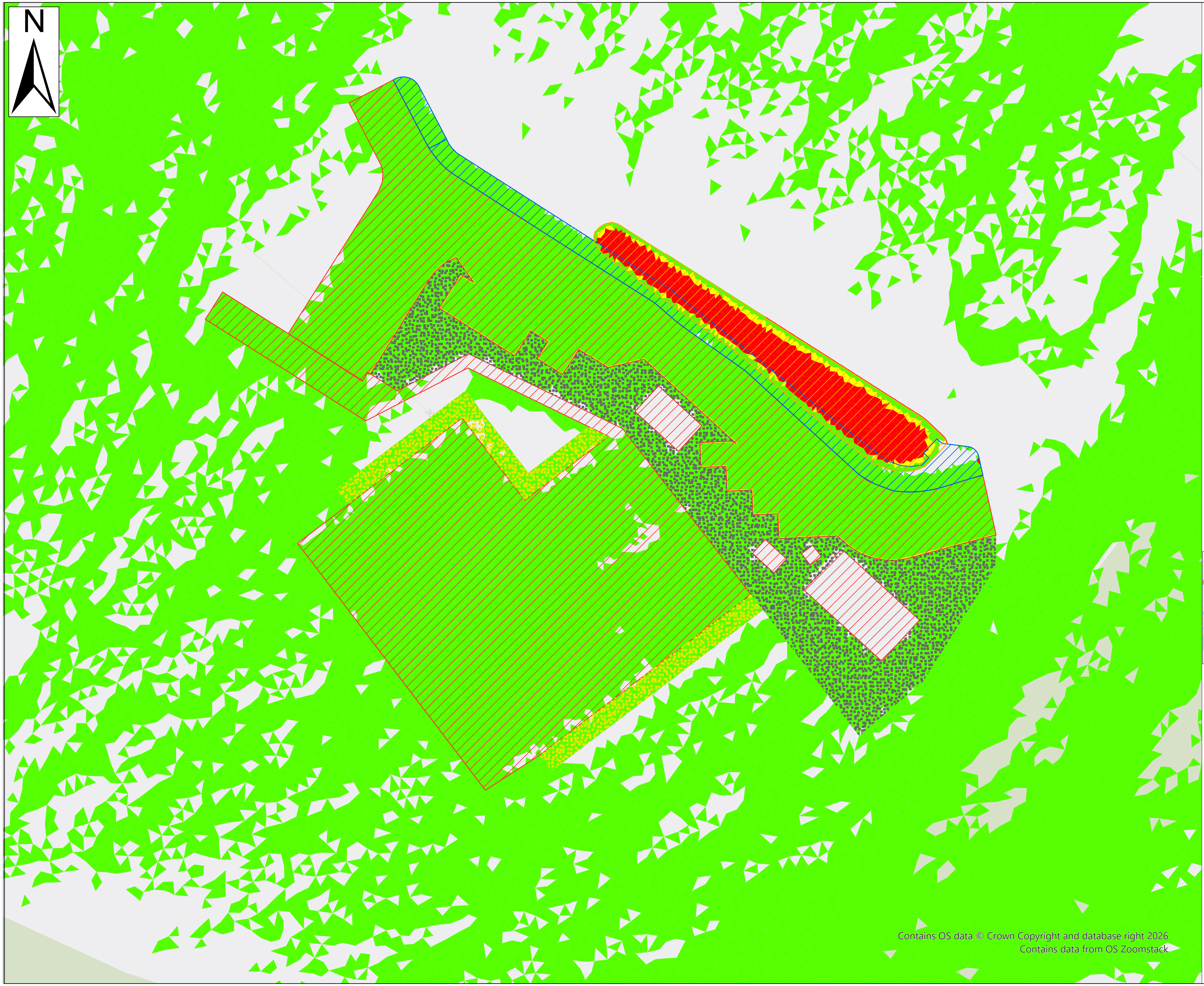
Project Name: IPS - K SuDS Design
Drawing Title: DEPTH(MAX) AND VELOCITY (MAX) RESULTS FOR M100-30MIN+45CC SCENARIO
Drawing No.:



LEGEND

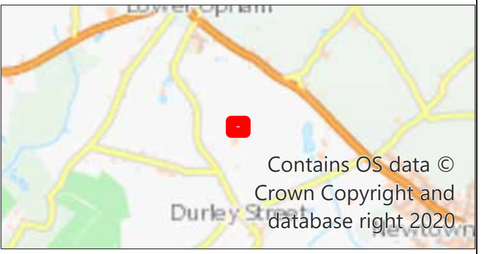
- ▨ FRENCH DRAIN
- ▨ DETENTION BASIN
- ▨ SWALE
- ▨ LOOSE GRAVEL COVER
- 🟩 FILTER STRIP
- ▨ IMPERMEABLE AREA

Hazard

HAZARD_M

- 🟩 0.00 - 0.75 - LOW
- 🟨 0.75 - 1.25 - MODERATE
- 🟥 1.25 - 2.50 - SIGNIFICANT

0 5 10 Meters



Current Version Information

Revision	Status	Suitability Description	Authored	Checked	Reviewed	Date
P01	S01	First Draft	MJ			09 Jan 2026

Stantec | Southern Water

Scale: 1:350
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Page Size: A3
Project Group: N/A
Sub Process: N/A
Location: SCIVIERS LANE, UPHAM, LOWER UPHAM, WINCHESTER
Postcode: SO32 2AL
Project Client: Southern Water Limited
Project Name: IPS - K SuDS Design
Drawing Title: HAZARD INDEX RESULTS FOR M100-30+45CC SCENARIO
Drawing No.:

Appendix D InfoDrainage results

APPENDIX D.1 - BPT/IPS-E InfoDrainage Results

Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Title: Rainfall Analysis Criteria	Company Address:		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FEH

Type: FEH

Site Location	GB 466441 106498 SU 66441 06498
Rainfall Version	2022
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
100.0	45.000
30.0	45.000
2.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Inflows Storm Phase: Phase	Company Address:		

Buildings and Loose Gravel Cover Runoff

Type : Catchment Area

Area (ha)	0.35

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Access Road Runoff

Type : Catchment Area

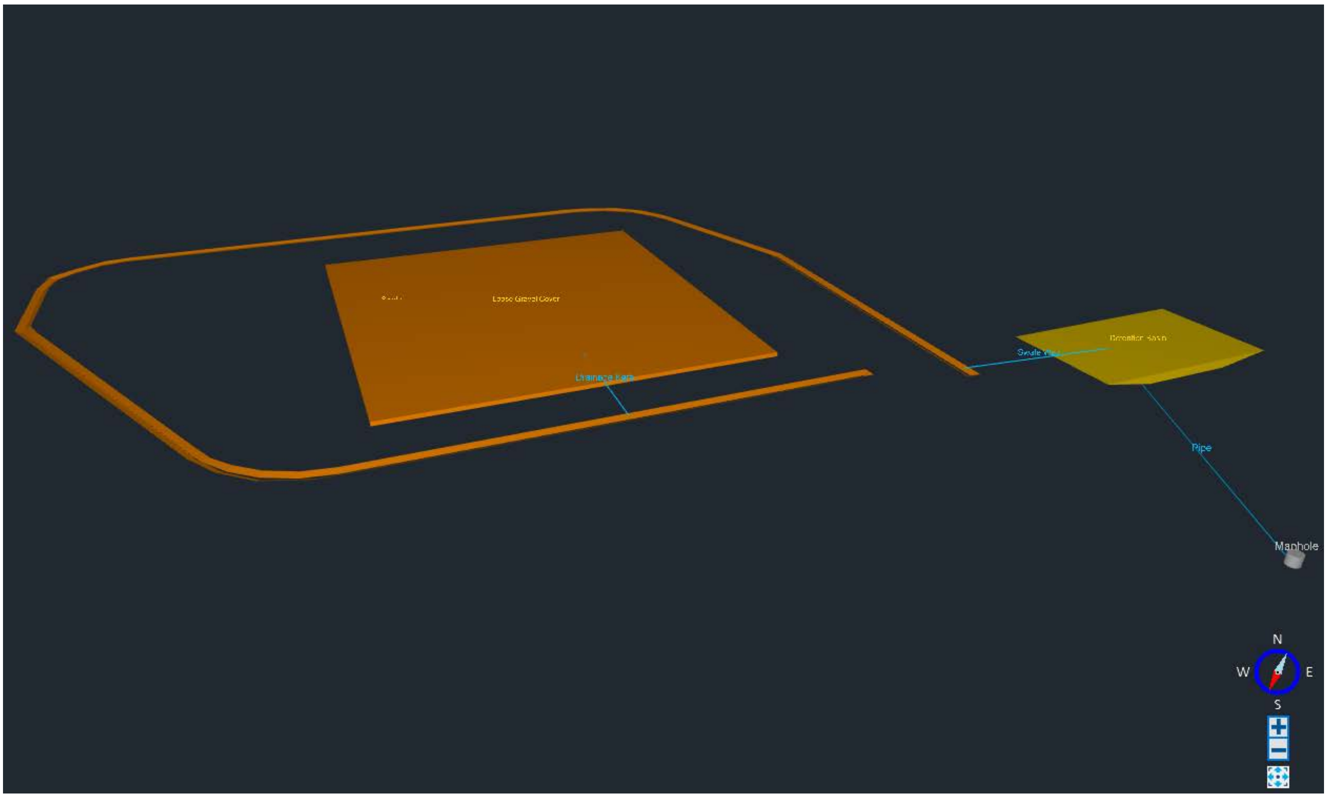
Area (ha)	0.17

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address:		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Access Road Runoff	Swale		Time of Concentration	0.17	100	0	100	0.17
Buildings and Loose Gravel Cover Runoff	Loose Gravel Cover		Time of Concentration	0.35	100	0	100	0.35
TOTAL		**0.0**		**0.52**				**0.52**



Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Loose Gravel Cover Type : Tank

Dimensions

Exceedance Level (m)	86.800
Depth (m)	0.450
Base Level (m)	86.350
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	30
Average Slope (1:X)	0.00
Total Volume (m³)	262.305

Depth (m)	Area (m²)	Volume (m³)
0.000	1943.00	0.000
0.450	1943.00	262.305

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Buildings and Loose Gravel Cover Runoff
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Drainage Kerb
Outlet Type	Weir

Width (m)	0.250
Coefficient of Discharge	0.544
Crest Level (m)	86.600

Advanced

Perimeter	Circular
Length (m)	47.216

Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Swale Type : Swale

Swale

Exceedance Level (m)	85.600
Depth (m)	0.300
Base Level (m)	85.300
Top Width (m)	2.000
Side Slope (1:X)	3.00
Base Width (m)	0.200
Freeboard (mm)	0
Length (m)	200.000
Long. Slope (1:X)	200.00
Filtration Rate (m/hr)	0.0
Friction Scheme	Manning's n
n	0.03
Total Volume (m³)	66.000

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Access Road Runoff
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Drainage Kerb
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Swale Weir
Outlet Type	Weir

Width (m)	2.000
Coefficient of Discharge	0.544
Crest Level (m)	85.450

Advanced

Swale

Porosity (%)	100

Project:	Date:		
HWTWRP BPT/IPS-E	28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Detention Basin Type : Tank

Dimensions

Exceedance Level (m)	85.300
Depth (m)	1.000
Base Level (m)	84.300
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	3.096
Total Volume (m³)	214.980

Depth (m)	Area (m²)	Volume (m³)
0.000	140.00	0.000
1.000	300.00	214.980

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Swale Weir
Bypass Destination	(None)
Capacity Type	No Restriction

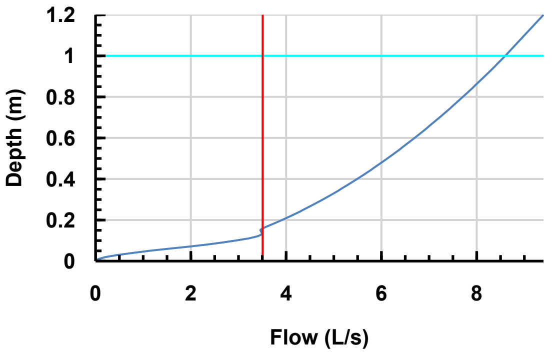
Outlets

Outlet

Outgoing Connection	Pipe
Outlet Type	Hydro-Brake®

Invert Level (m)	84.300
Design Depth (m)	1.000
Design Flow (L/s)	8.6
Objective	Linear Discharge Profile
Application	Surface Water Only
Sump Available	☐

Unit Reference	CCU-0093-8600-1000-8600



Advanced

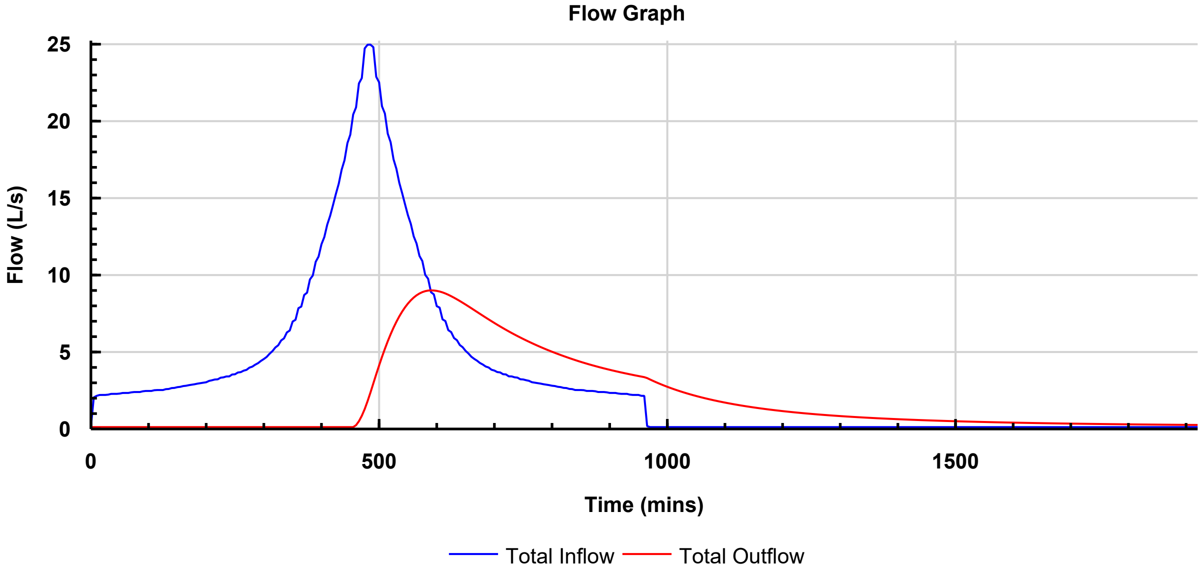
Perimeter	Circular
Length (m)	13.528

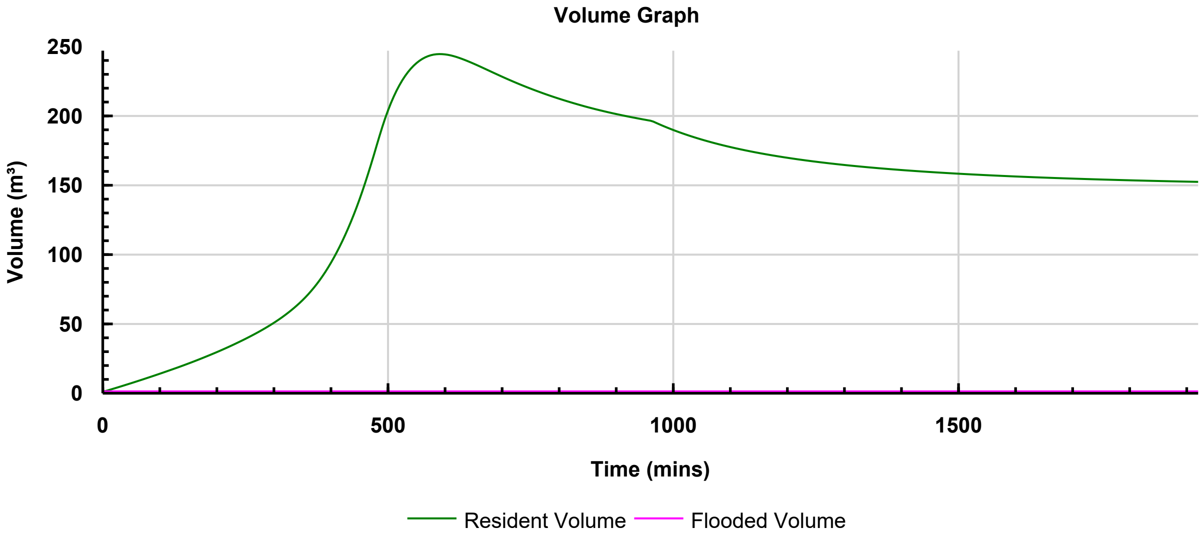
Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Loose Gravel Cover
Critical by Return Period: FEH: 100 years: Increase Rainfall (%): +45: 960 mins: Summer

Type : Tank

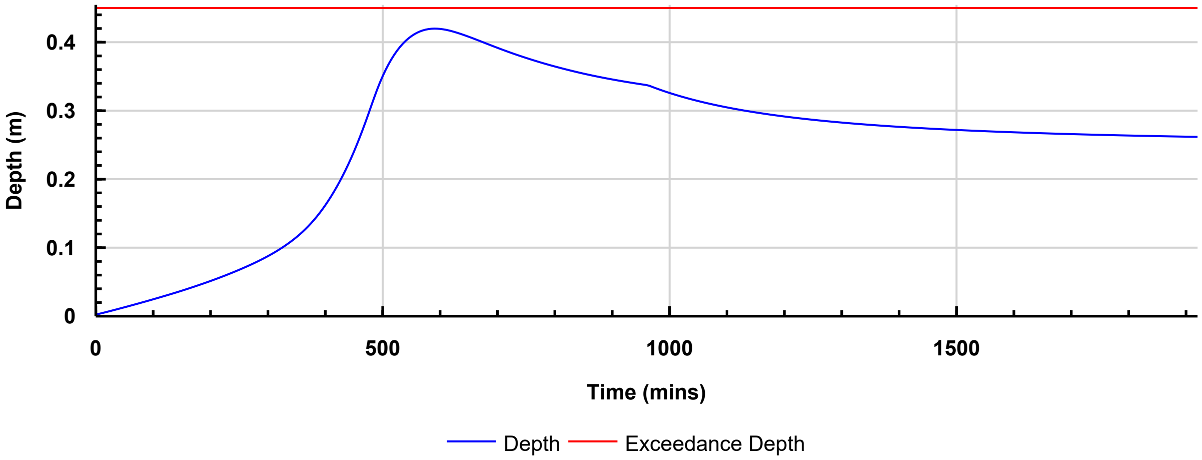
Graphs





Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Depth Graph



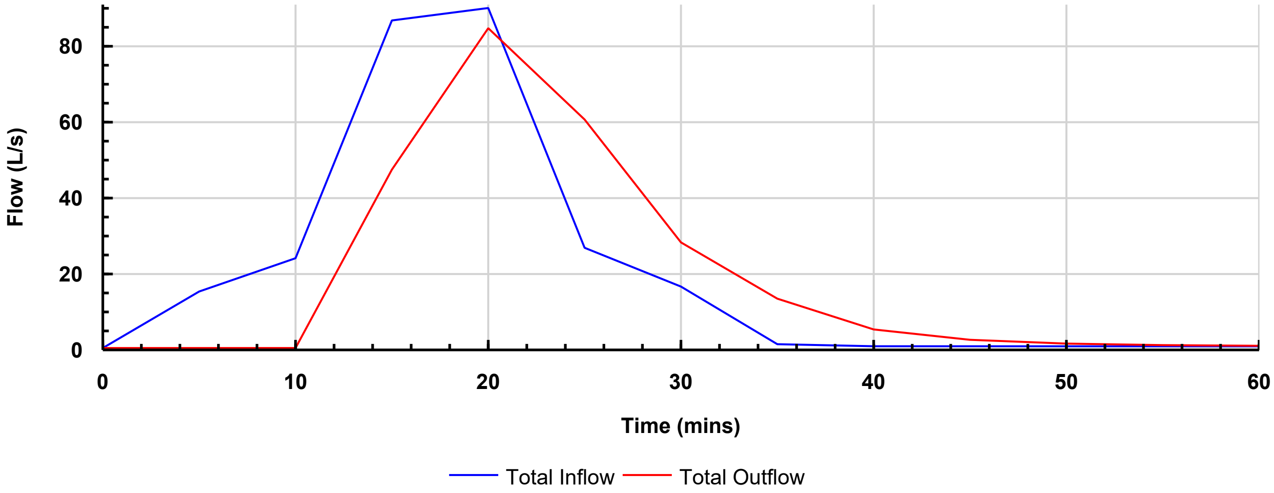
Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Swale
Critical by Return Period: FEH: 100 years: Increase Rainfall (%): +45: 30 mins: Summer

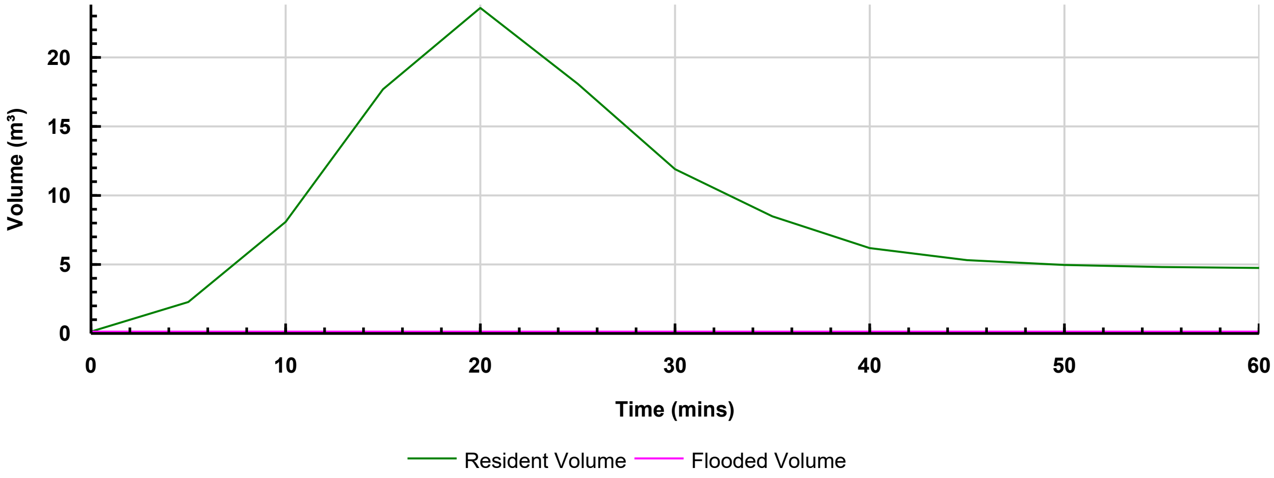
Type : Swale

Graphs

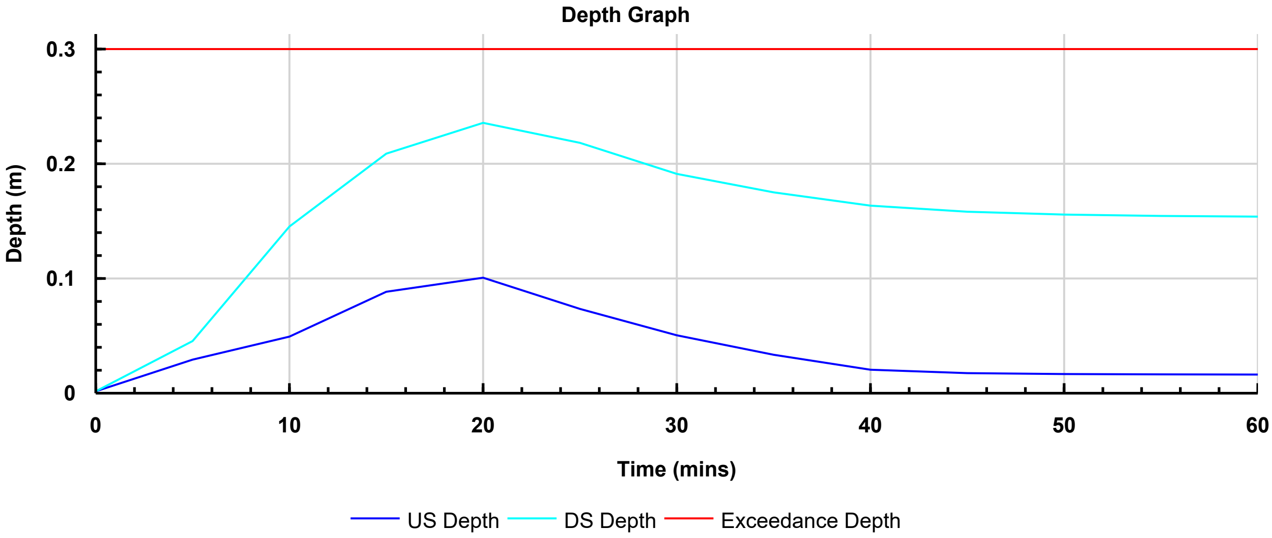
Flow Graph



Volume Graph



Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

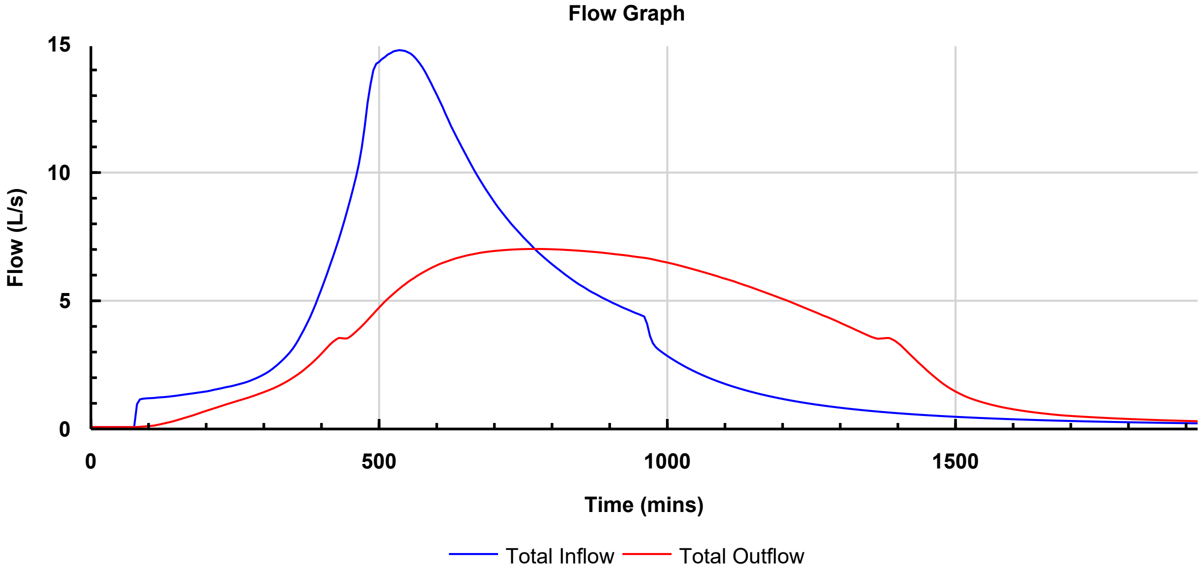


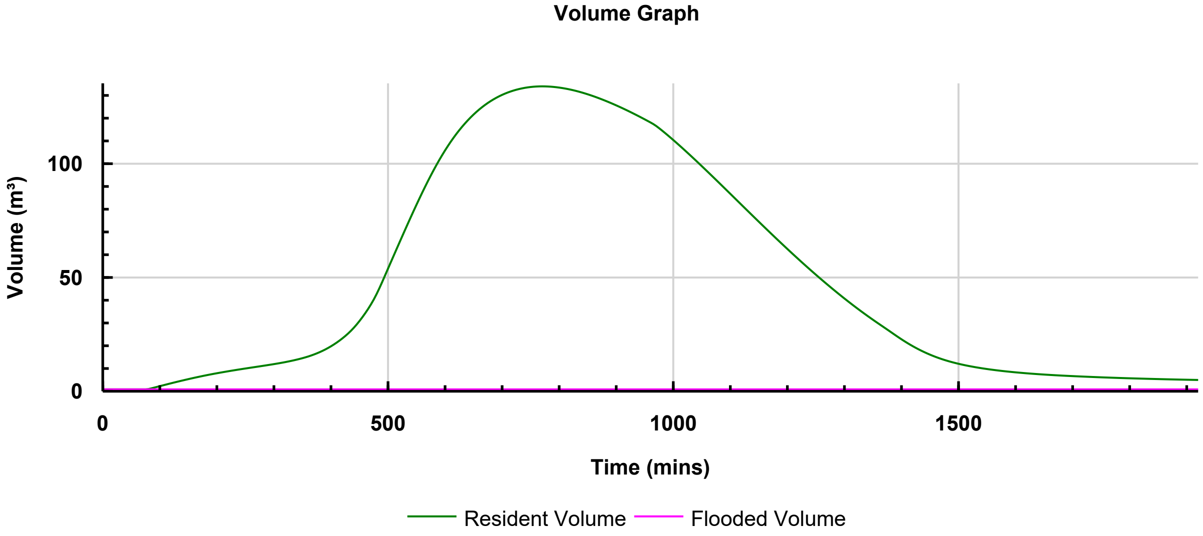
Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Detention Basin
Critical by Return Period: FEH: 100 years: Increase Rainfall (%): +45: 960 mins: Summer

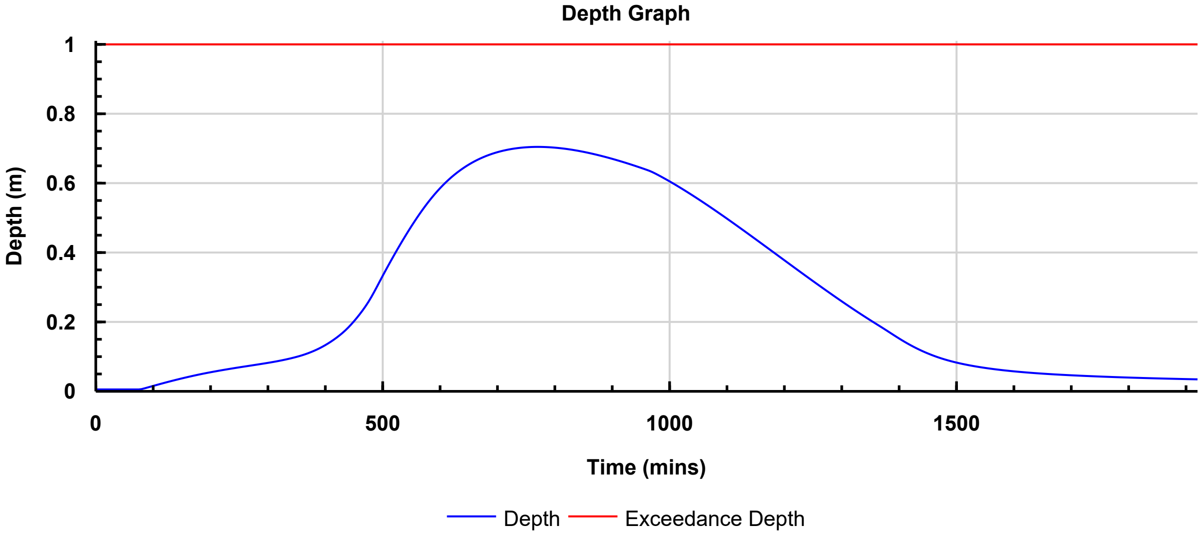
Type : Tank

Graphs





Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

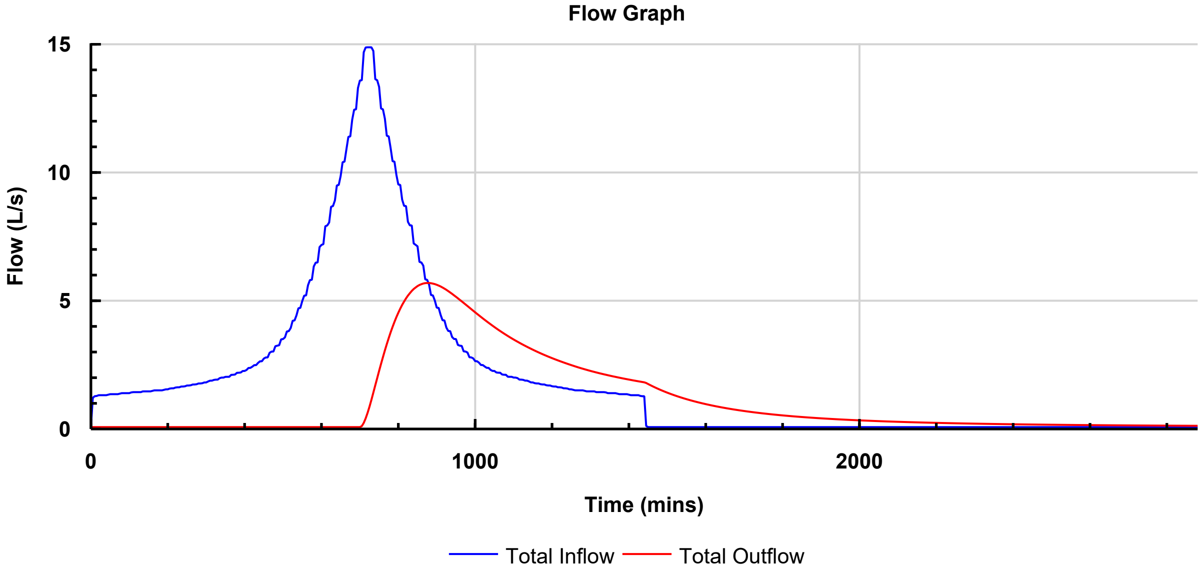


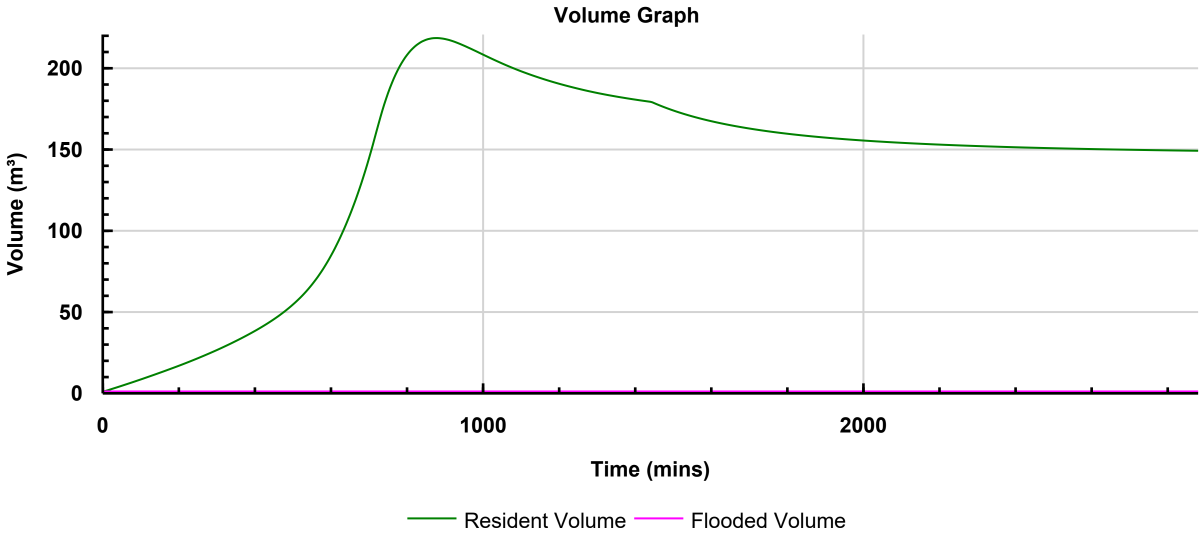
Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Loose Gravel Cover
Critical by Return Period: FEH: 30 years: Increase Rainfall (%): +45: 1440 mins: Summer

Type : Tank

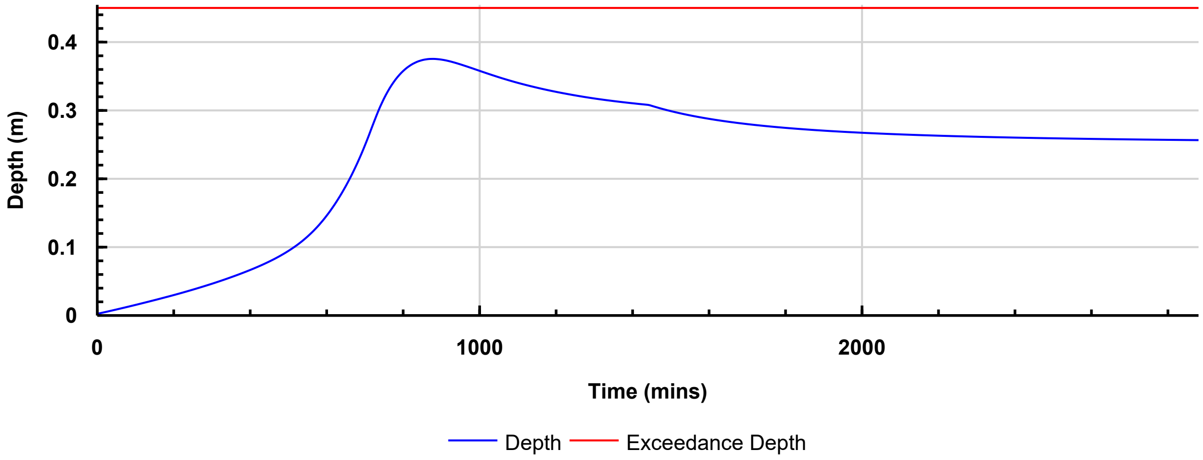
Graphs





Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Depth Graph

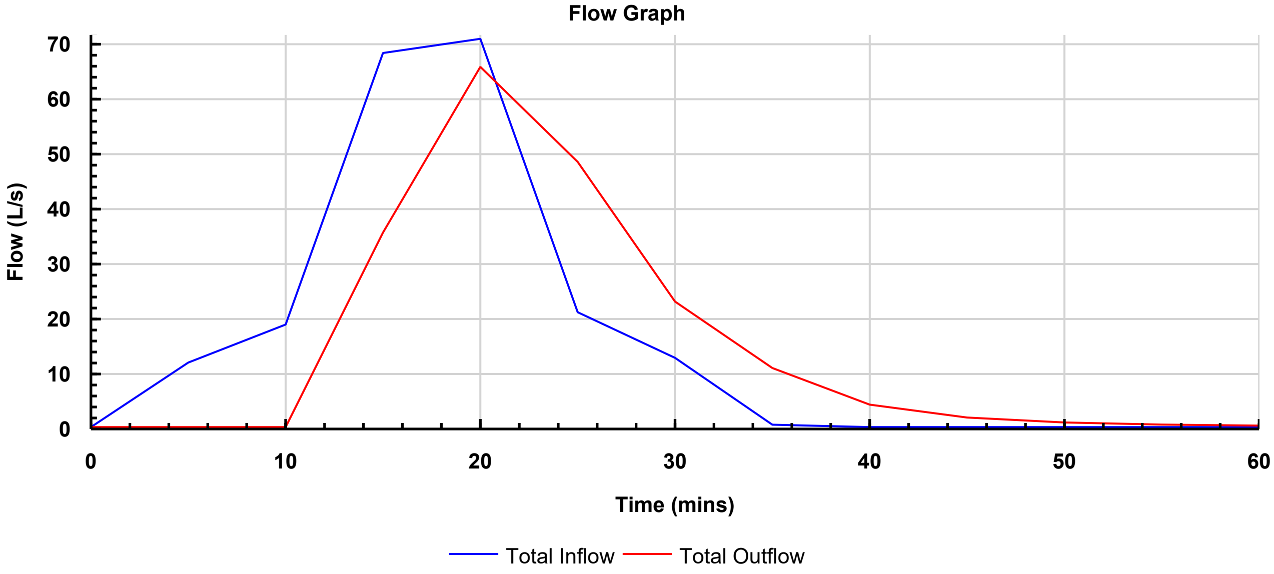


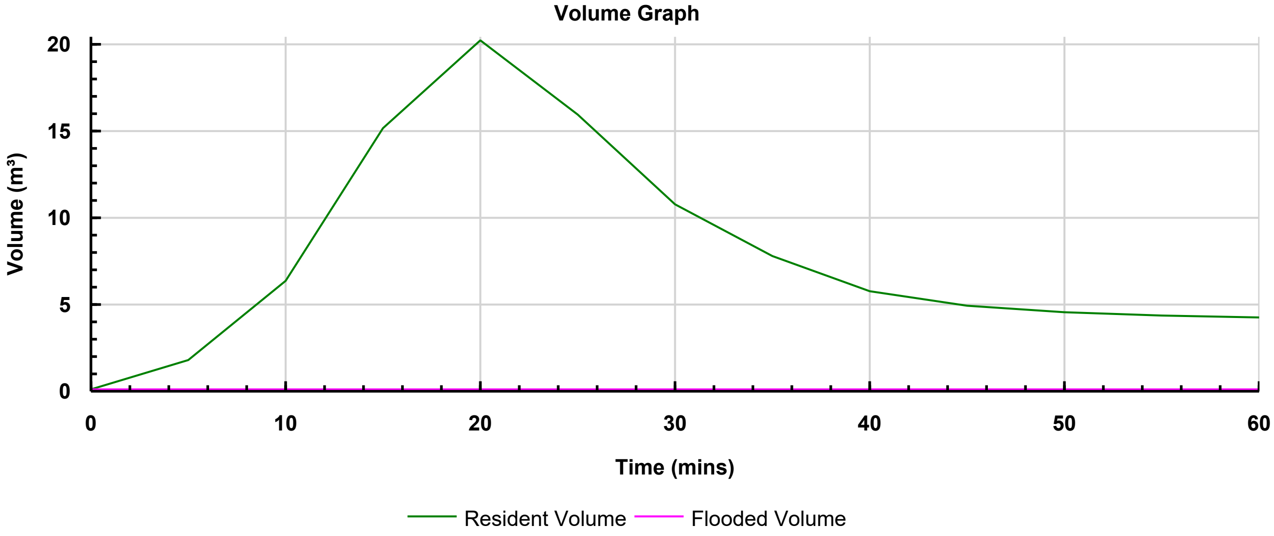
Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Swale
Critical by Return Period: FEH: 30 years: Increase Rainfall (%): +45: 30 mins: Summer

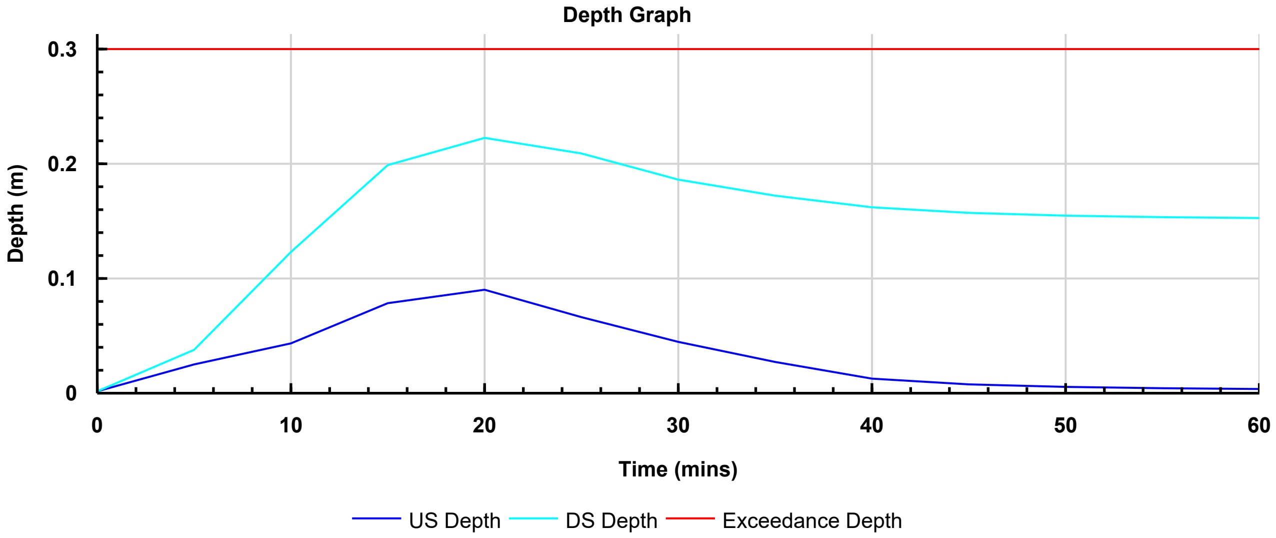
Type : Swale

Graphs





Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		



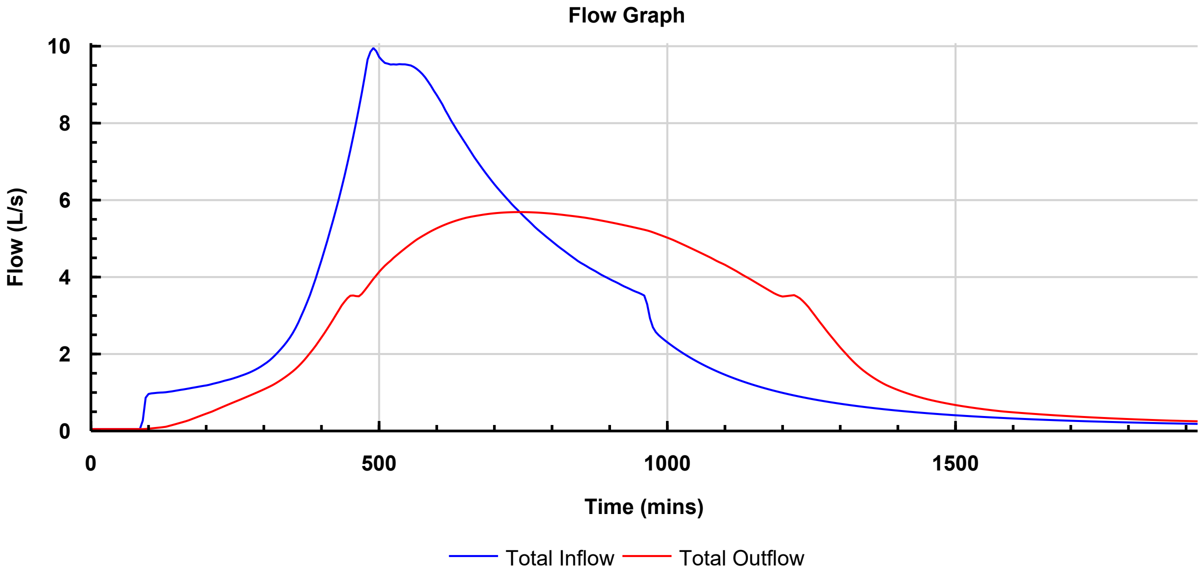
Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

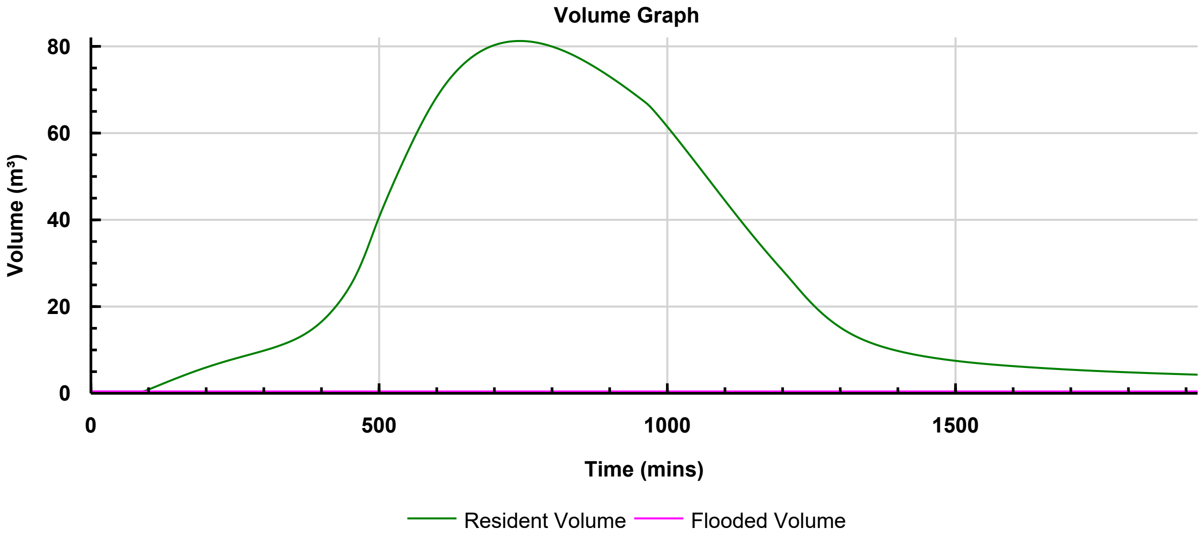
Detention Basin

Critical by Return Period: FEH: 30 years: Increase Rainfall (%): +45: 960 mins: Summer

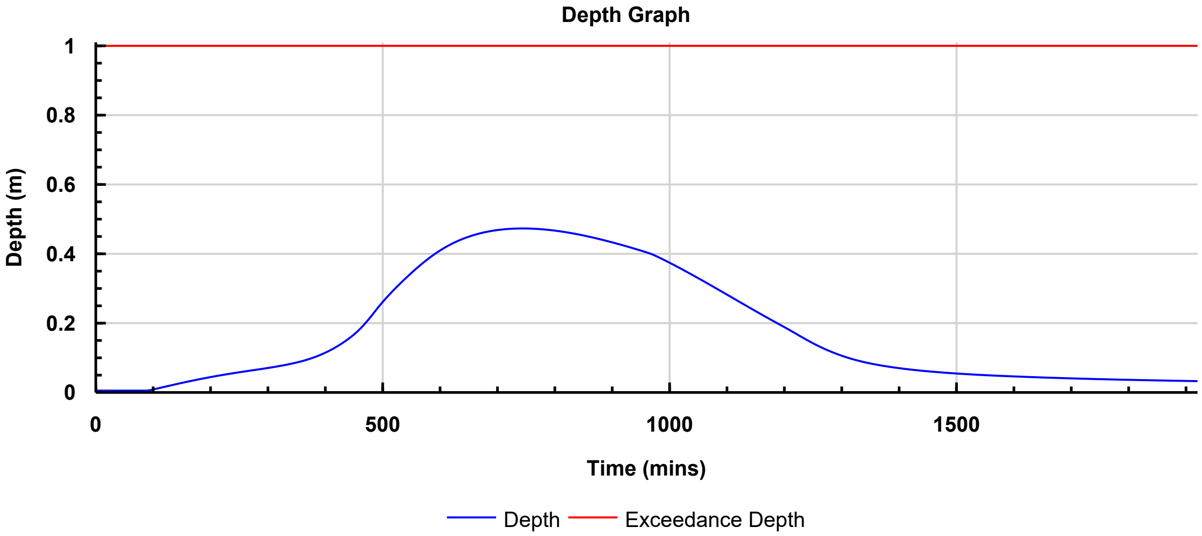
Type : Tank

Graphs





Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

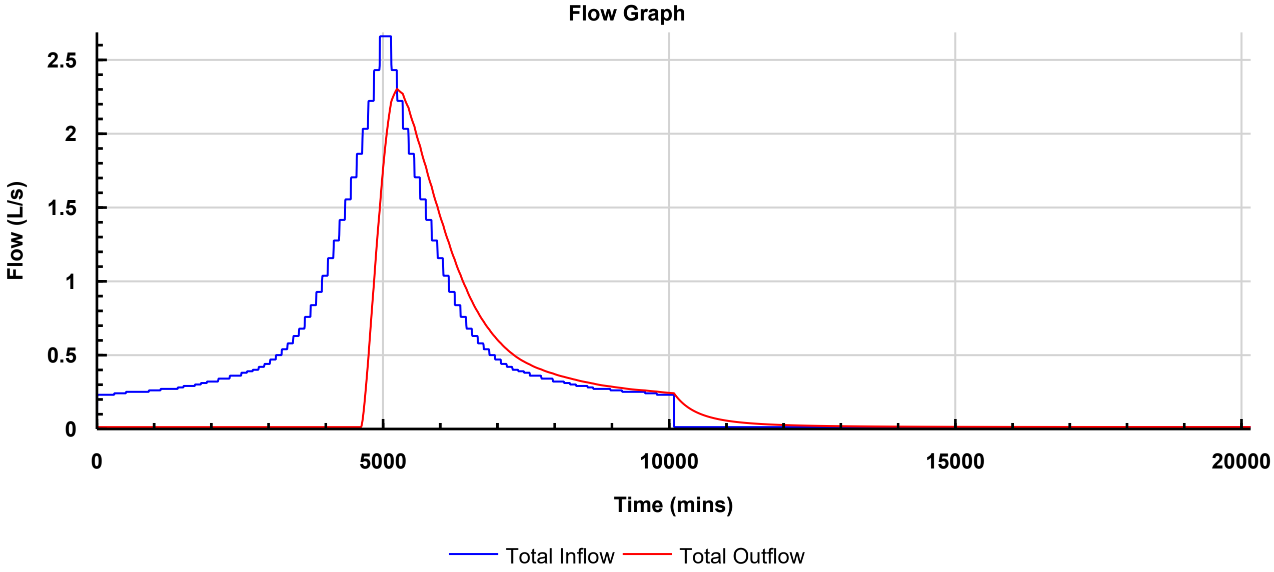


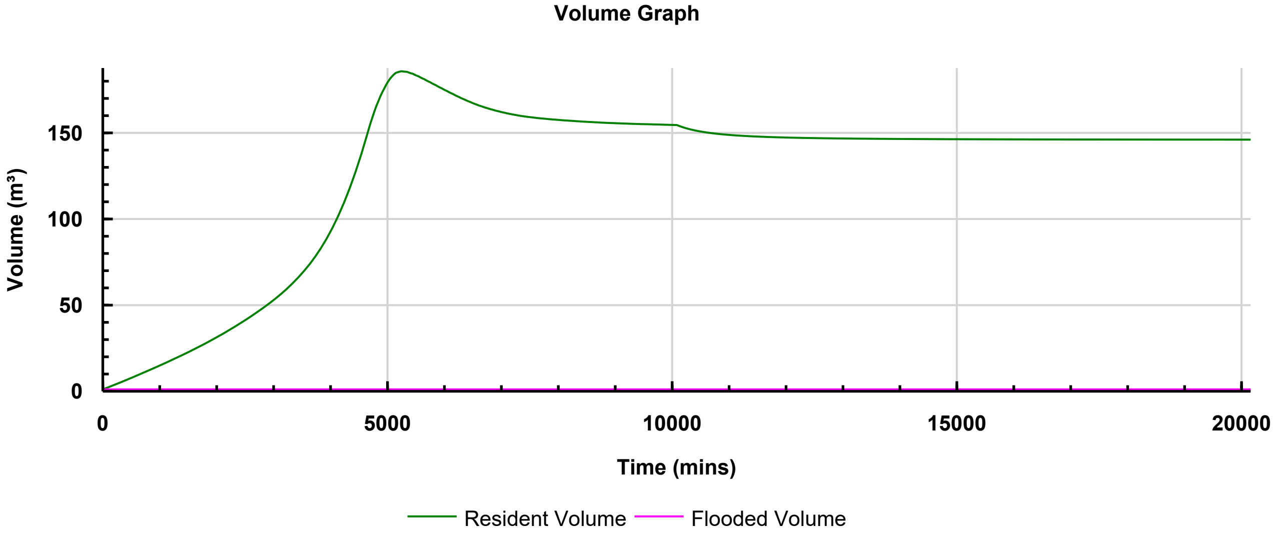
Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Loose Gravel Cover
Critical by Return Period: FEH: 2 years: Increase Rainfall (%): +45: 10080 mins: Summer

Type : Tank

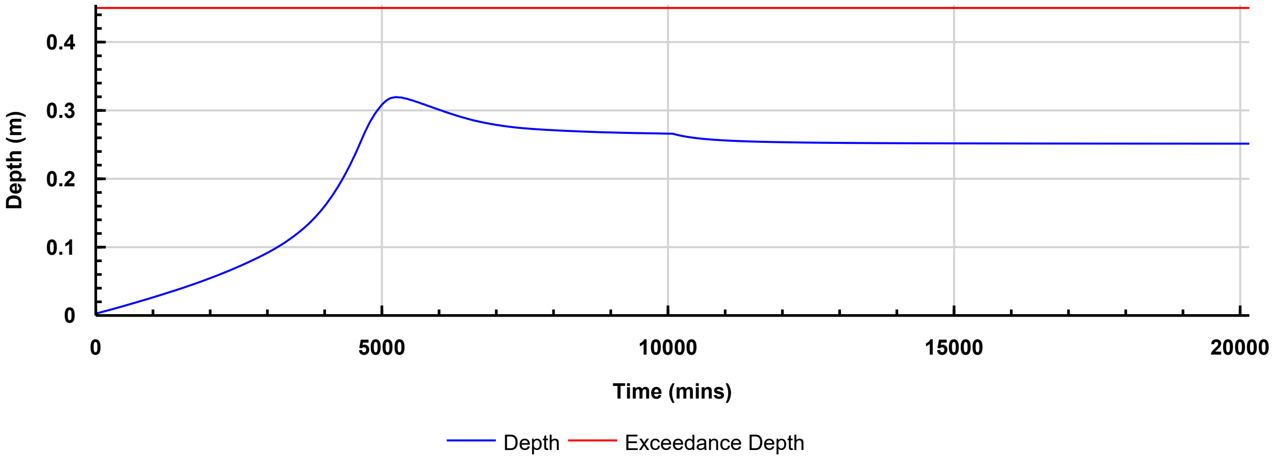
Graphs





Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

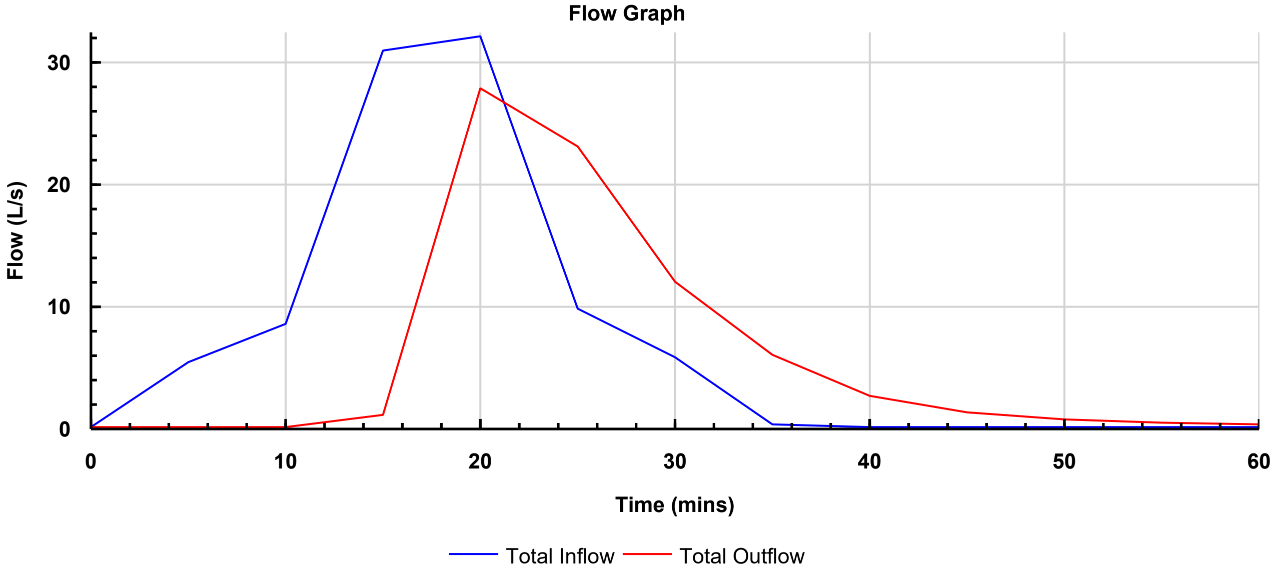
Depth Graph

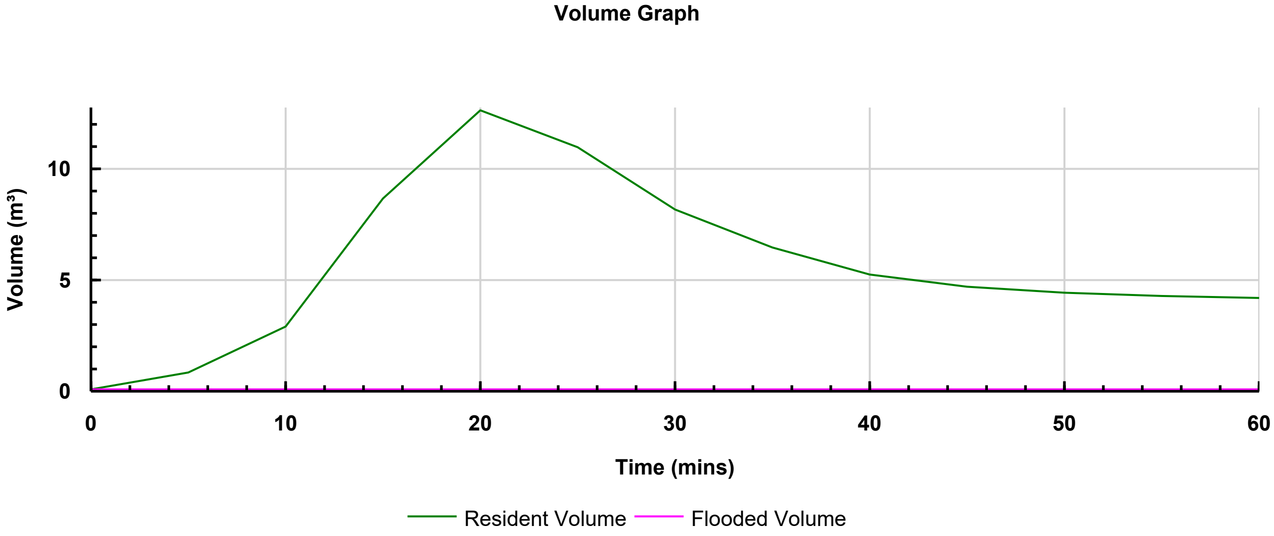


Swale
Critical by Return Period: FEH: 2 years: Increase Rainfall (%): +45: 30 mins: Summer

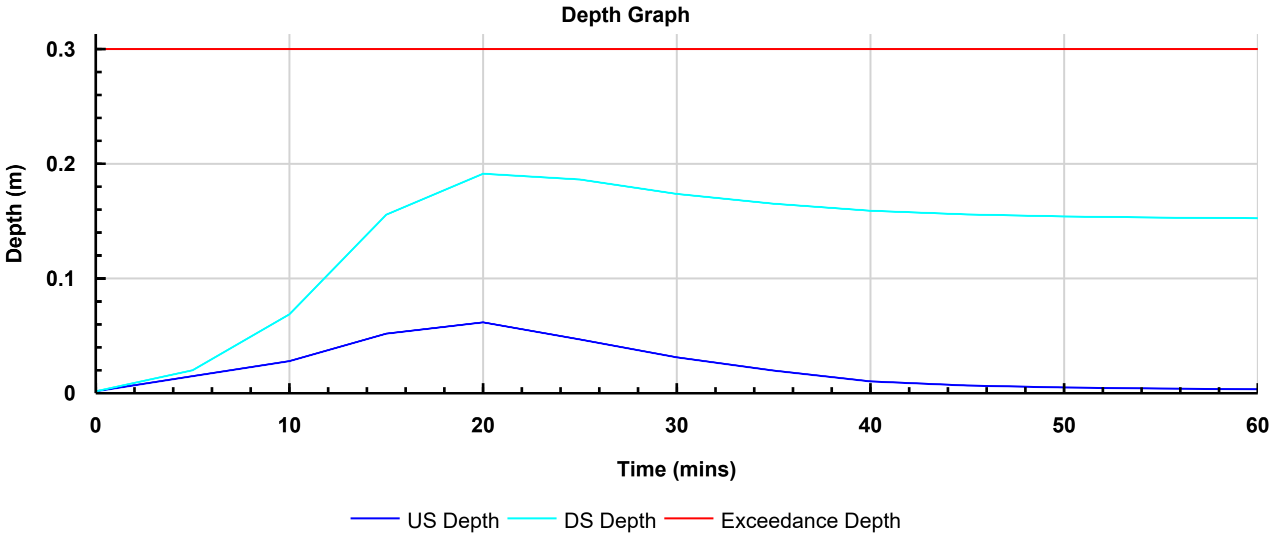
Type : Swale

Graphs





Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

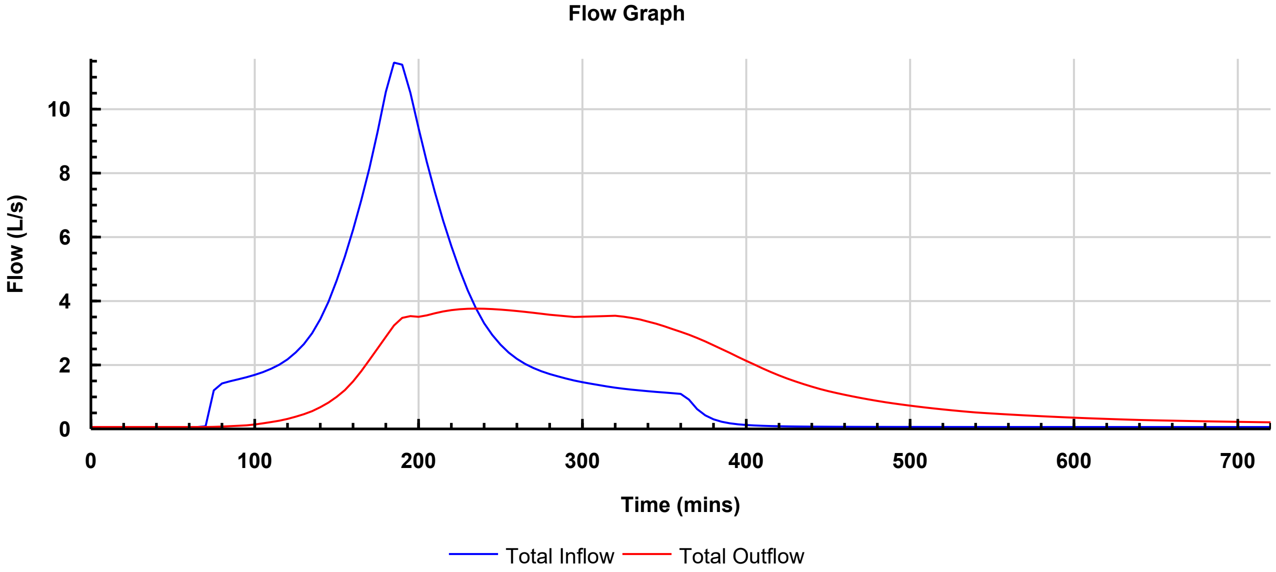


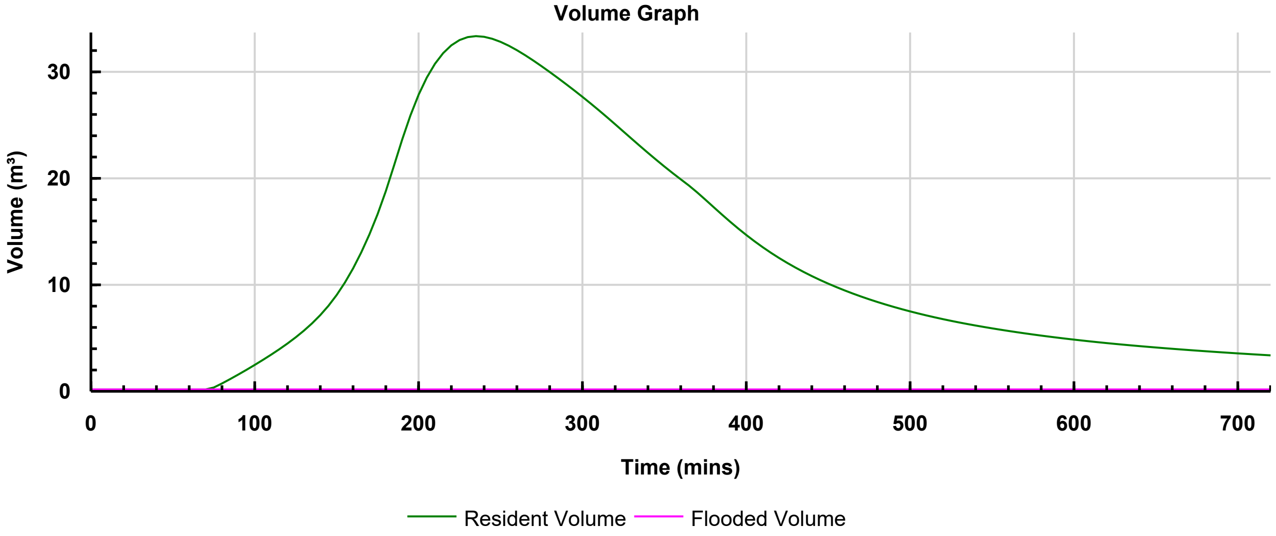
Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Detention Basin
Critical by Return Period: FEH: 2 years: Increase Rainfall (%): +45: 360 mins: Summer

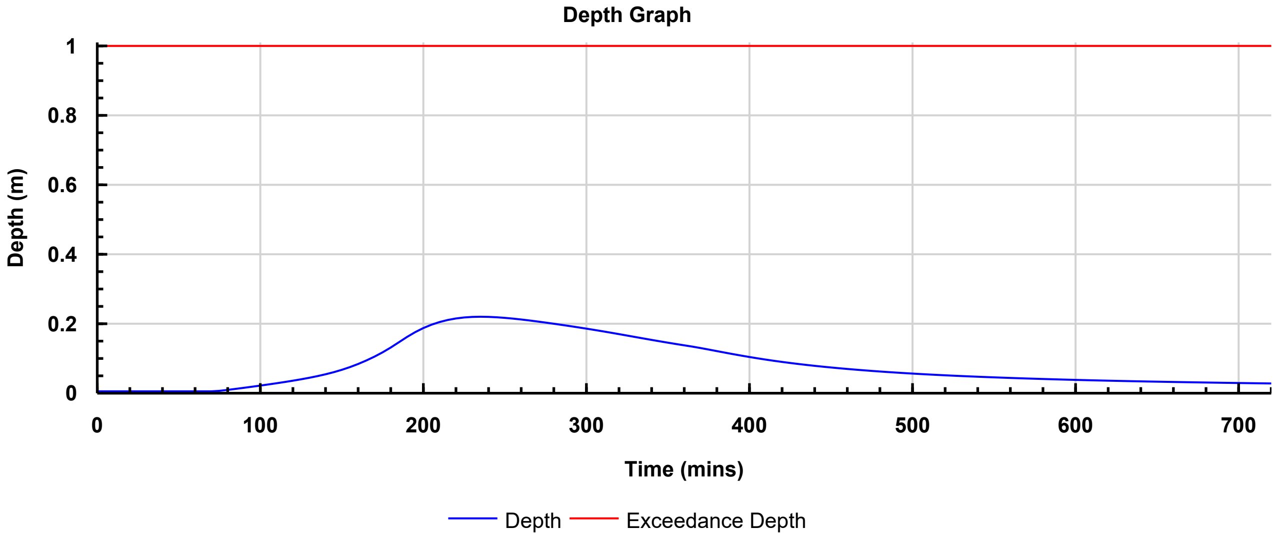
Type : Tank

Graphs





Project: HWTWRP BPT/IPS-E	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		



APPENDIX D.2 - IPS-F InfoDrainage Results

Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Title: Rainfall Analysis Criteria	Company Address:		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FEH

Type: FEH

Site Location	GB 458218 109006 SU 58218 09006
Rainfall Version	2022
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
100.0	45.000
30.0	45.000
2.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Inflows Storm Phase: Phase	Company Address:		

Buildings and Loose Gravel Cover Runoff

Type : Catchment Area

Area (ha)	0.24

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Access Road Runoff

Type : Catchment Area

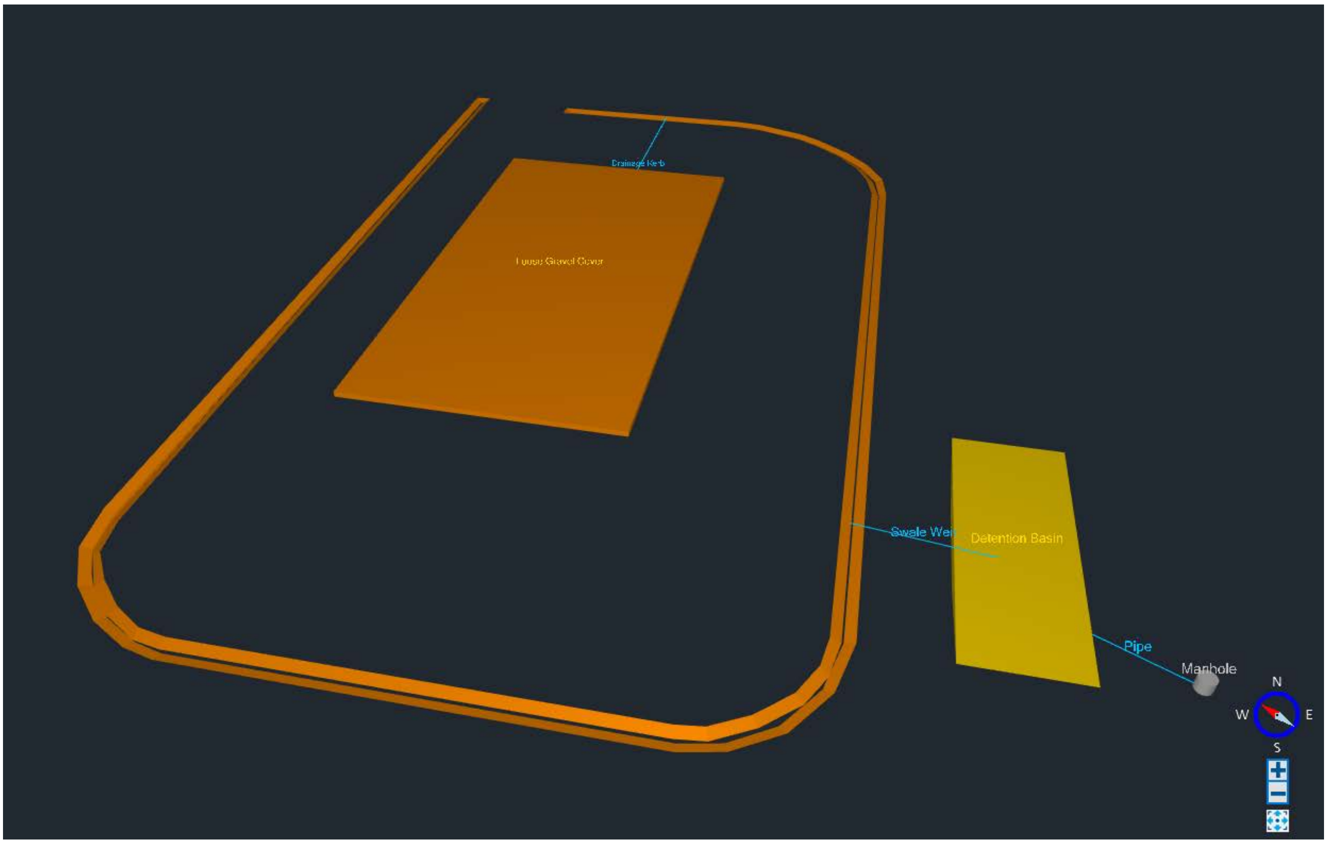
Area (ha)	0.11

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address:		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Access Road Runoff	Swale		Time of Concentration	0.11	100	0	100	0.11
Buildings and Loose Gravel Cover Runoff	Loose Gravel Cover		Time of Concentration	0.24	100	0	100	0.24
TOTAL		**0.0**		**0.35**				**0.35**



Loose Gravel Cover

Type : Tank

Dimensions

Exceedance Level (m)	22.000
Depth (m)	0.450
Base Level (m)	21.550
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	30
Average Slope (1:X)	0.00
Total Volume (m³)	132.030

Depth (m)	Area (m²)	Volume (m³)
0.000	978.00	0.000
0.450	978.00	132.030

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Buildings and Loose Gravel Cover Runoff
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Drainage Kerb

Outgoing Connection	Drainage Kerb
Outlet Type	Weir

Width (m)	0.350
Coefficient of Discharge	0.544
Crest Level (m)	21.800

Advanced

Perimeter	Circular
Length (m)	22.819

Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Swale Type : Swale

Swale

Exceedance Level (m)	18.800
Depth (m)	0.300
Base Level (m)	18.500
Top Width (m)	2.000
Side Slope (1:X)	3.00
Base Width (m)	0.200
Freeboard (mm)	0
Length (m)	200.000
Long. Slope (1:X)	200.00
Filtration Rate (m/hr)	0.0
Friction Scheme	Manning's n
n	0.03
Total Volume (m³)	66.000

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Access Road Runoff
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Drainage Kerb
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Swale Weir
Outlet Type	Weir

Width (m)	2.000
Coefficient of Discharge	0.544
Crest Level (m)	18.650

Advanced

Swale

Porosity (%)	100

Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Detention Basin

Type : Tank

Dimensions

Exceedance Level (m)	18.500
Depth (m)	1.000
Base Level (m)	17.500
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	3.021
Total Volume (m³)	117.722

Depth (m)	Area (m²)	Volume (m³)
0.000	65.00	0.000
1.000	180.00	117.722

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Swale Weir
Bypass Destination	(None)
Capacity Type	No Restriction

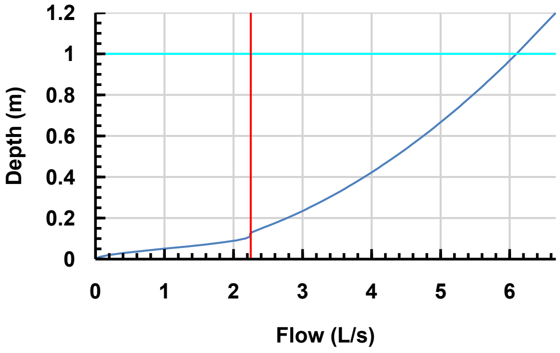
Outlets

Outlet

Outgoing Connection	Pipe
Outlet Type	Hydro-Brake®

Invert Level (m)	17.500
Design Depth (m)	1.000
Design Flow (L/s)	6.1
Objective	Linear Discharge Profile
Application	Surface Water Only
Sump Available	☐

Unit Reference	CCU-0078-6100-1000-6100



Advanced

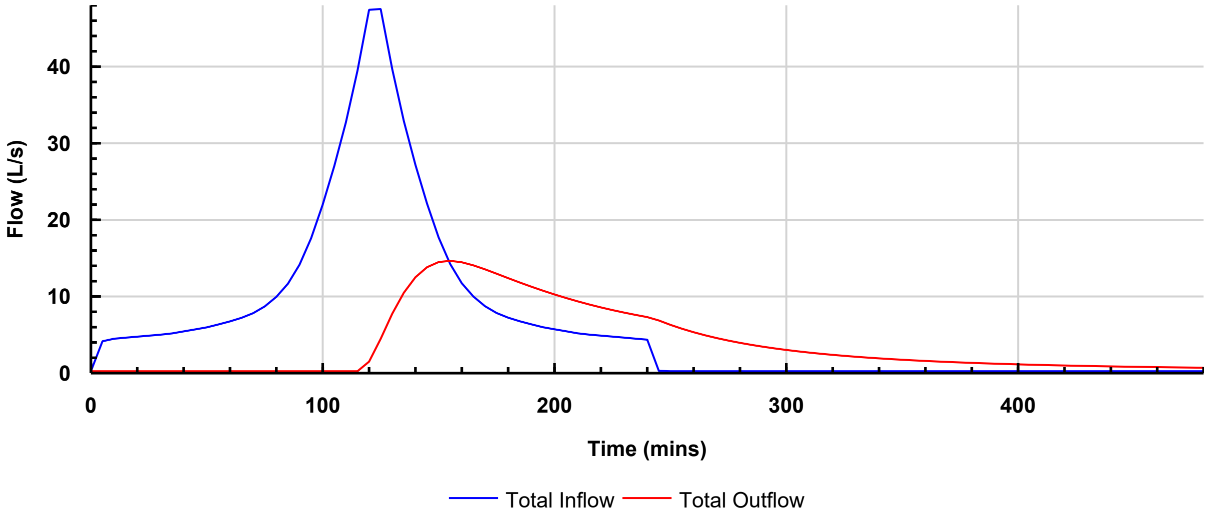
Perimeter	Circular
Length (m)	8.230

Loose Gravel Cover
Critical by Return Period: FEH: 100 years: Increase Rainfall (%): +45: 240 mins: Summer

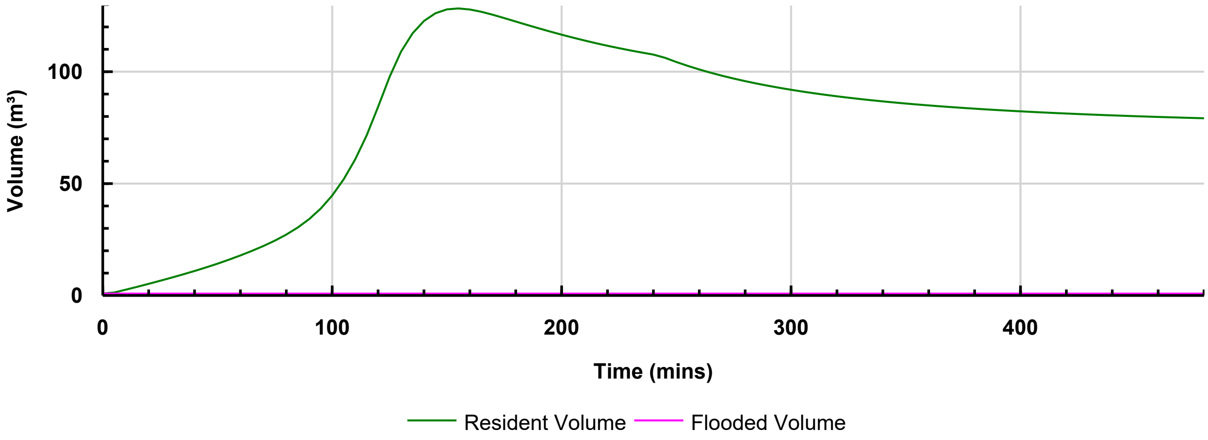
Type : Tank

Graphs

Flow Graph

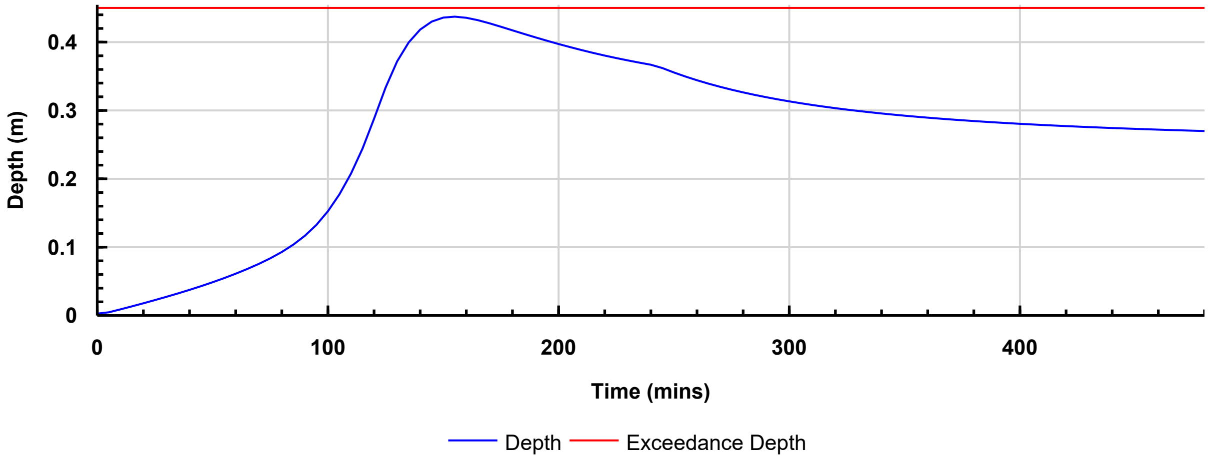


Volume Graph



Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Depth Graph



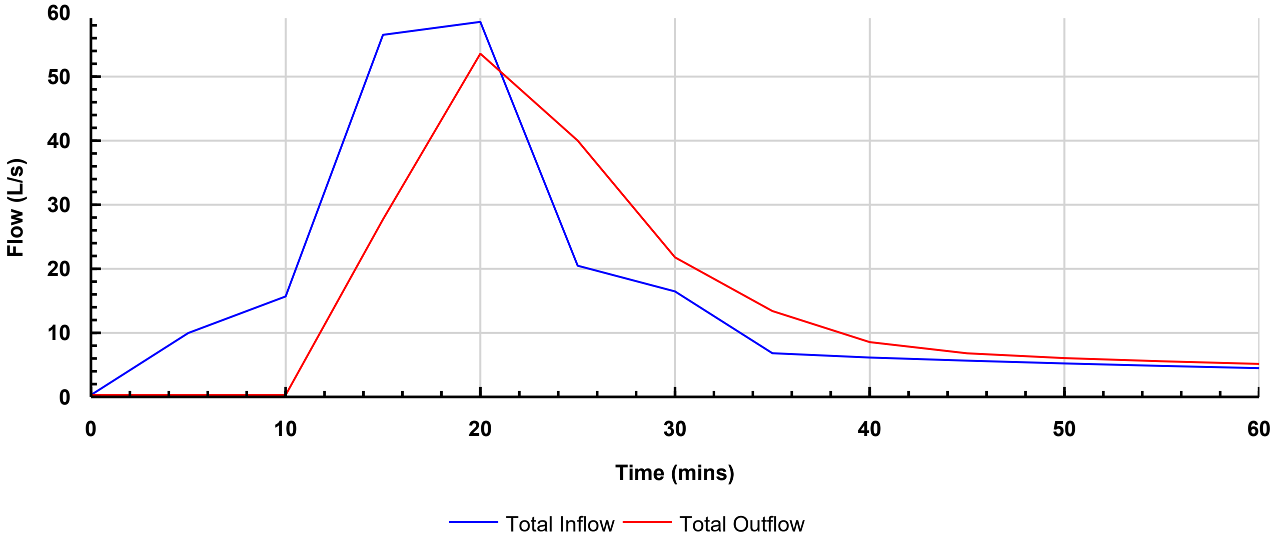
Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Swale
Critical by Return Period: FEH: 100 years: Increase Rainfall (%): +45: 30 mins: Summer

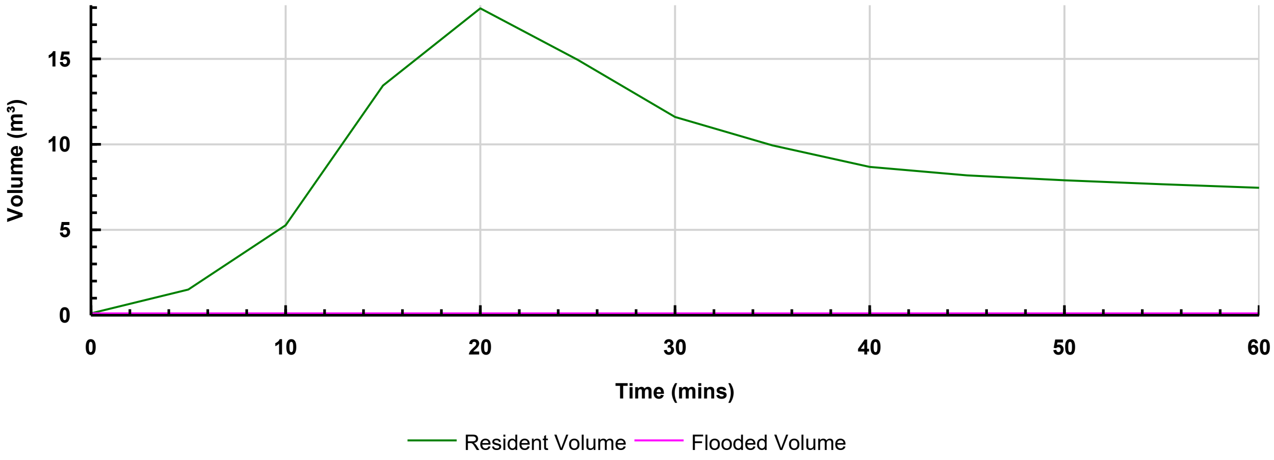
Type : Swale

Graphs

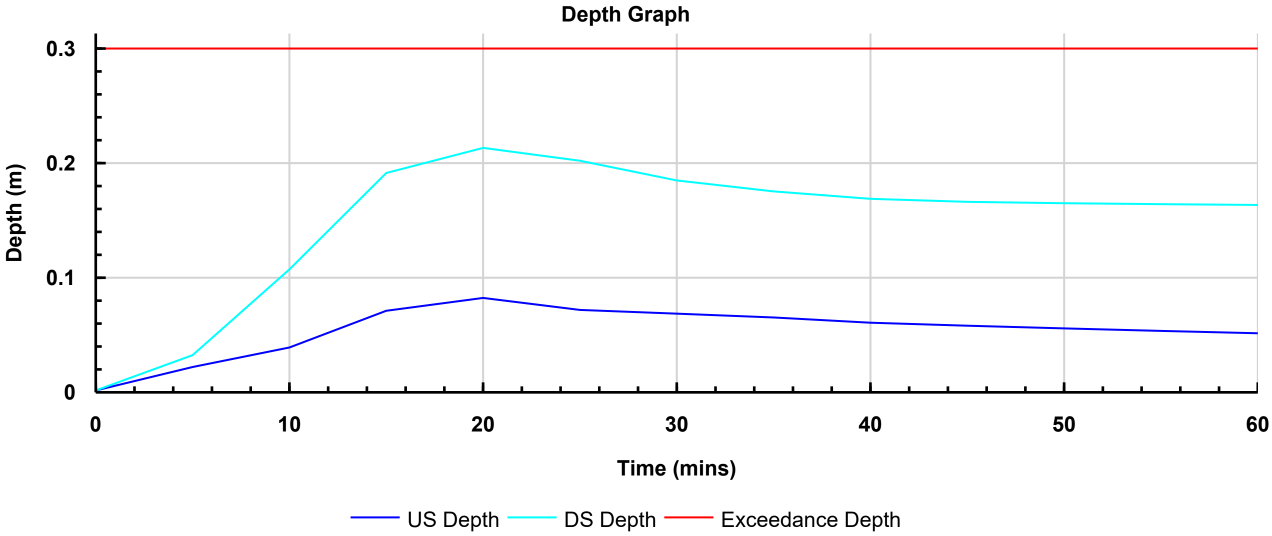
Flow Graph



Volume Graph



Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

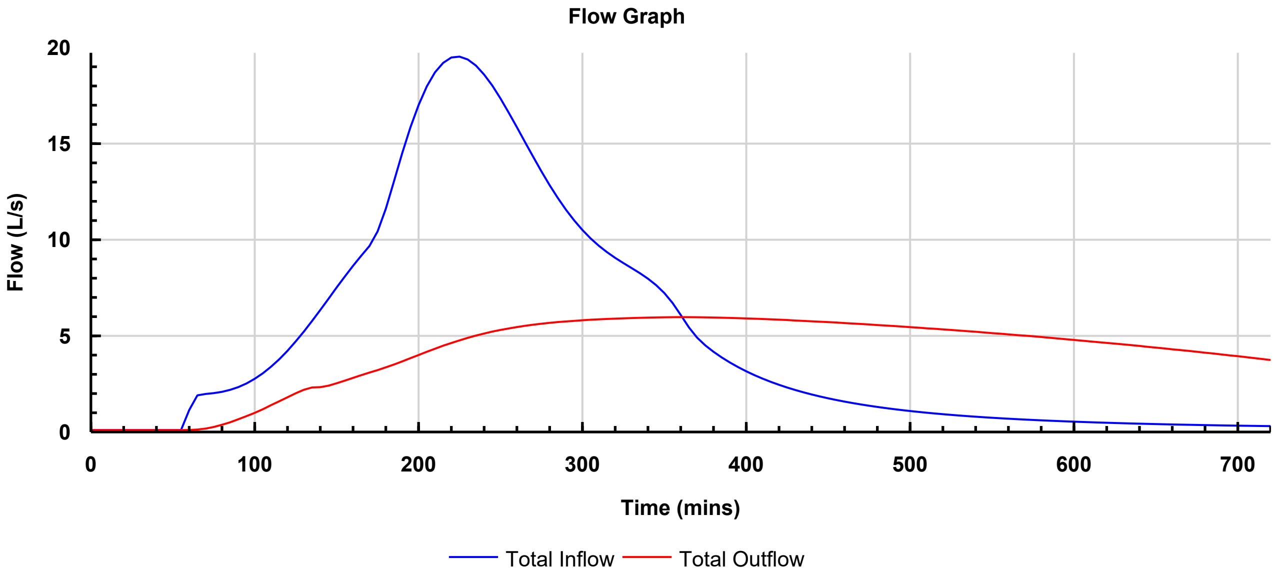


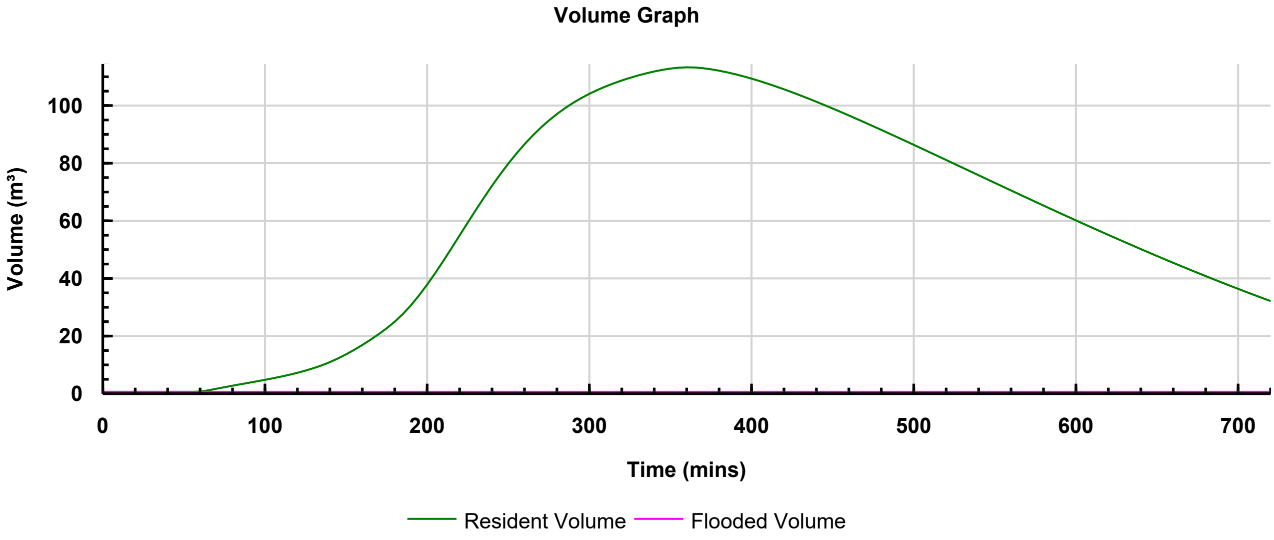
Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Detention Basin
Critical by Return Period: FEH: 100 years: Increase Rainfall (%): +45: 360 mins: Winter

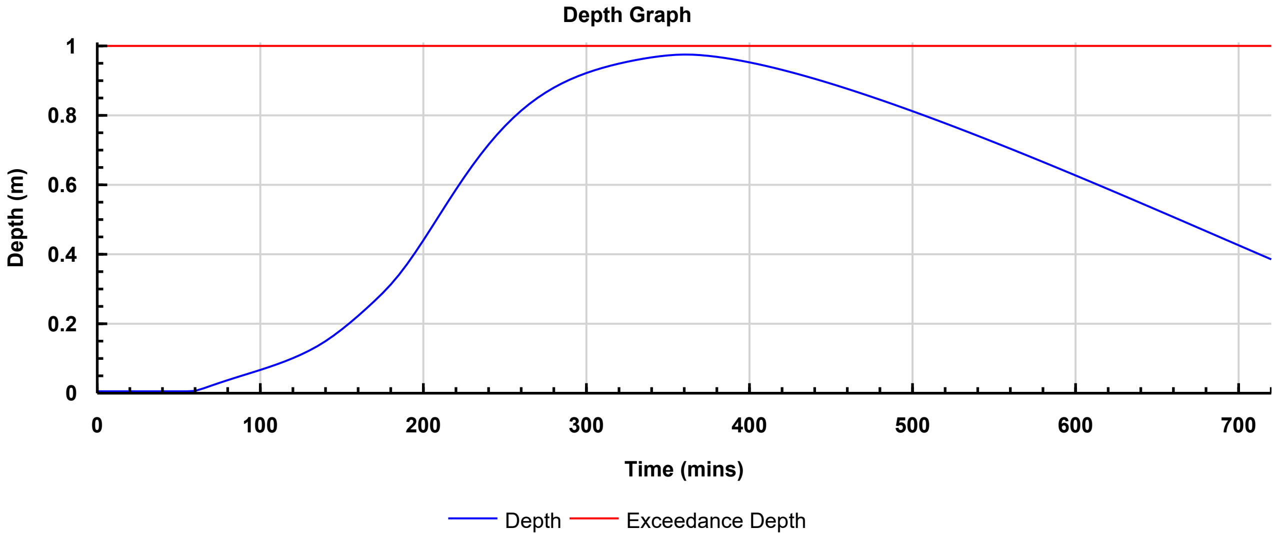
Type : Tank

Graphs





Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		



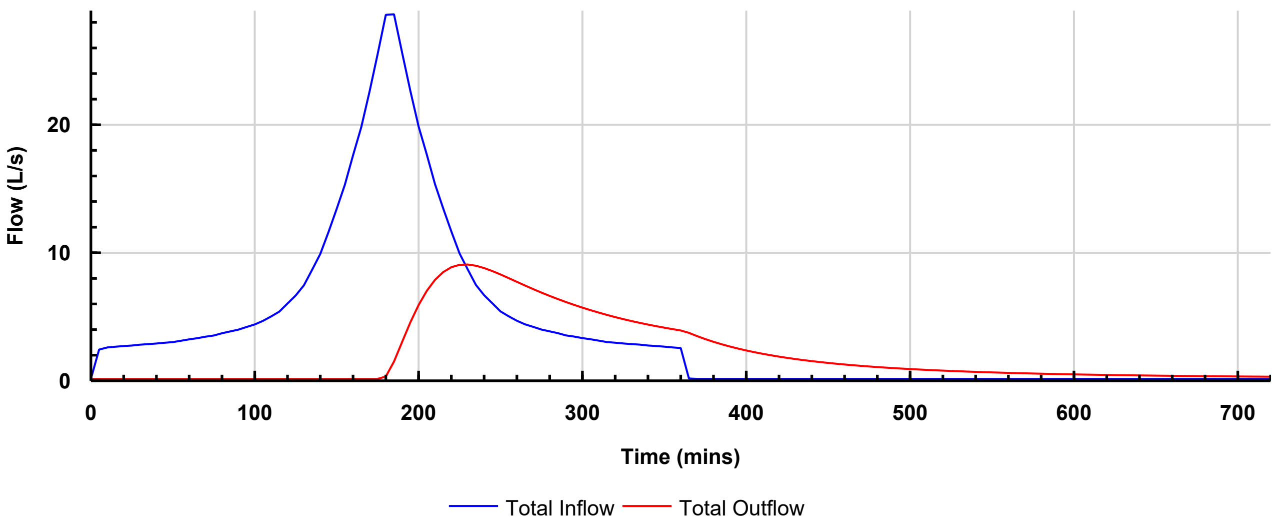
Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Loose Gravel Cover
Critical by Return Period: FEH: 30 years: Increase Rainfall (%): +45: 360 mins: Summer

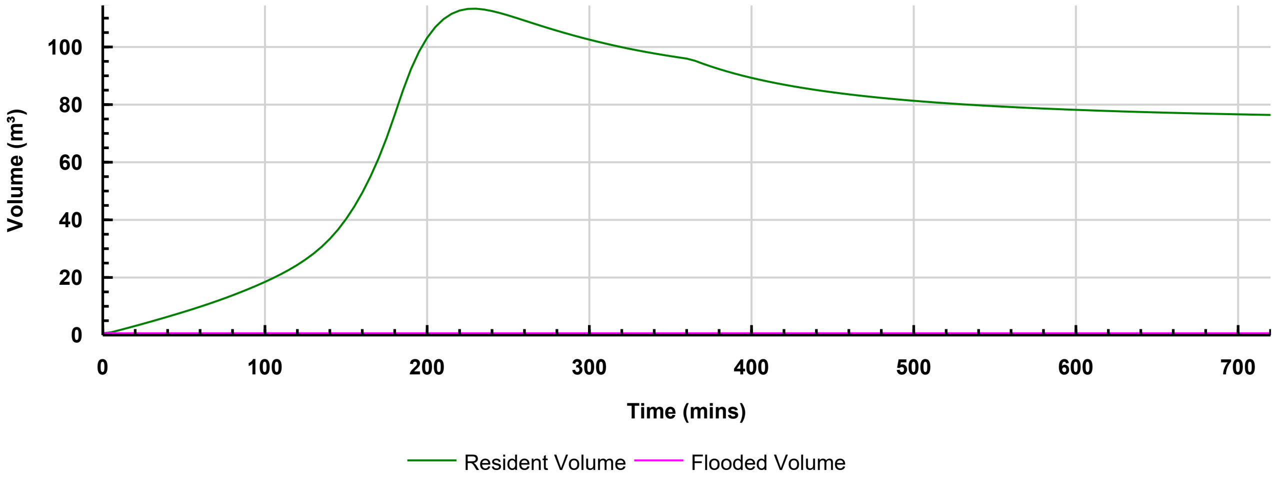
Type : Tank

Graphs

Flow Graph

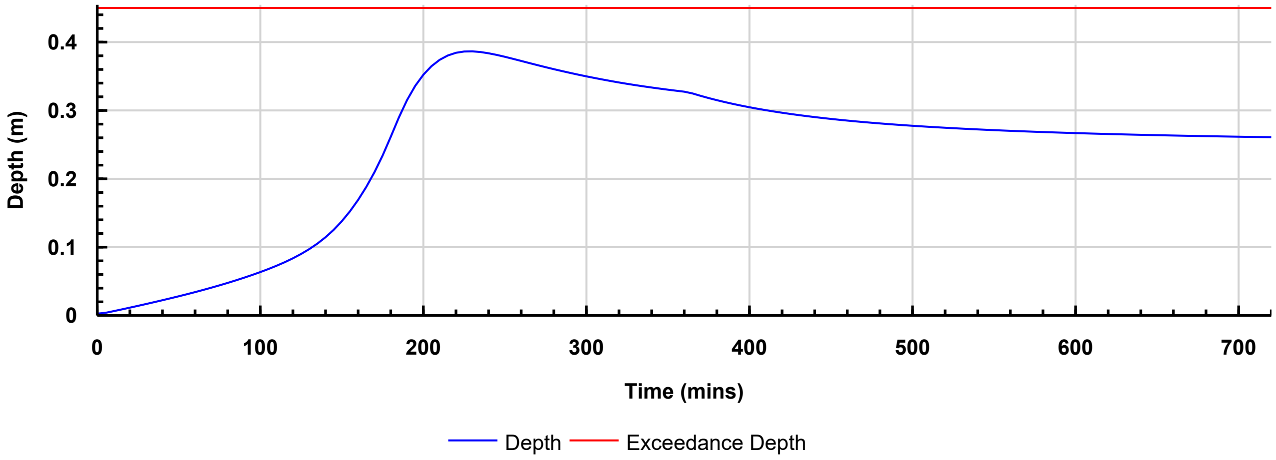


Volume Graph



Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Depth Graph

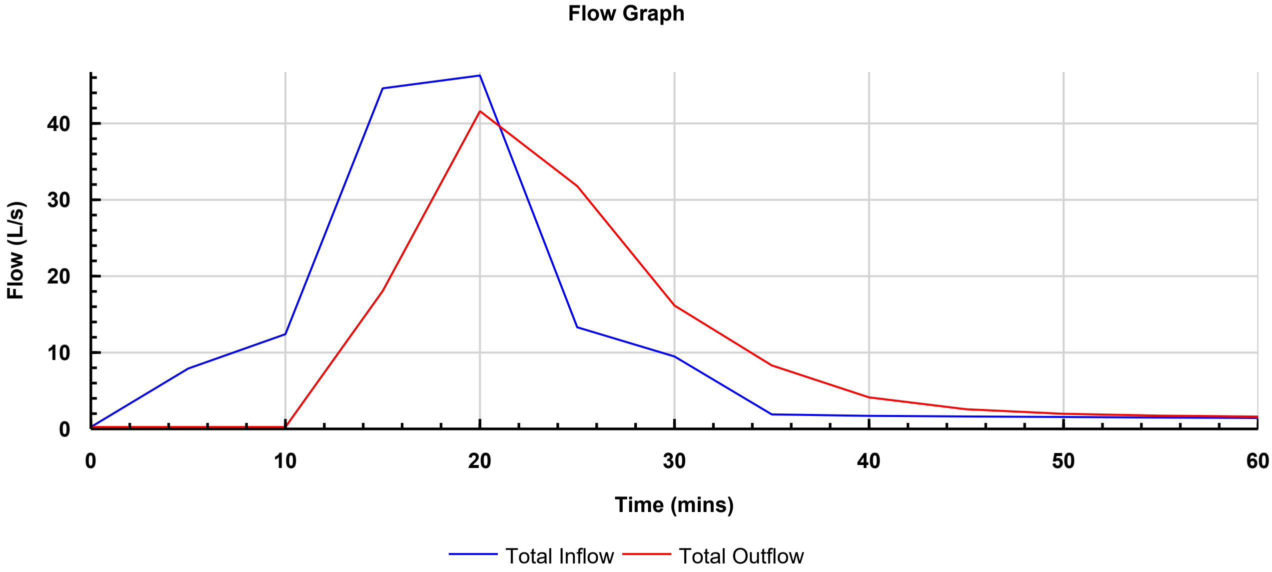


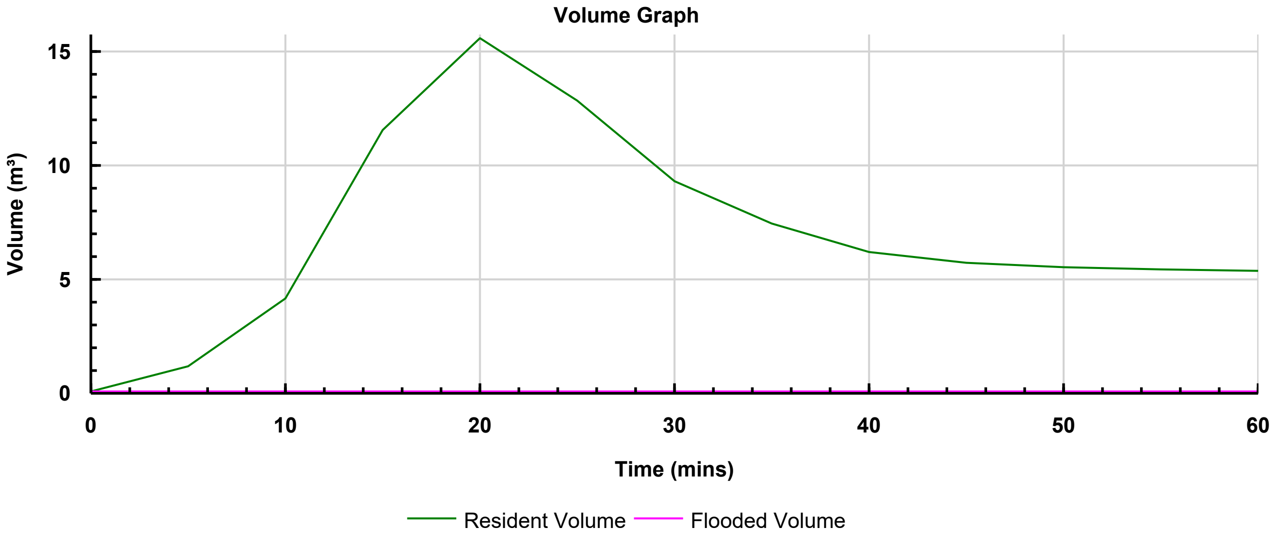
Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Swale
Critical by Return Period: FEH: 30 years: Increase Rainfall (%): +45: 30 mins: Summer

Type : Swale

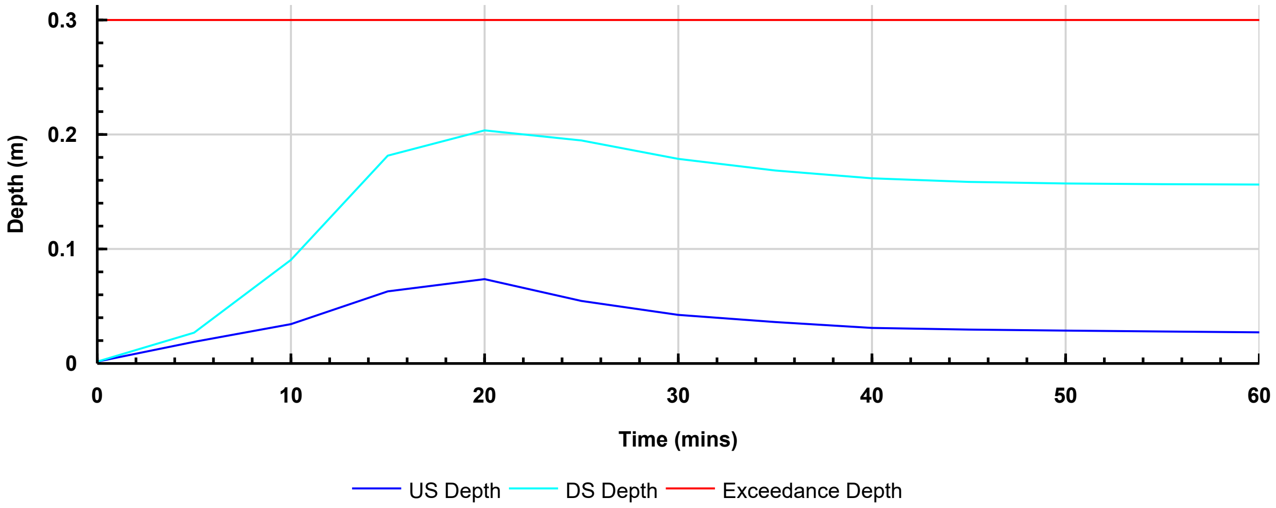
Graphs





Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Depth Graph

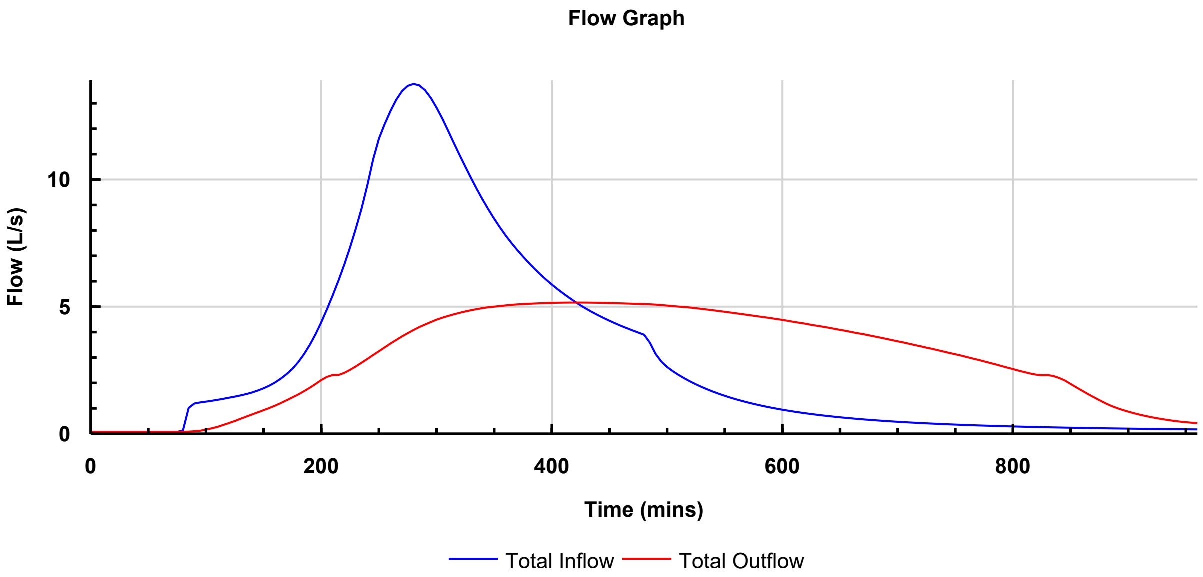


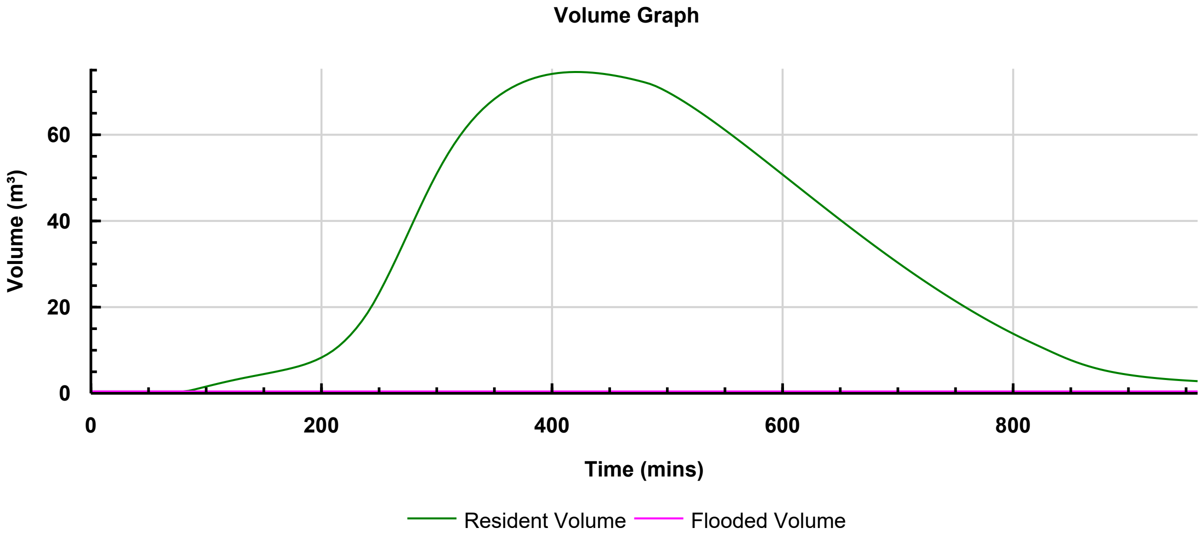
Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Detention Basin
Critical by Return Period: FEH: 30 years: Increase Rainfall (%): +45: 480 mins: Summer

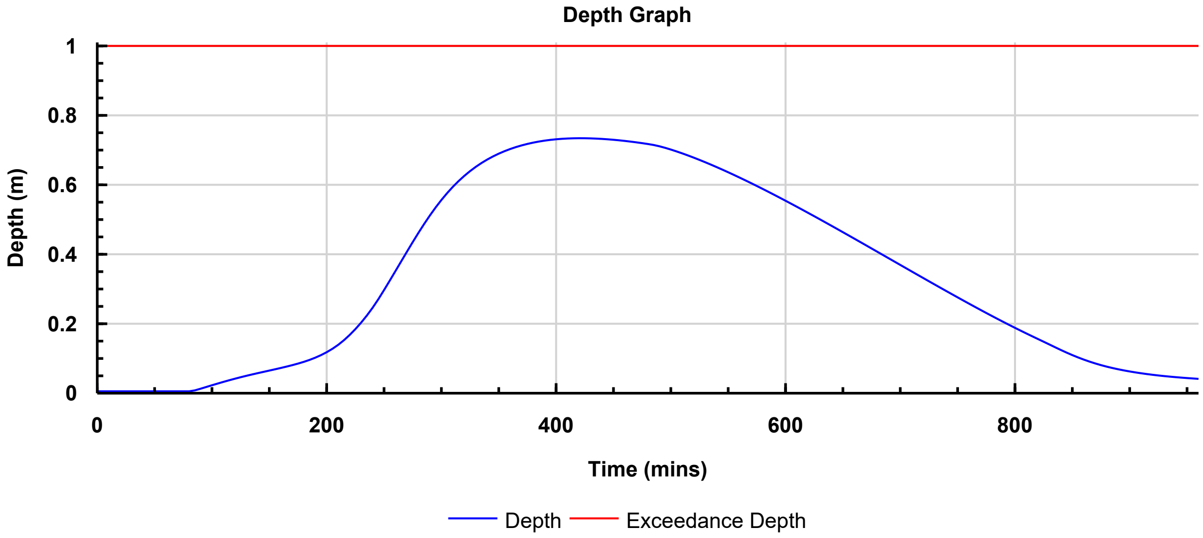
Type : Tank

Graphs





Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

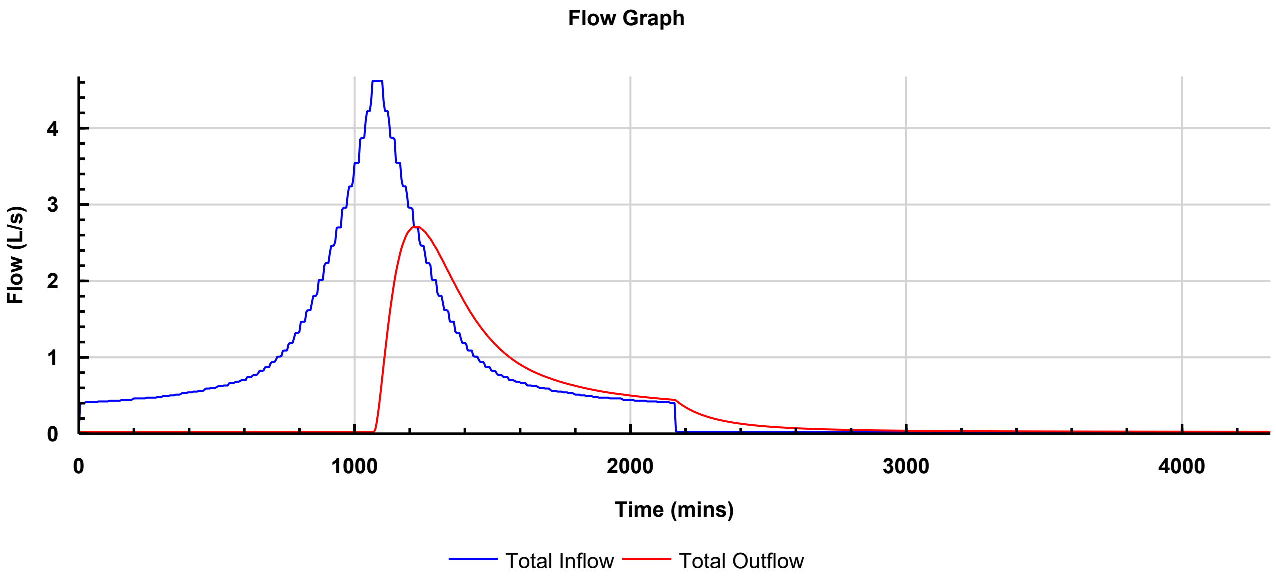

Depth Graph

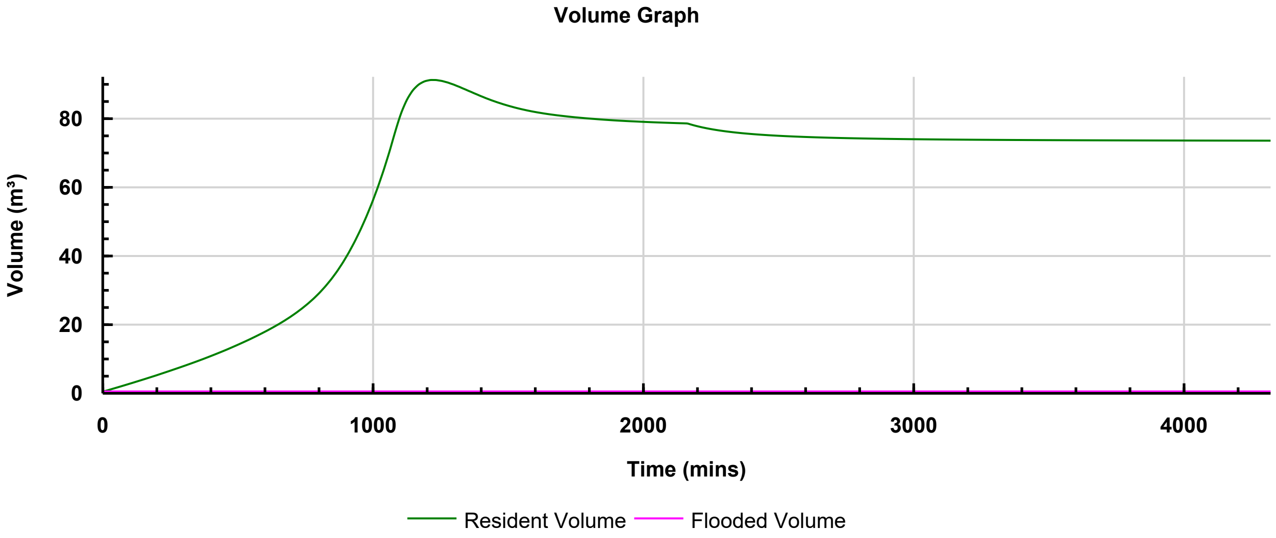
Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Loose Gravel Cover
Critical by Return Period: FEH: 2 years: Increase Rainfall (%): +45: 2160 mins: Summer

Type : Tank

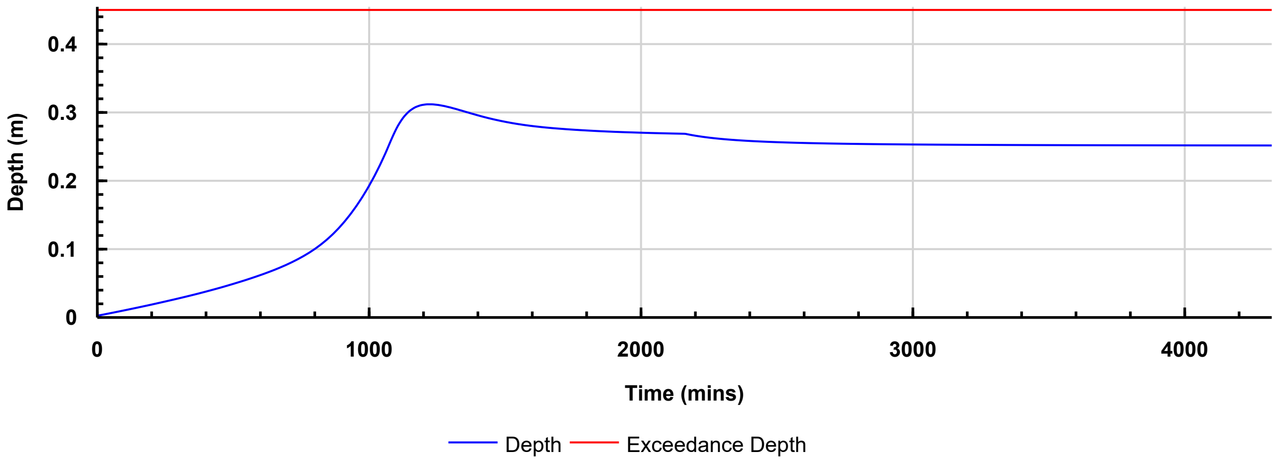
Graphs





Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Depth Graph

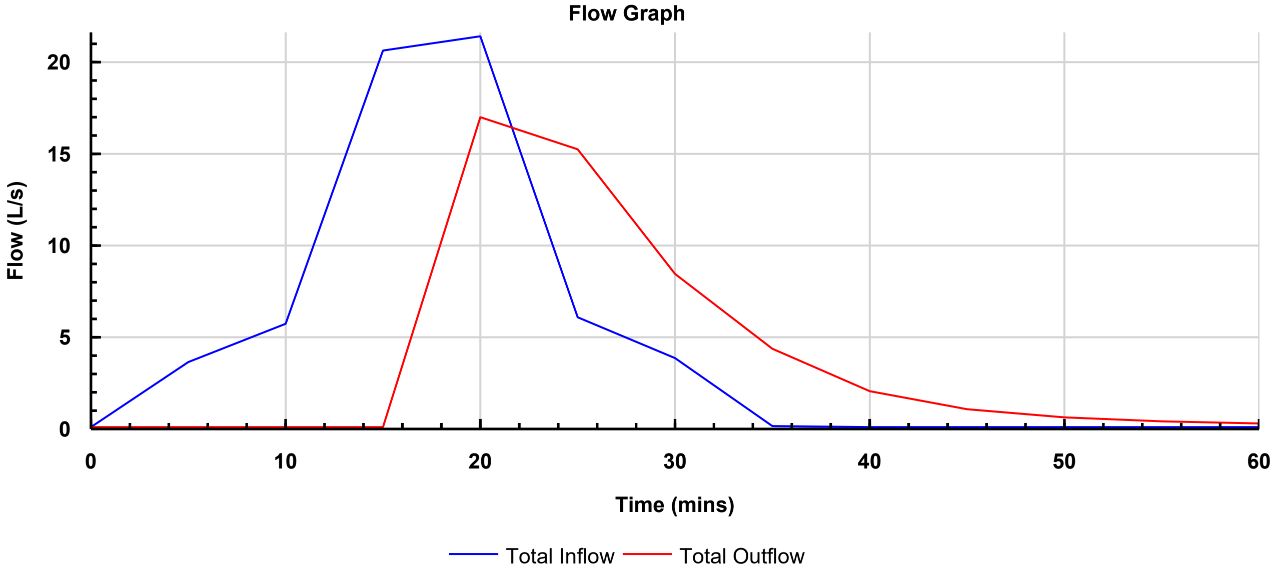


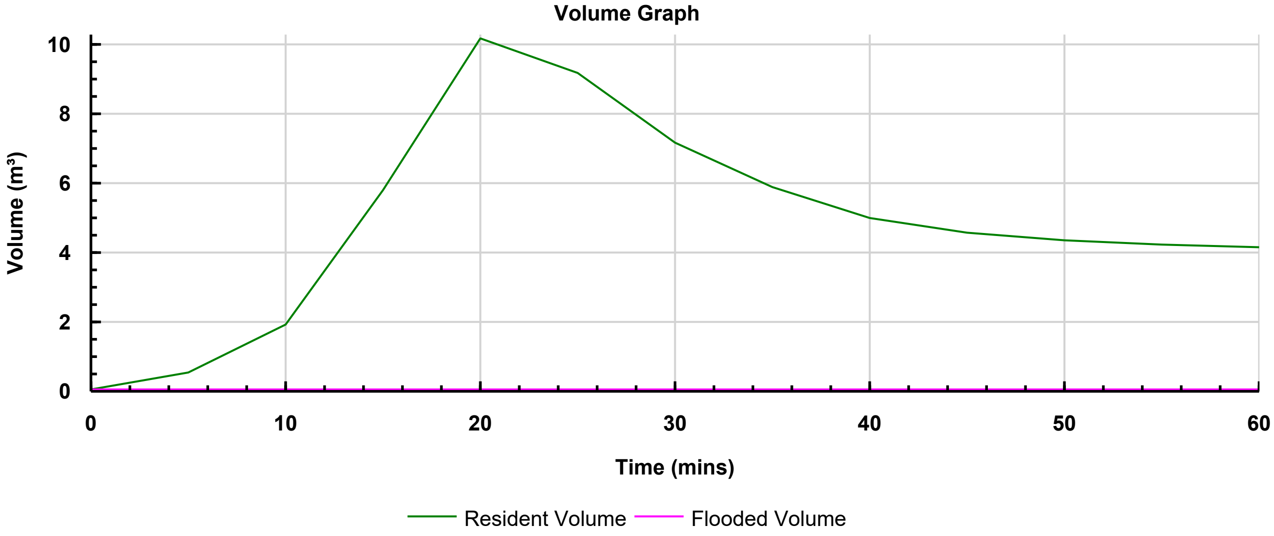
Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Swale
Critical by Return Period: FEH: 2 years: Increase Rainfall (%): +45: 30 mins: Summer

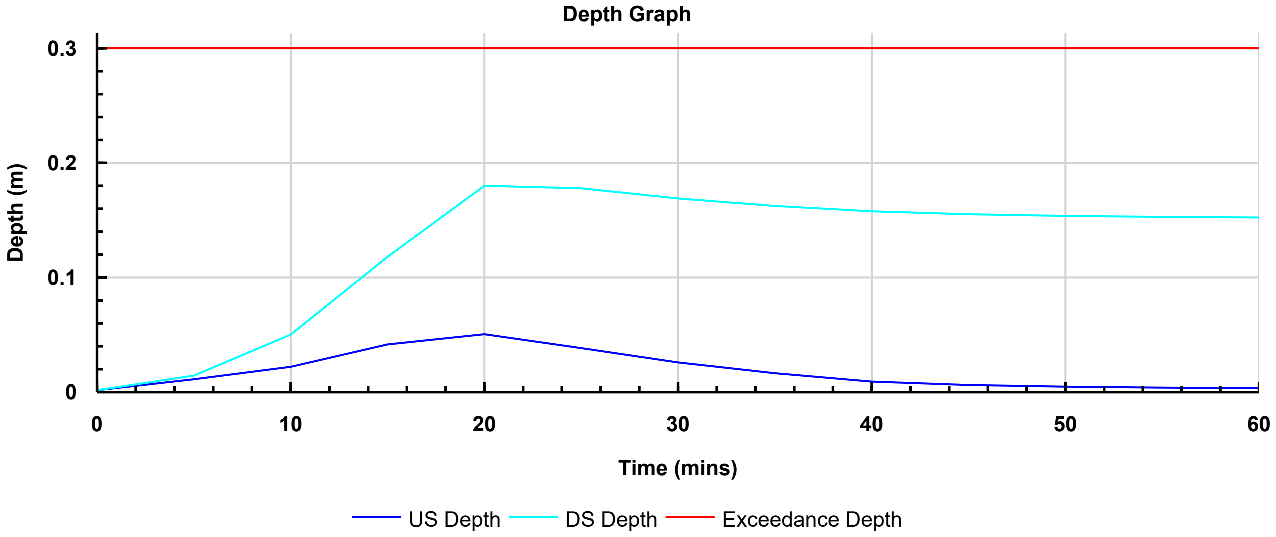
Type : Swale

Graphs





Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

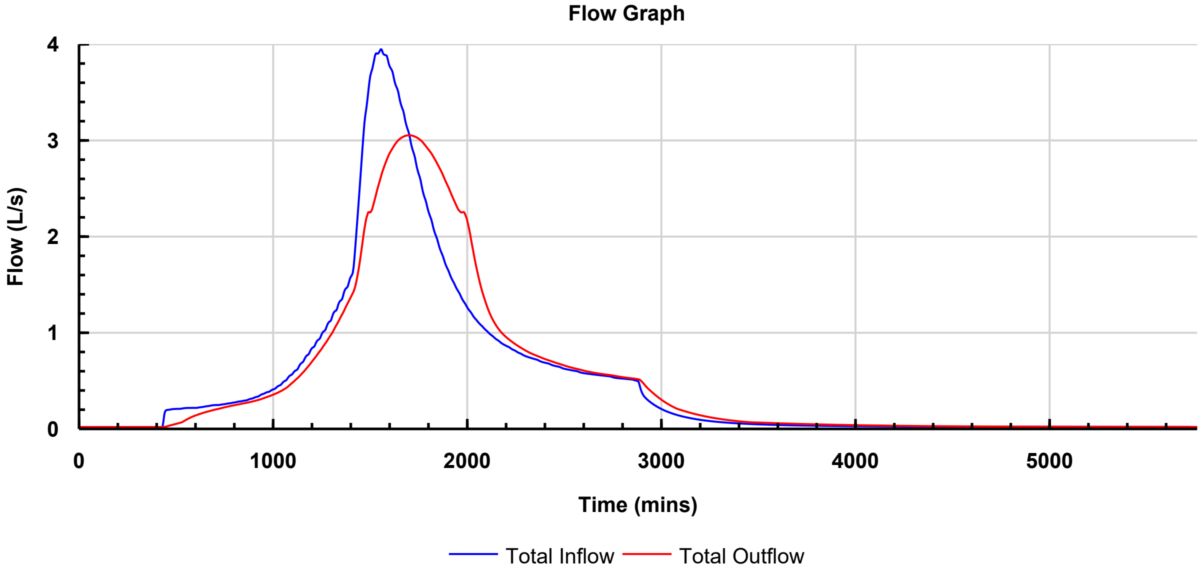


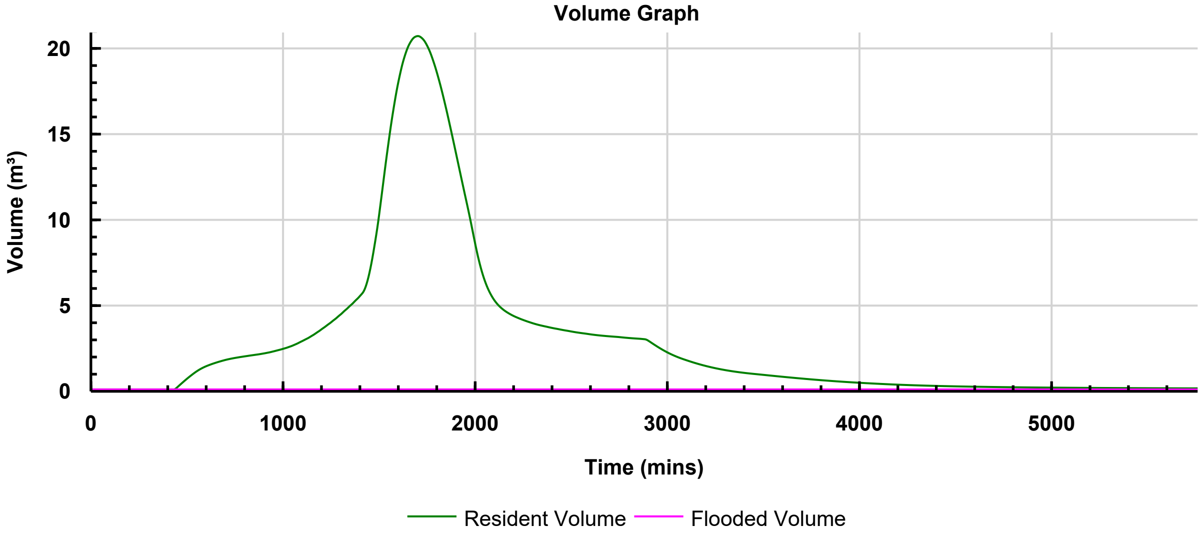
Project: HWTWRP IPS-F	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

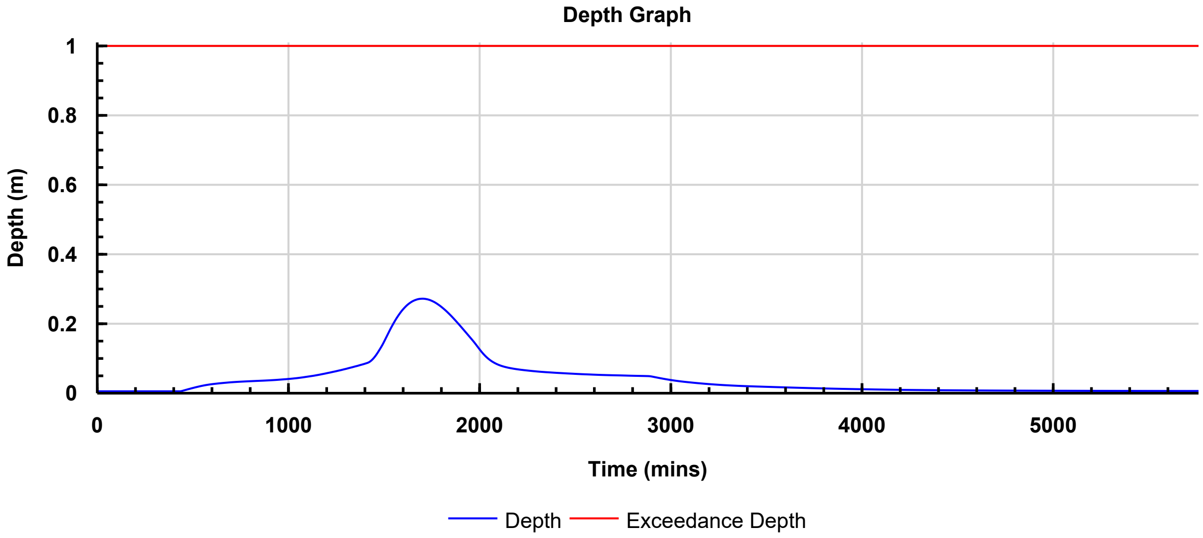
Detention Basin
Critical by Return Period: FEH: 2 years: Increase Rainfall (%): +45: 2880 mins: Summer

Type : Tank

Graphs







Depth Graph
1
0.8
0.6
0.4
0.2
0
Depth (m)
0
1000
2000
3000
4000
5000
Time (mins)
Depth
Exceedance Depth

APPENDIX D.3 - IPS-G InfoDrainage Results

Project: HWTWRP IPS-G	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Title: Rainfall Analysis Criteria	Company Address:		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FEH

Type: FEH

Site Location	GB 456336 111711 SU 56336 11711
Rainfall Version	2022
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
100.0	45.000
30.0	45.000
2.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Project: HWTWRP IPS-G	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Inflows Storm Phase: Phase	Company Address:		

Buildings and Loose Gravel Cover Runoff Type : Catchment Area

Area (ha)	0.24

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Access Road Runoff Type : Catchment Area

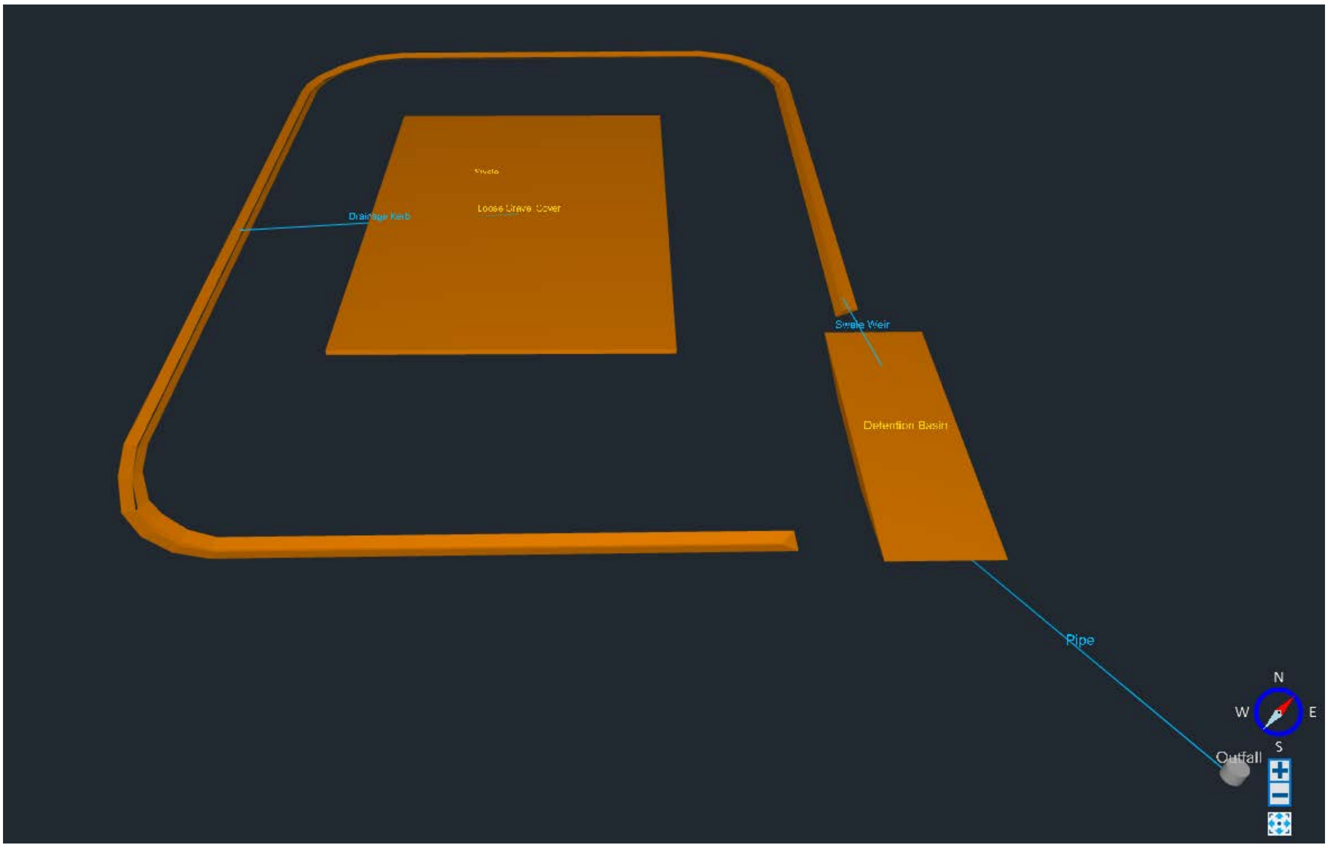
Area (ha)	0.11

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project: HWTWRP IPS-G	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address:		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Access Road Runoff	Swale		Time of Concentration	0.11	100	0	100	0.11
Buildings and Loose Gravel Cover Runoff	Loose Gravel Cover		Time of Concentration	0.24	100	0	100	0.24
TOTAL		**0.0**		**0.35**				**0.35**



Project: HWTWRP IPS-G	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Loose Gravel Cover Type : Tank

Dimensions

Exceedance Level (m)	52.200
Depth (m)	0.450
Base Level (m)	51.750
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	30
Average Slope (1:X)	0.00
Total Volume (m³)	154.575

Depth (m)	Area (m²)	Volume (m³)
0.000	1145.00	0.000
0.450	1145.00	154.575

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Buildings and Loose Gravel Cover Runoff
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Drainage Kerb
Outlet Type	Weir

Width (m)	0.250
Coefficient of Discharge	0.544
Crest Level (m)	52.000

Advanced

Perimeter	Circular
Length (m)	27.808

Swale

Type : Swale

Swale

Exceedance Level (m)	51.000
Depth (m)	0.300
Base Level (m)	50.700
Top Width (m)	2.000
Side Slope (1:X)	3.00
Base Width (m)	0.200
Freeboard (mm)	0
Length (m)	200.000
Long. Slope (1:X)	200.00
Filtration Rate (m/hr)	0.0
Friction Scheme	Manning's n
n	0.03
Total Volume (m³)	66.000

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Drainage Kerb
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Lateral Inflow
Incoming Item(s)	Access Road Runoff
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Swale Weir
Outlet Type	Weir

Width (m)	2.000
Coefficient of Discharge	0.544
Crest Level (m)	50.850

Advanced

Swale

Porosity (%)	100

Detention Basin

Type : Tank

Dimensions

Exceedance Level (m)	50.700
Depth (m)	1.000
Base Level (m)	49.700
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	3.093
Total Volume (m³)	132.491

Depth (m)	Area (m²)	Volume (m³)
0.000	75.00	0.000
1.000	200.00	132.491

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Swale Weir
Bypass Destination	(None)
Capacity Type	No Restriction

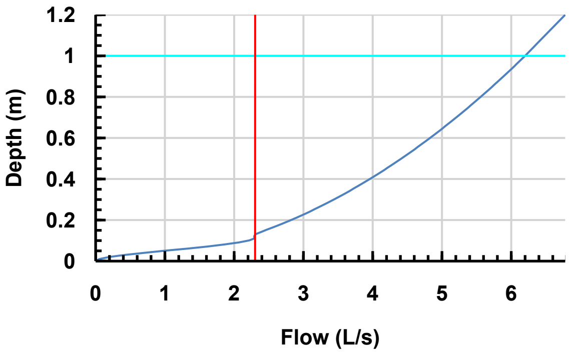
Outlets

Outlet

Outgoing Connection	Pipe
Outlet Type	Hydro-Brake®

Invert Level (m)	49.700
Design Depth (m)	1.000
Design Flow (L/s)	6.2
Objective	Linear Discharge Profile
Application	Surface Water Only
Sump Available	☐

Unit Reference	CCU-0079-6200-1000-6200



Advanced

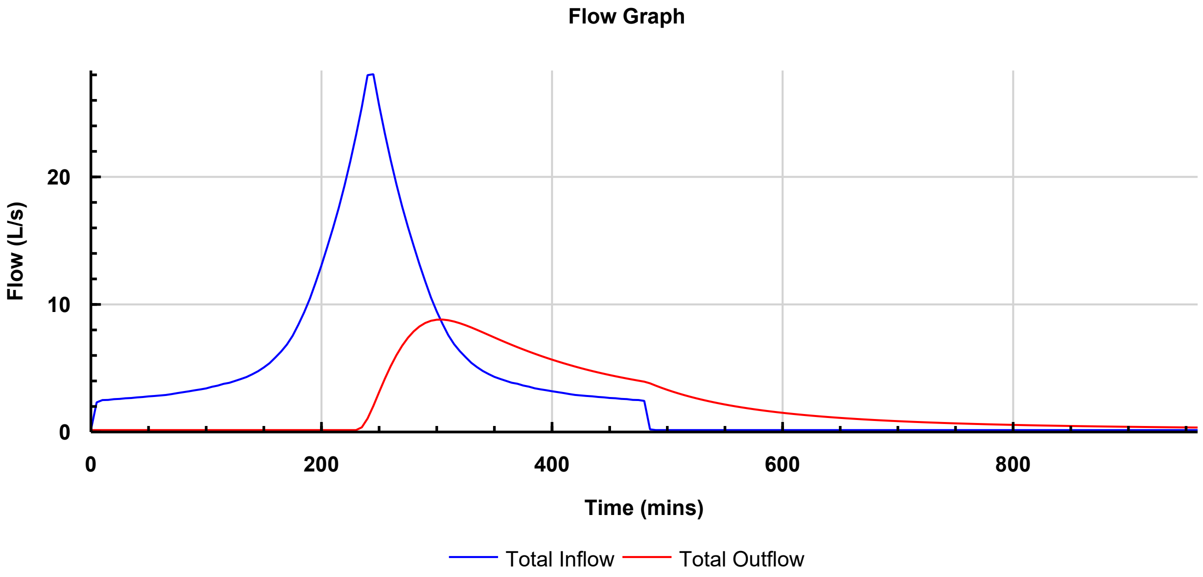
Perimeter	Circular
Length (m)	8.094

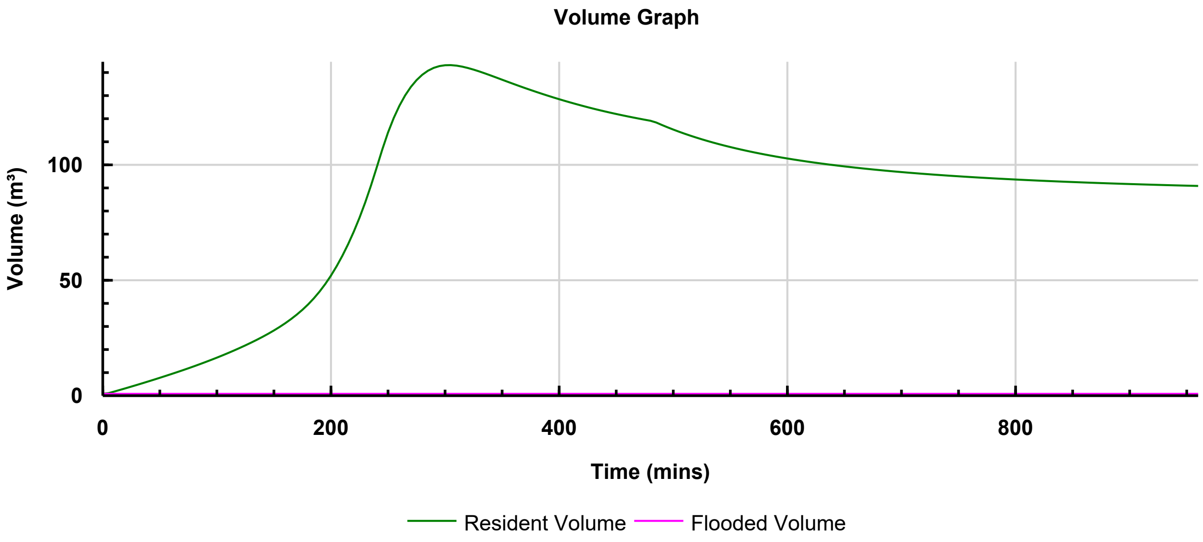
Project: HWTWRP IPS-G	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Loose Gravel Cover
Critical by Return Period: FEH: 100 years: Increase Rainfall (%): +45: 480 mins: Summer

Type : Tank

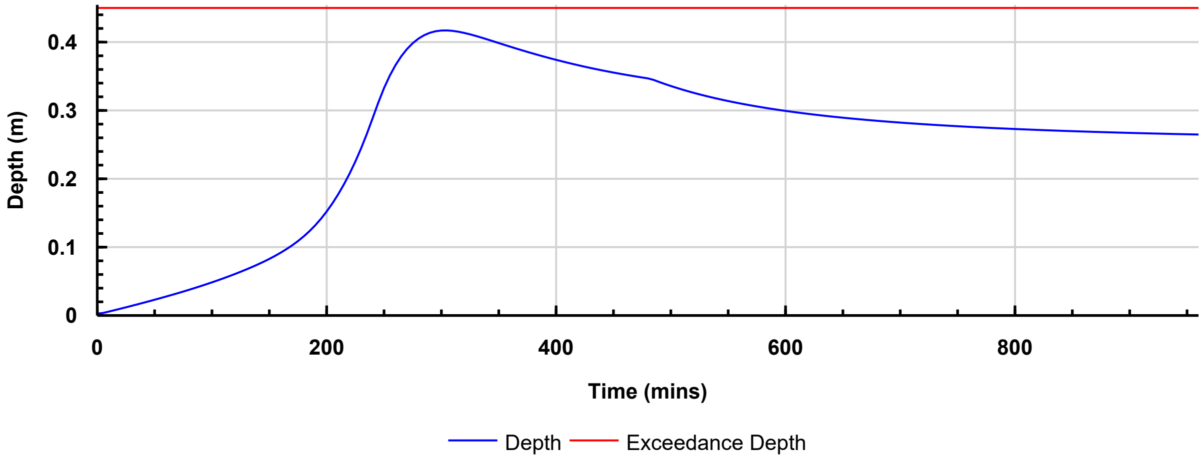
Graphs





Project: HWTWRP IPS-G	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Depth Graph



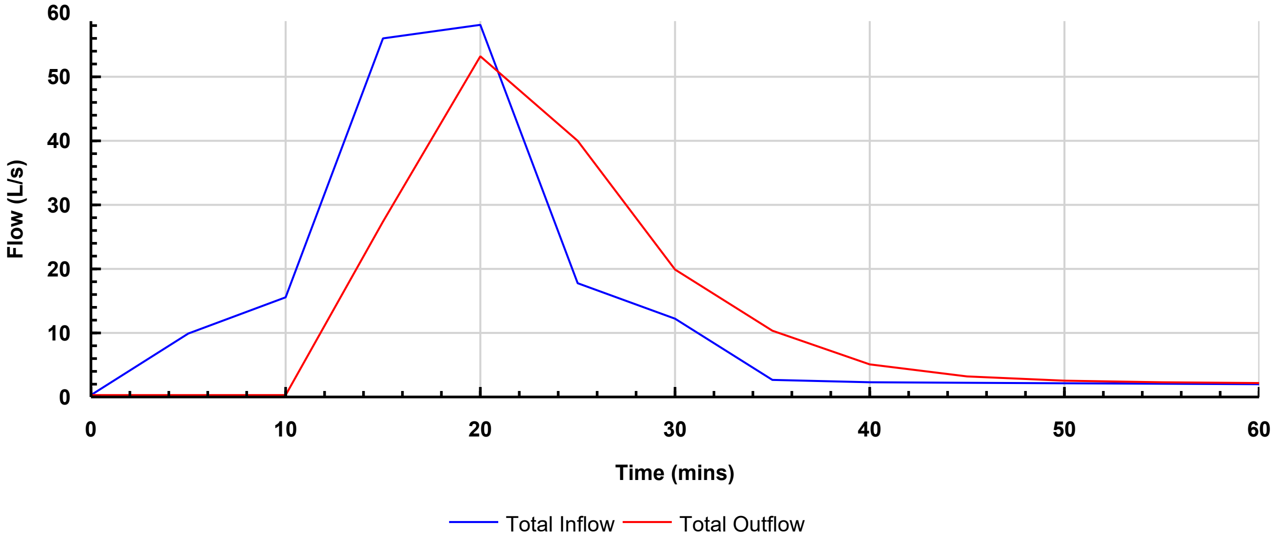
Project: HWTWRP IPS-G	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Swale
Critical by Return Period: FEH: 100 years: Increase Rainfall (%): +45: 30 mins: Summer

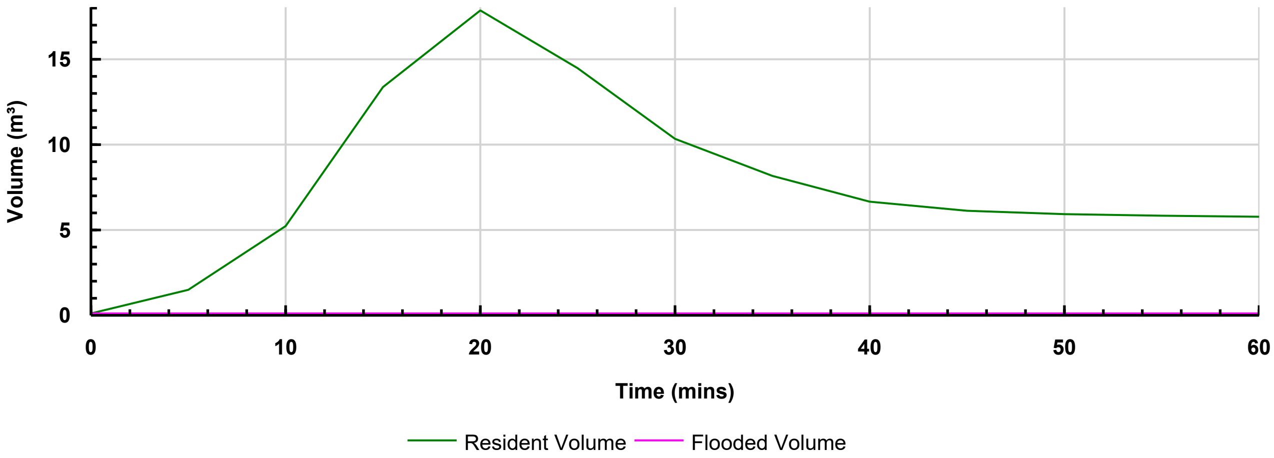
Type : Swale

Graphs

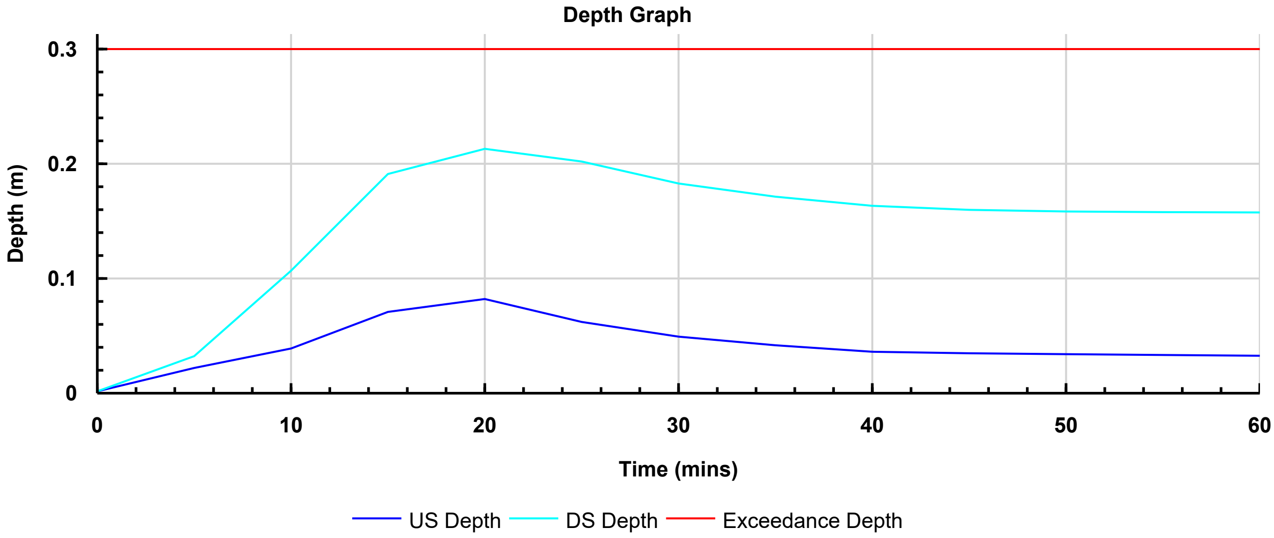
Flow Graph



Volume Graph



Project: HWTWRP IPS-G	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		



Project: HWTWRP IPS-G	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

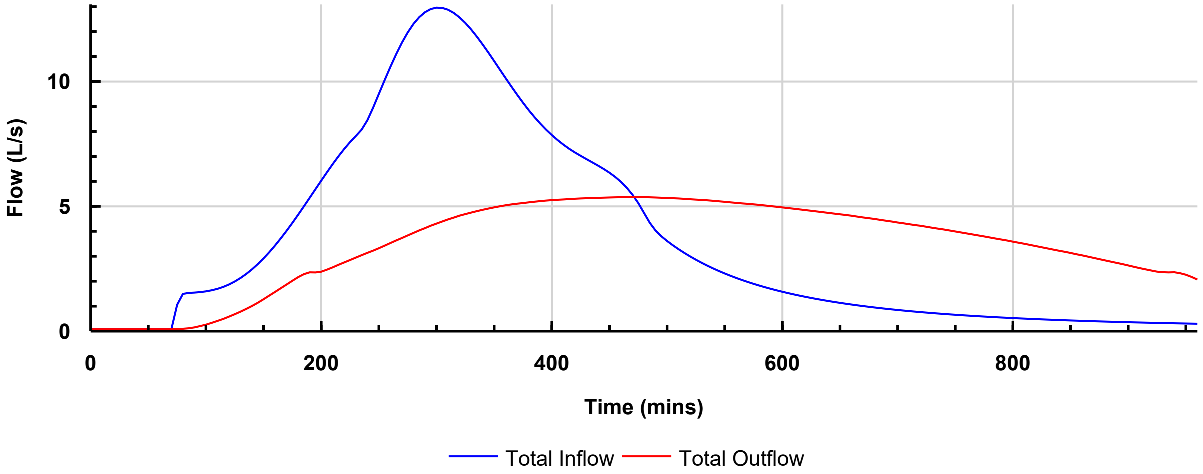
Detention Basin

Critical by Return Period: FEH: 100 years: Increase Rainfall (%): +45: 480 mins: Winter

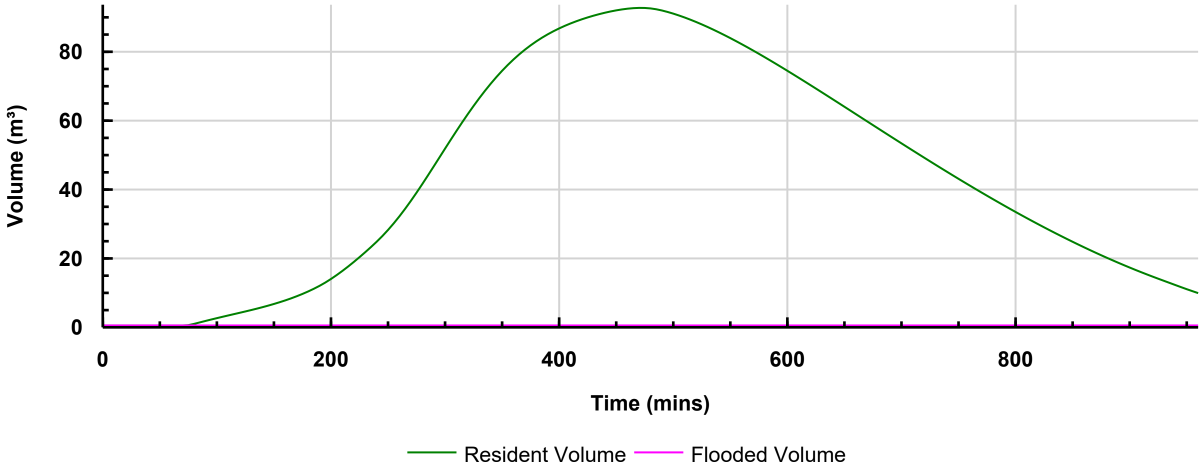
Type : Tank

Graphs

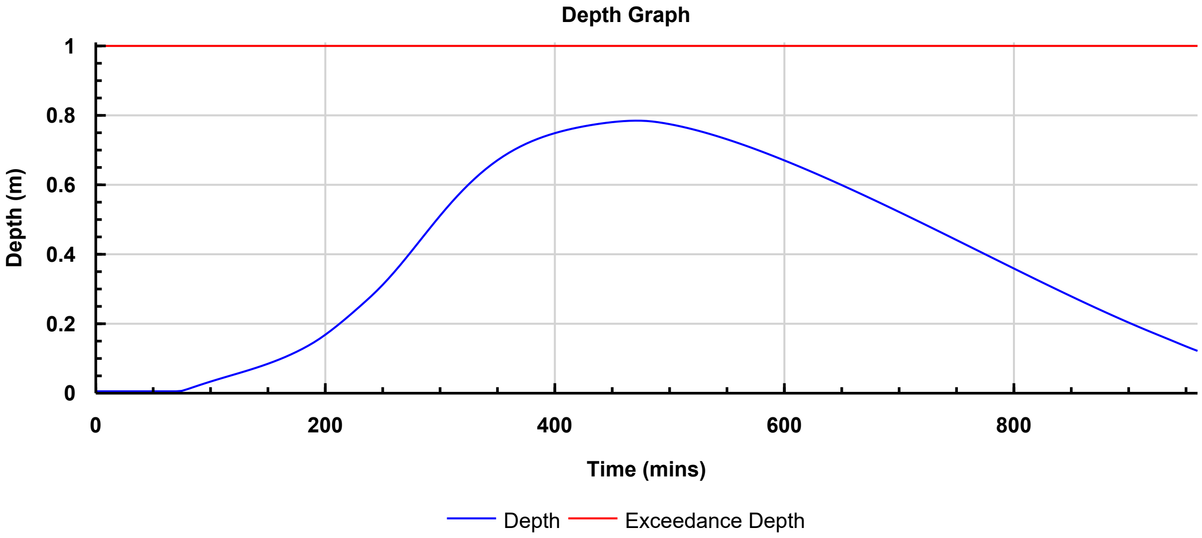
Flow Graph



Volume Graph



Project: HWTWRP IPS-G	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

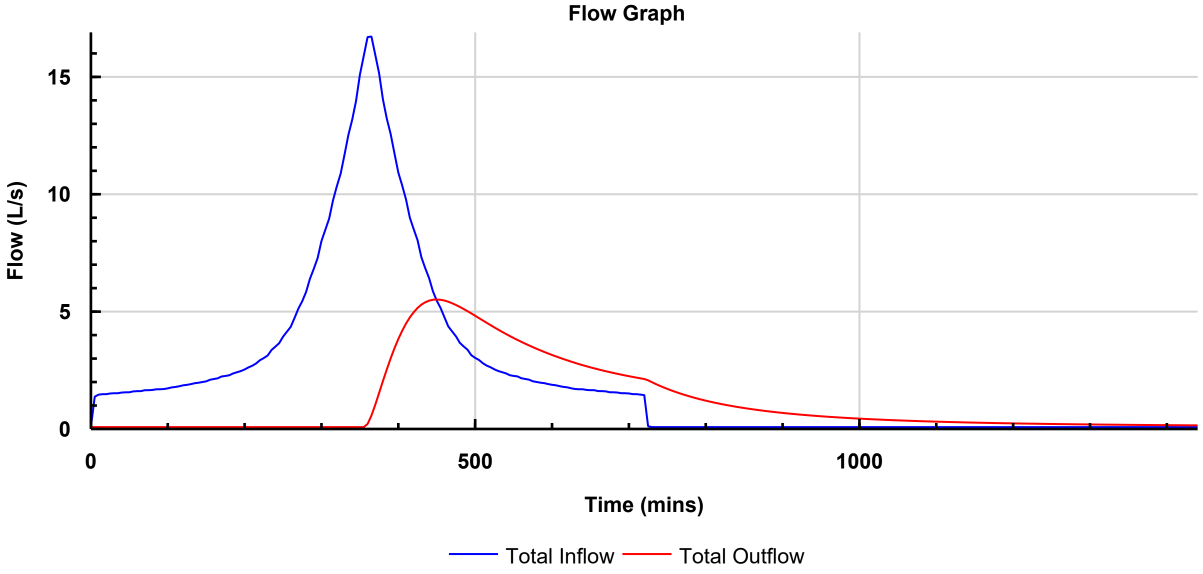


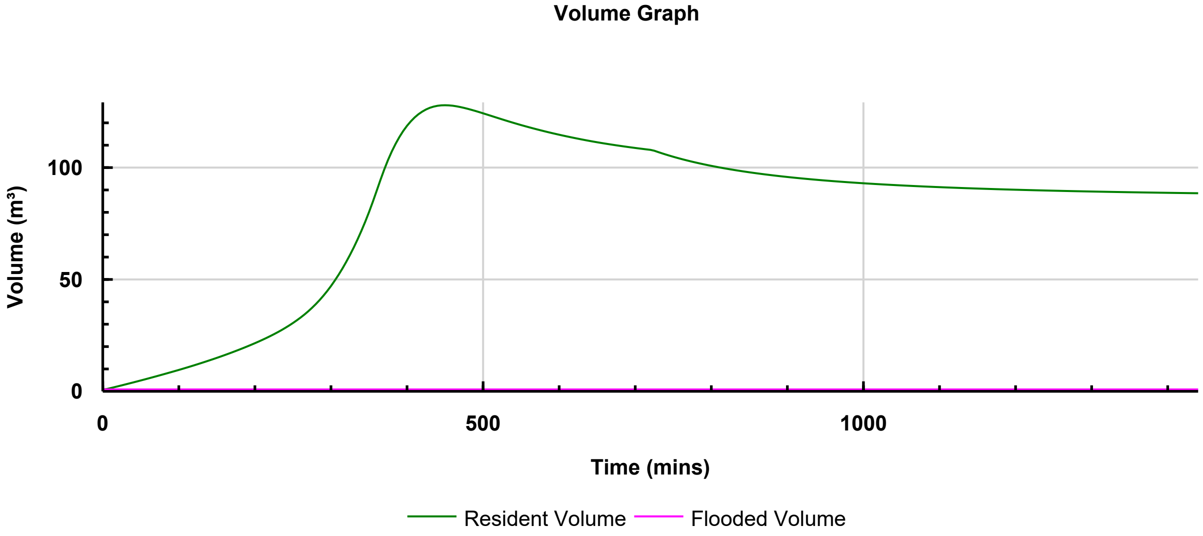
Project: HWTWRP IPS-G	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Loose Gravel Cover
Critical by Return Period: FEH: 30 years: Increase Rainfall (%): +45: 720 mins: Summer

Type : Tank

Graphs





Project: HWTWRP IPS-G	Date: 28/10/2025		
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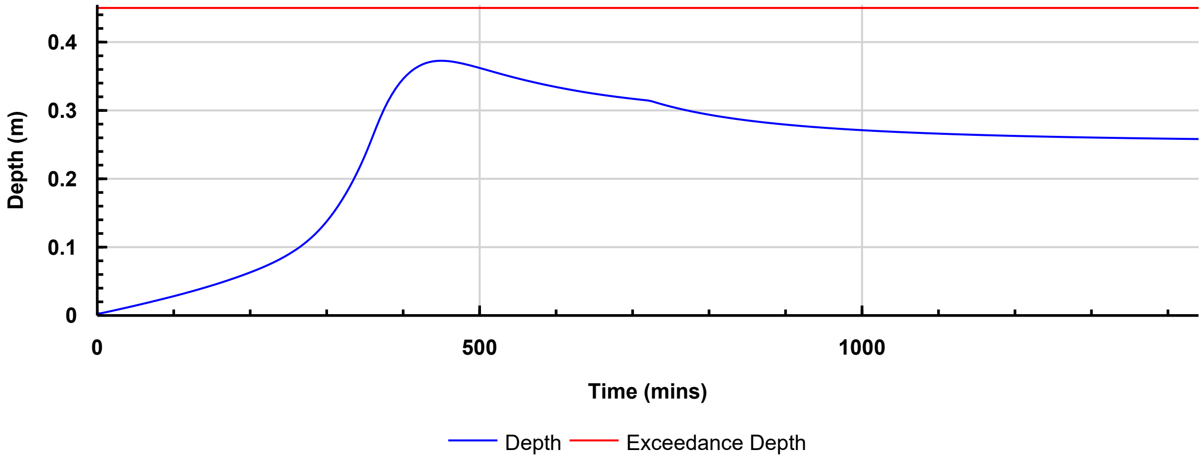
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Depth Graph

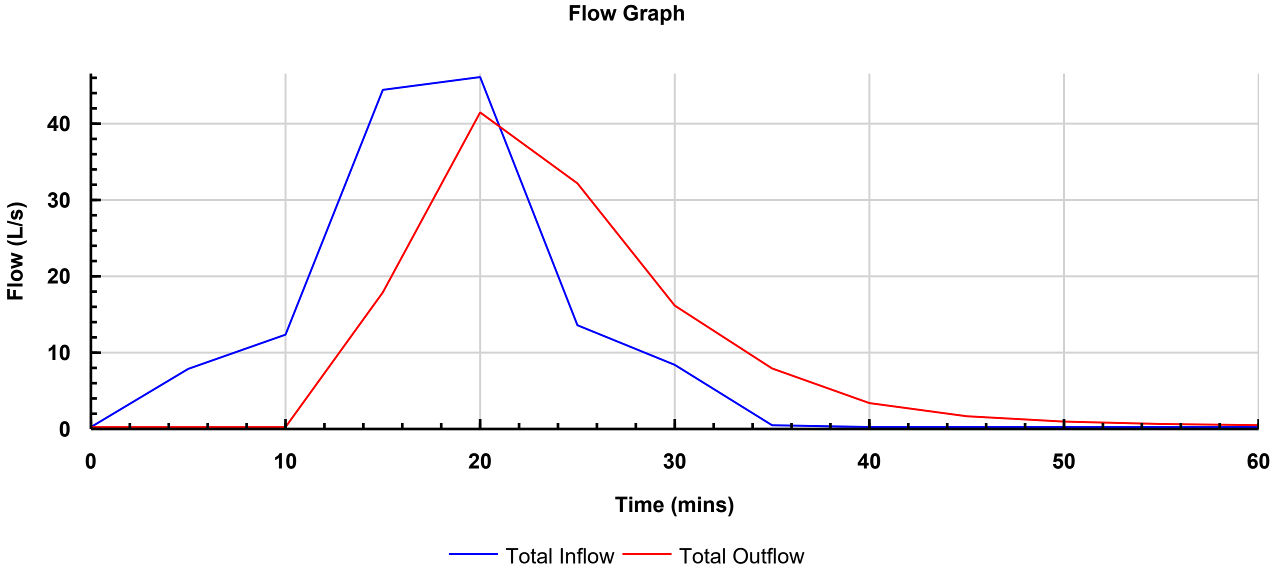


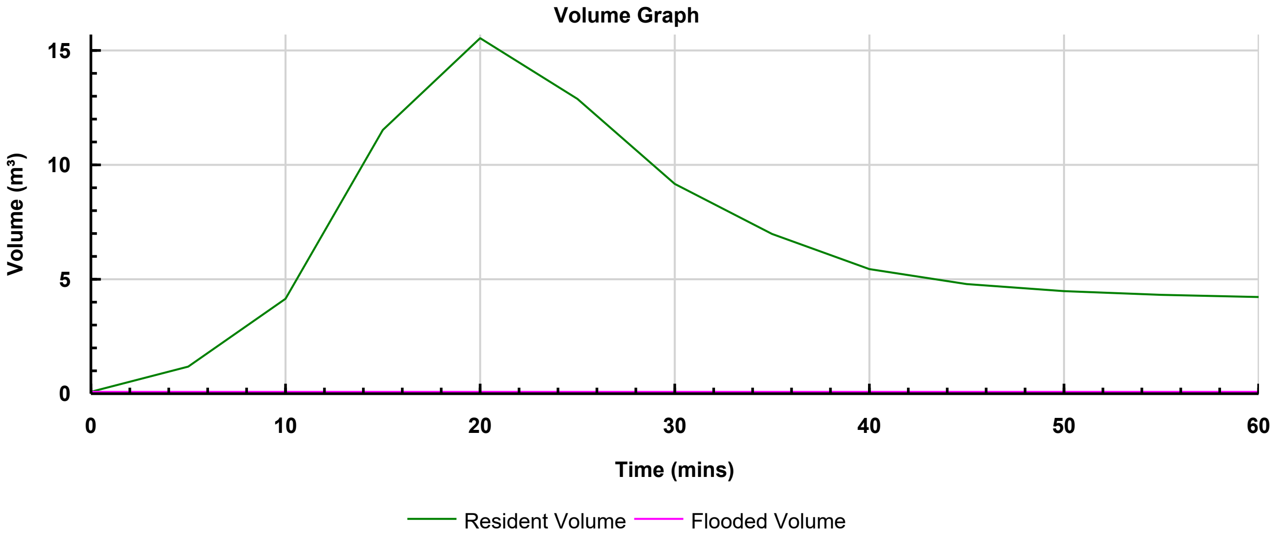
Project: HWTWRP IPS-G	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Swale
Critical by Return Period: FEH: 30 years: Increase Rainfall (%): +45: 30 mins: Summer

Type : Swale

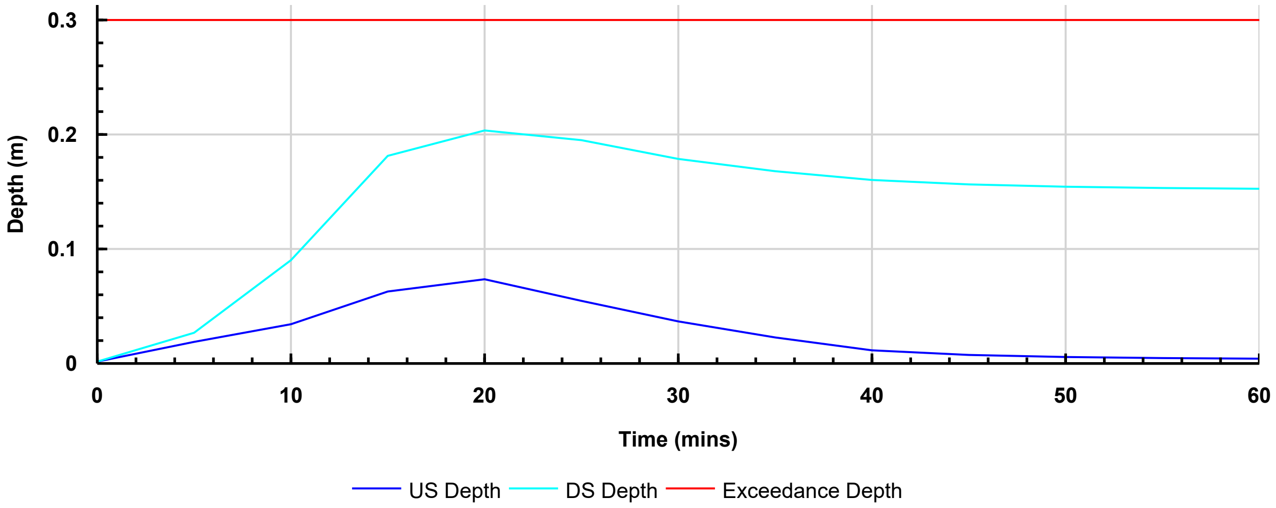
Graphs





Project: HWTWRP IPS-G	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

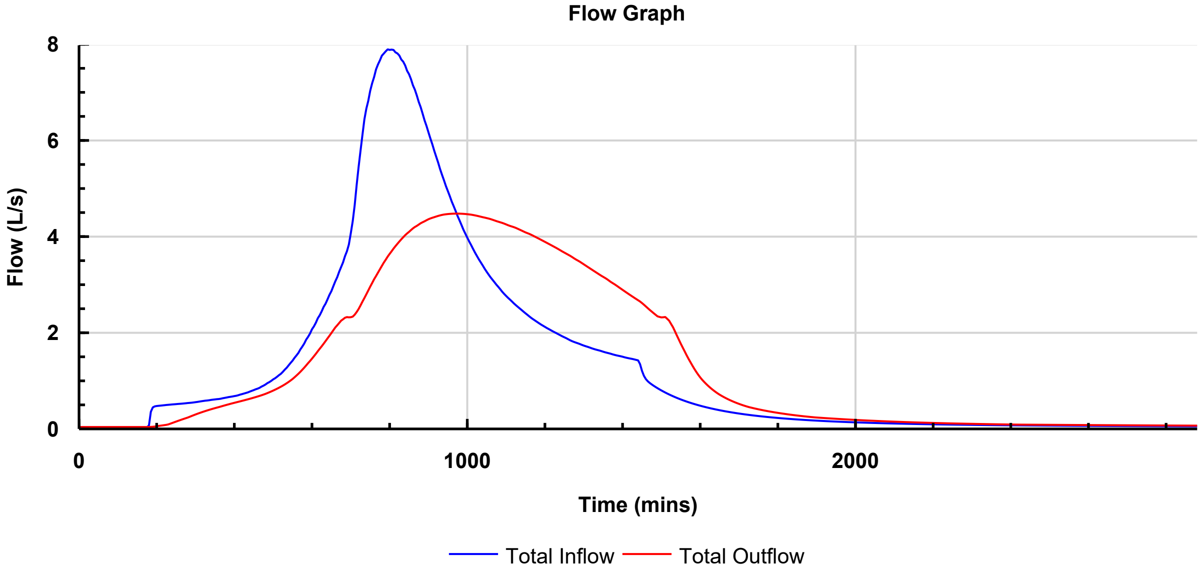
Depth Graph

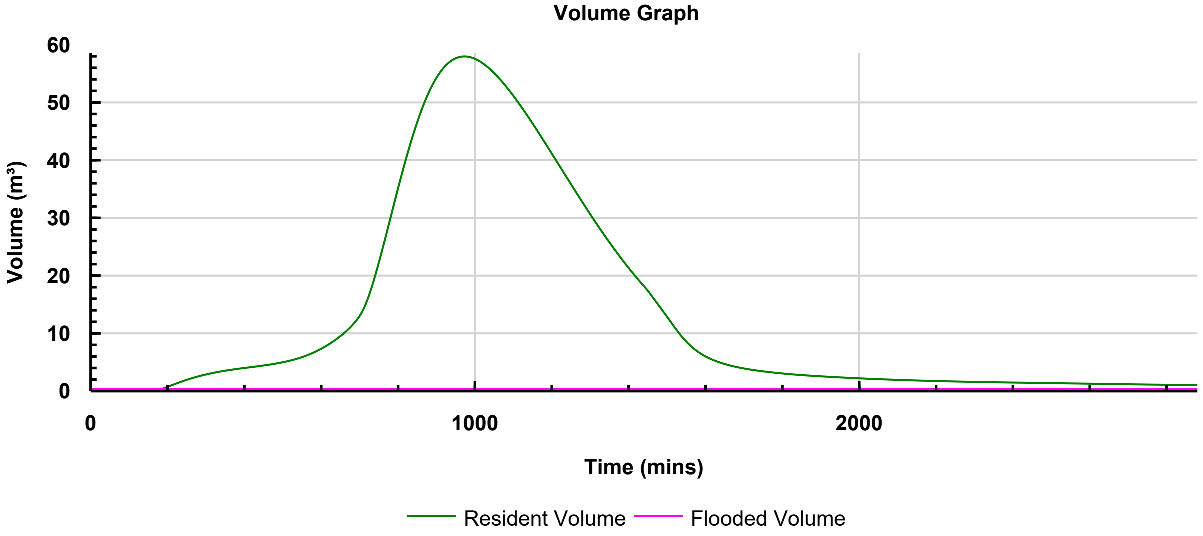


Detention Basin
Critical by Return Period: FEH: 30 years: Increase Rainfall (%): +45: 1440 mins: Summer

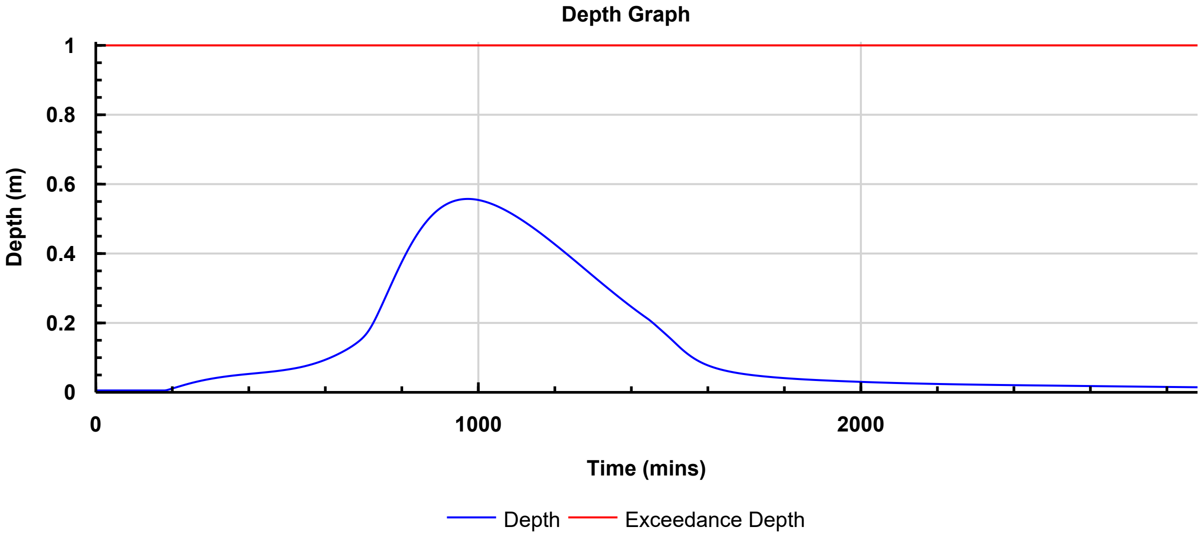
Type : Tank

Graphs





Project: HWTWRP IPS-G	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		



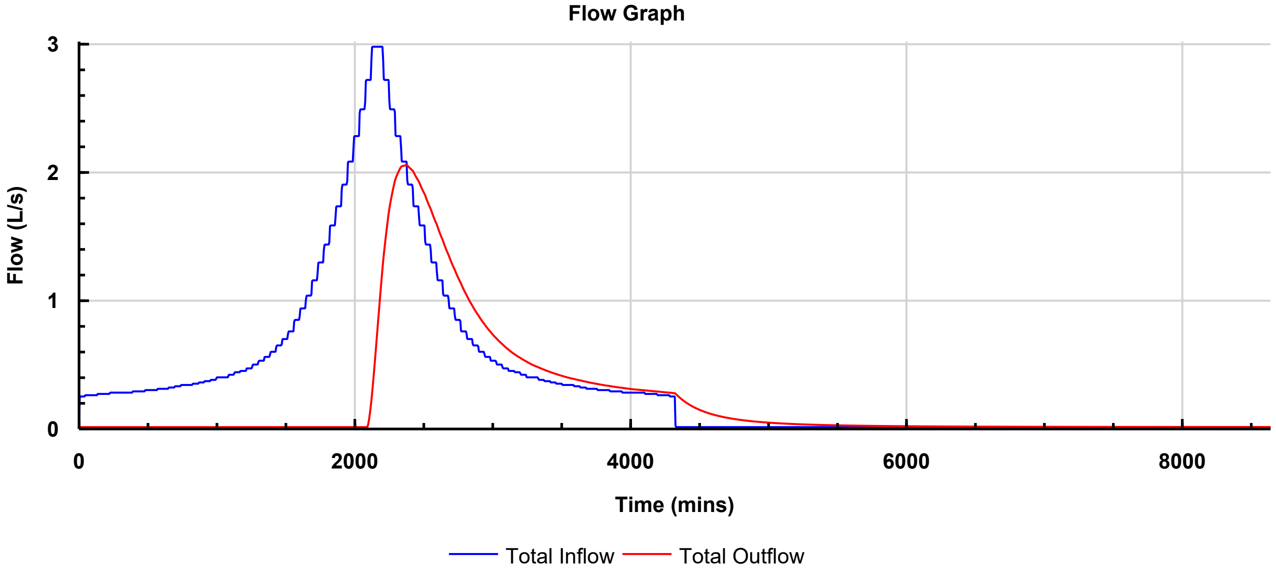
Created in InfoDrainage 2025.5

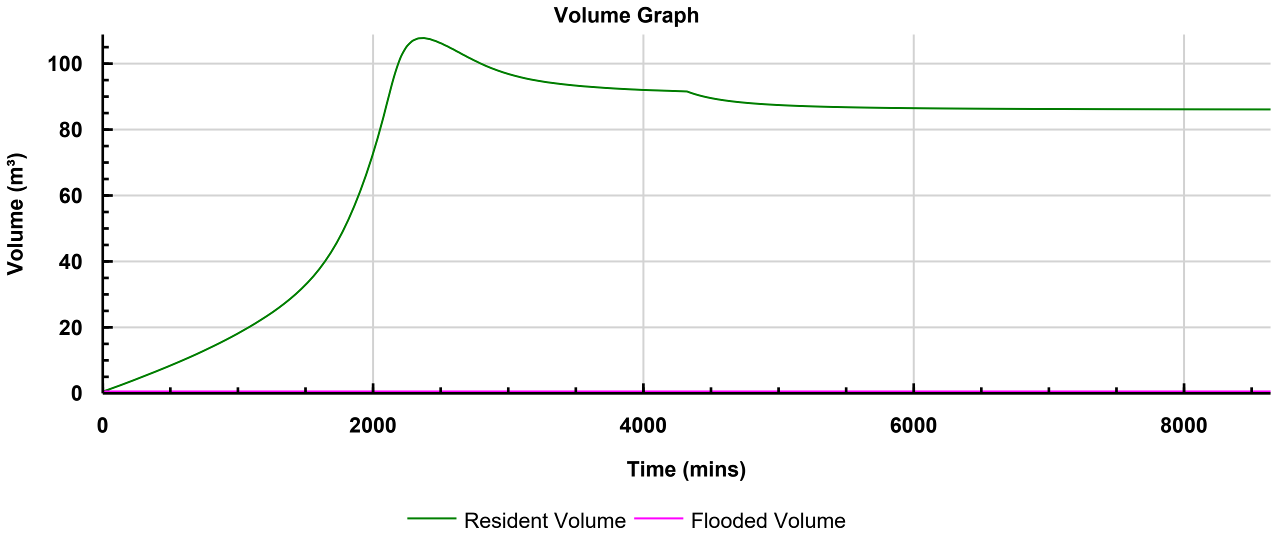
Project: HWTWRP IPS-G	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Loose Gravel Cover
Critical by Return Period: FEH: 2 years: Increase Rainfall (%): +45: 4320 mins: Summer

Type : Tank

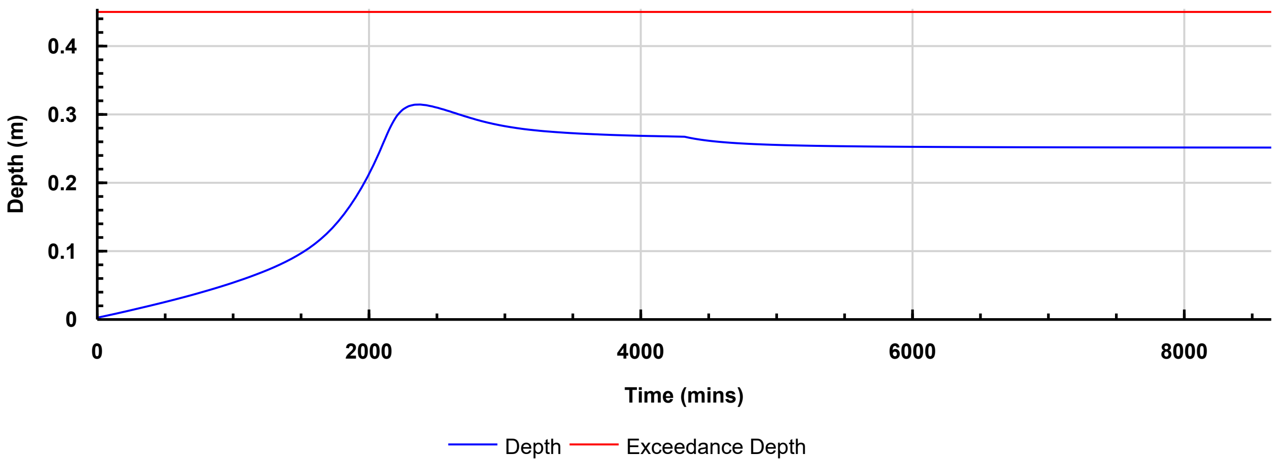
Graphs





Project: HWTWRP IPS-G	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Depth Graph

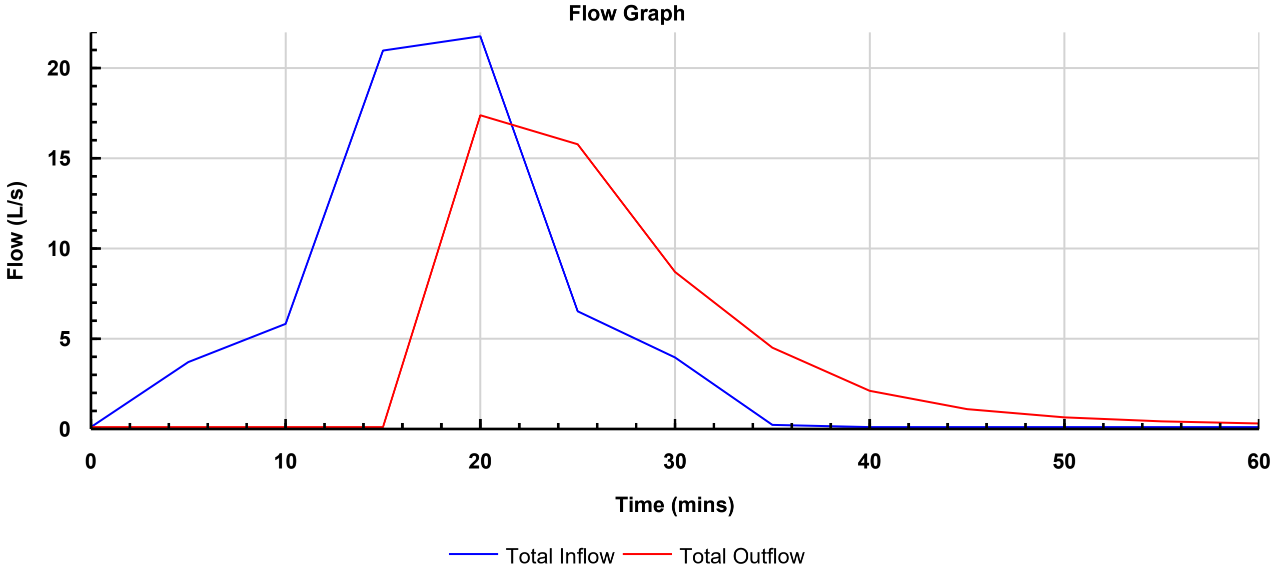


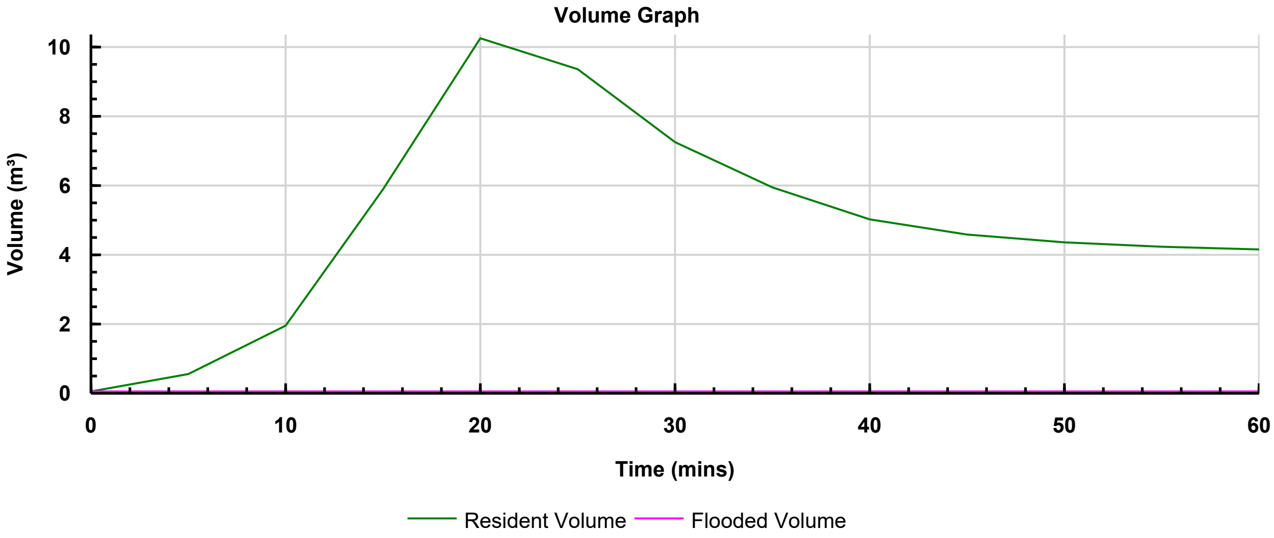
Project: HWTWRP IPS-G	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Swale
Critical by Return Period: FEH: 2 years: Increase Rainfall (%): +45: 30 mins: Summer

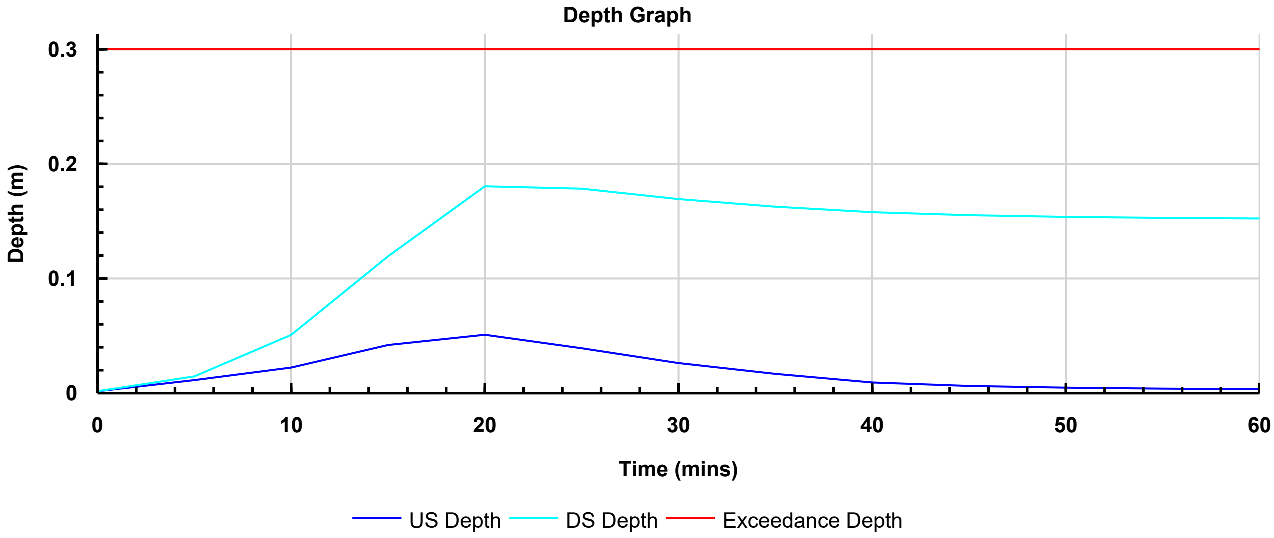
Type : Swale

Graphs





Project: HWTWRP IPS-G	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

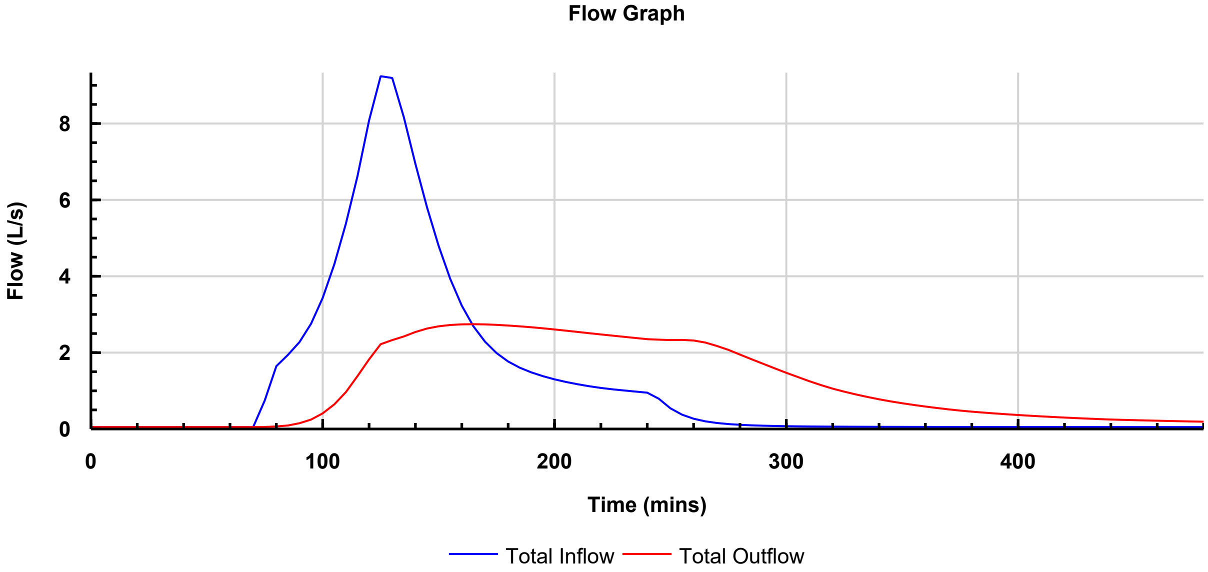


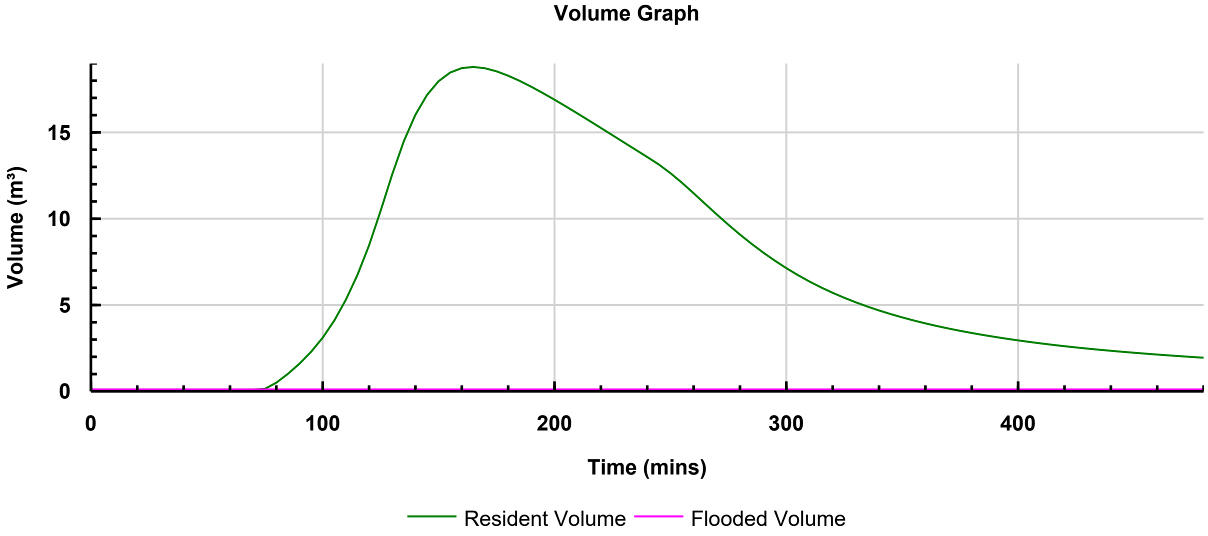
Project: HWTWRP IPS-G	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Detention Basin
Critical by Return Period: FEH: 2 years: Increase Rainfall (%): +45: 240 mins: Summer

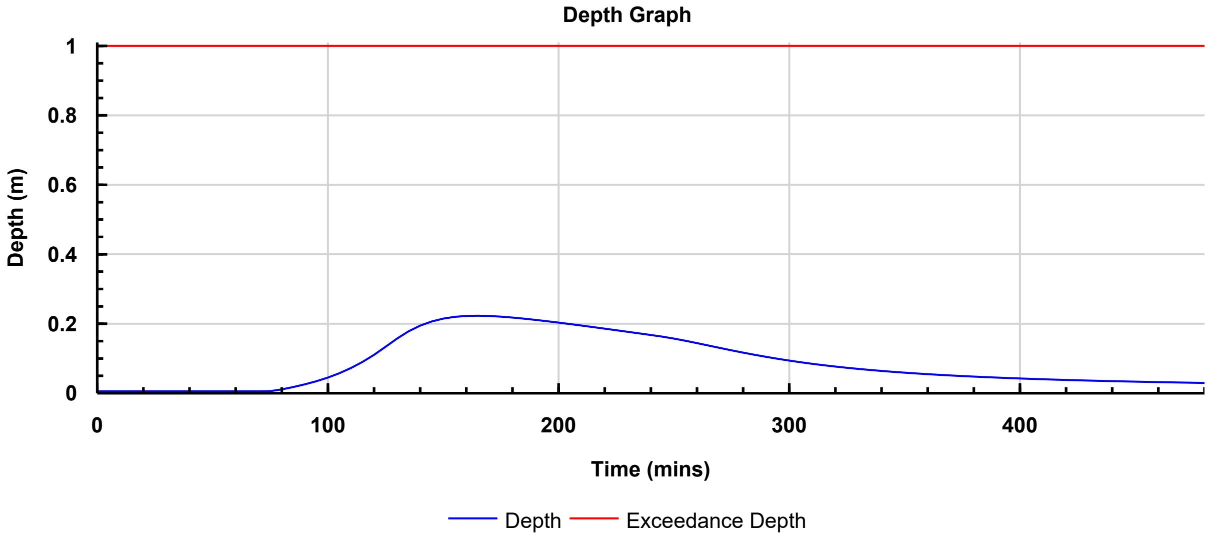
Type : Tank

Graphs





Project: HWTWRP IPS-G	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		



APPENDIX D.4 - BPT-K InfoDrainage Results

Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Title: Rainfall Analysis Criteria	Company Address:		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FEH

Type: FEH

Site Location	GB 452817 118499 SU 52817 18499
Rainfall Version	2022
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
100.0	45.000
30.0	45.000
2.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Project:
HWTWRP
BPT-K

Date:
28/10/2025

Designed by:
WB

Checked by:
KL

Approved By:
KL

Report Details:
Type: Inflows
Storm Phase: Phase

Company Address:

Building Runoff

Type : Catchment Area

Area (ha)	0.16

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Access Road Runoff

Type : Catchment Area

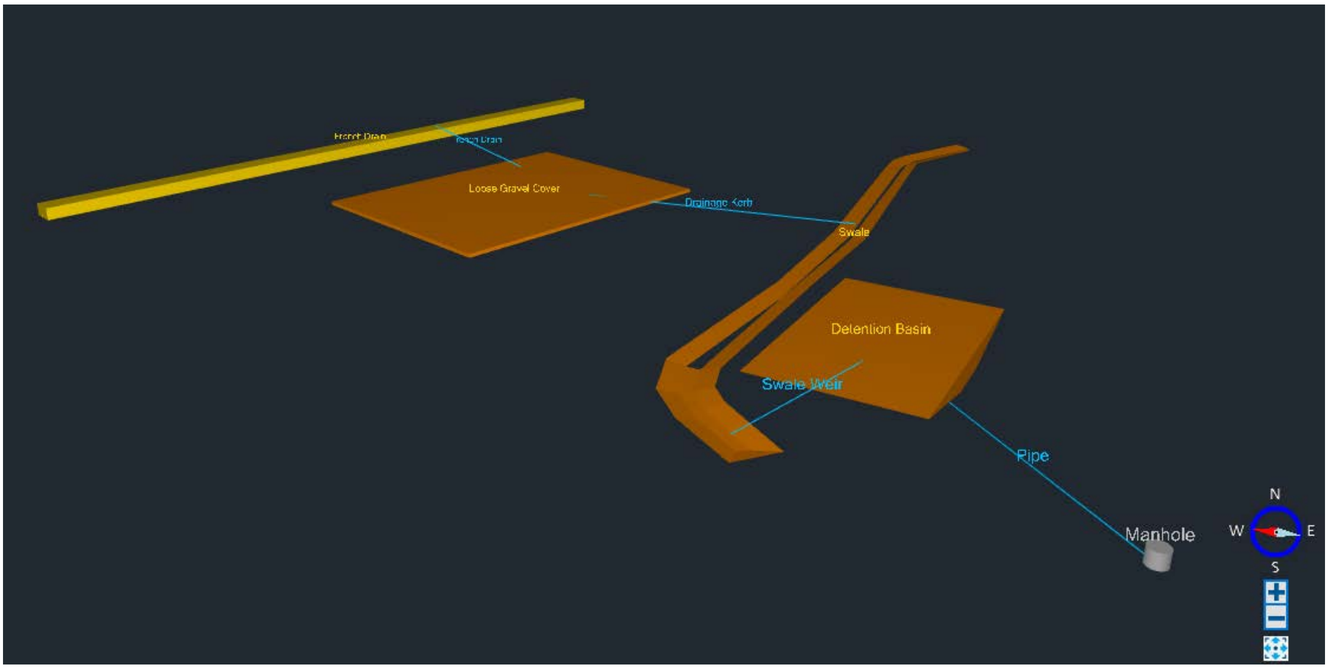
Area (ha)	0.08

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.950
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address:		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Access Road Runoff	Swale		Time of Concentration	0.08	100	0	100	0.08
Building Runoff	French Drain		Time of Concentration	0.16	100	0	100	0.16
TOTAL		**0.0**		**0.24**				**0.24**



Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

French Drain Type : Infiltration Trench

Dimensions

Exceedance Level (m)	68.500
Depth (m)	1.000
Base Level (m)	67.500
Freeboard (mm)	0
Porosity (%)	30
Length (m)	60.000
Long. Slope (1:X)	200.00
Width (m)	2.000
Total Volume (m³)	36.742

Under Drain

Height Above Base (m)	0.100
Diameter (mm)	150
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Building Runoff
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	French Drain
Outlet Type	Orifice
Diameter (m)	0.600
Coefficient of Discharge	0.600
Invert Level (m)	67.500

Advanced

Conductivity (m/hr)	0.001

Project:	Date:		
HWTWRP BPT-K	28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Loose Gravel Cover

Type : Tank

Dimensions

Exceedance Level (m)	67.300
Depth (m)	0.300
Base Level (m)	67.000
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	30
Average Slope (1:X)	0.00
Total Volume (m³)	41.850

Depth (m)	Area (m²)	Volume (m³)
0.000	465.00	0.000
0.300	465.00	41.850

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	French Drain
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Drainage Kerb
Outlet Type	Weir

Width (m)	0.450
Coefficient of Discharge	0.544
Crest Level (m)	67.000

Advanced

Perimeter	Circular
Length (m)	24.820

Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Swale

Type : Swale

Swale

Exceedance Level (m)	66.500
Depth (m)	0.300
Base Level (m)	66.200
Top Width (m)	2.000
Side Slope (1:X)	3.00
Base Width (m)	0.200
Freeboard (mm)	0
Length (m)	100.000
Long. Slope (1:X)	500.00
Filtration Rate (m/hr)	0.0
Friction Scheme	Manning's n
n	0.03
Total Volume (m³)	33.000

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Access Road Runoff
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Drainage Kerb
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Swale Weir
Outlet Type	Weir

Width (m)	1.000
Coefficient of Discharge	0.544
Crest Level (m)	66.400

Advanced

Swale

Porosity (%)	100

Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Detention Basin

Type : Tank

Dimensions

Exceedance Level (m)	66.200
Depth (m)	1.500
Base Level (m)	64.700
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	2.94
Total Volume (m³)	164.721

Depth (m)	Area (m²)	Volume (m³)
0.000	40.00	0.000
1.500	200.00	164.721

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Swale Weir
Bypass Destination	(None)
Capacity Type	No Restriction

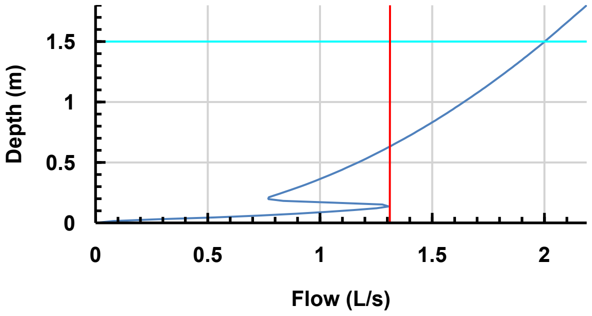
Outlets

Outlet

Outgoing Connection	Pipe
Outlet Type	Hydro-Brake®

Invert Level (m)	64.700
Design Depth (m)	1.500
Design Flow (L/s)	2.0
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☐

Unit Reference	CHE-0058-2000-1500-2000



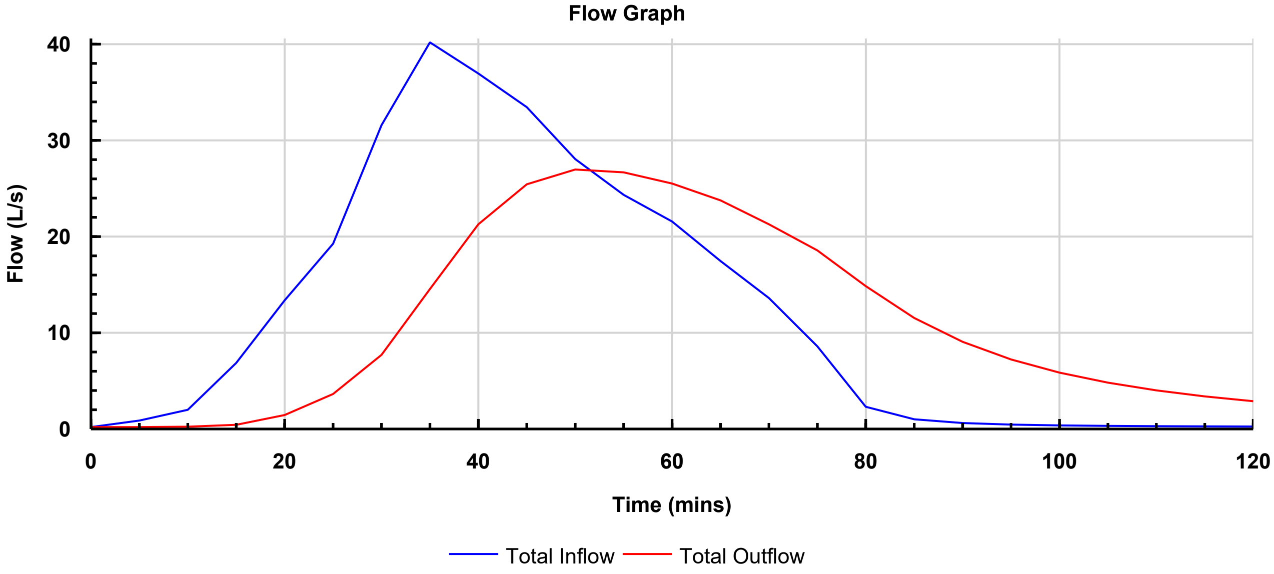
Advanced

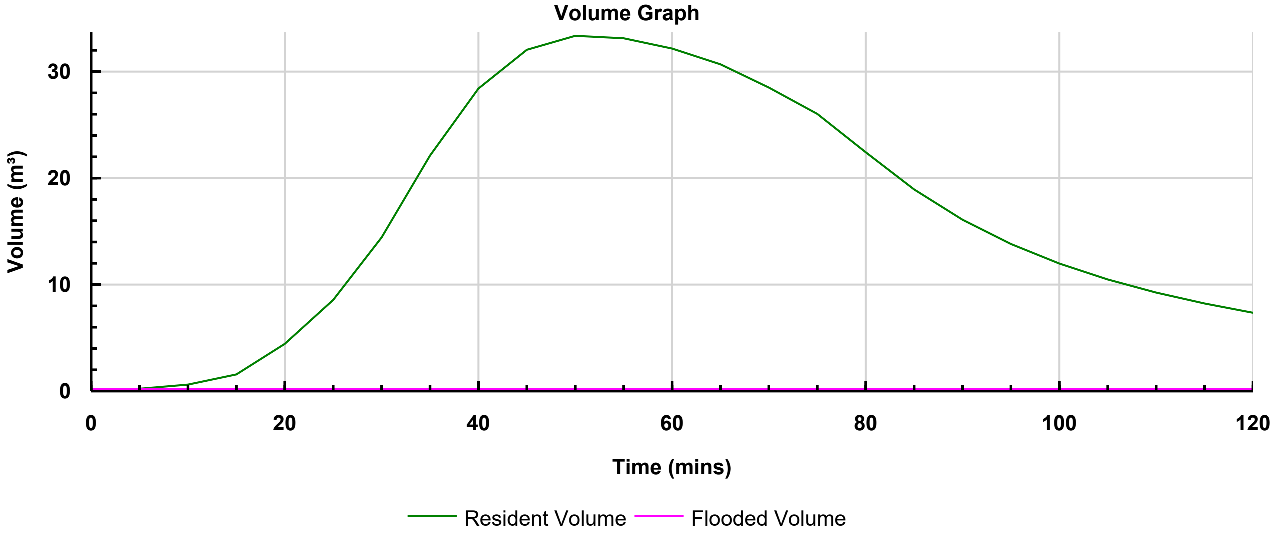
Perimeter	Circular
Length (m)	11.017

Loose Gravel Cover
Critical by Return Period: FEH: 100 years: Increase Rainfall (%): +45: 60 mins: Summer

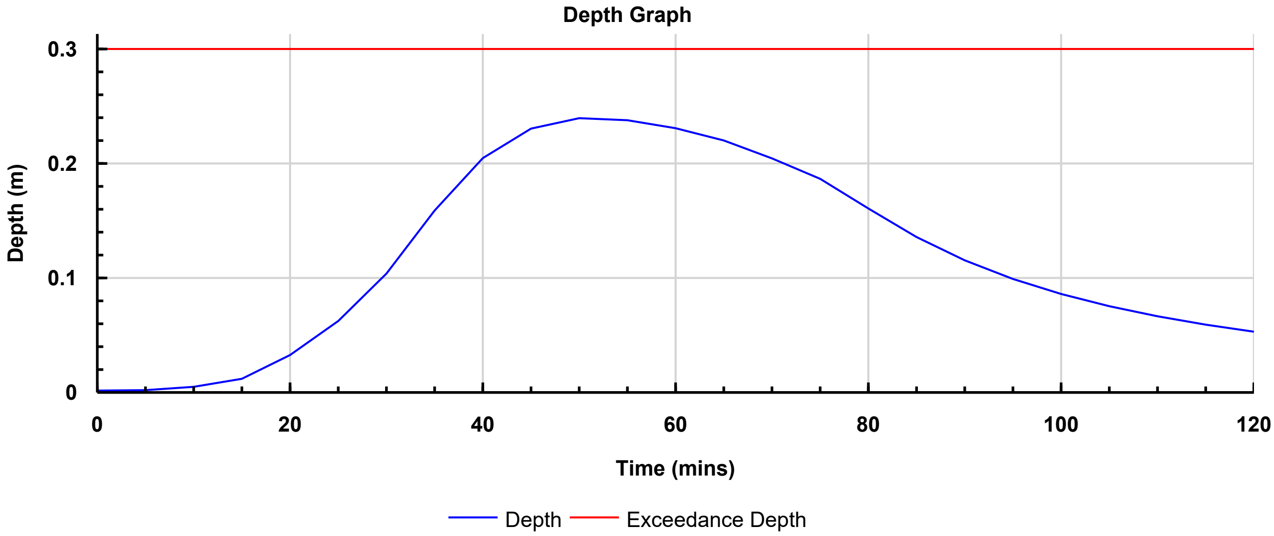
Type : Tank

Graphs





Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

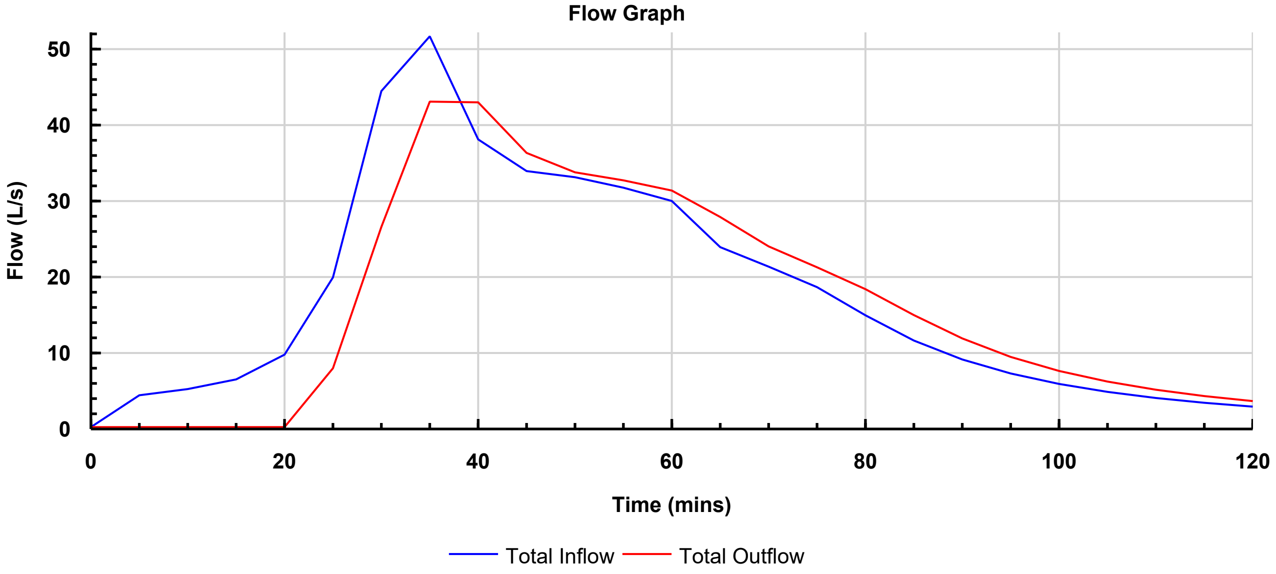


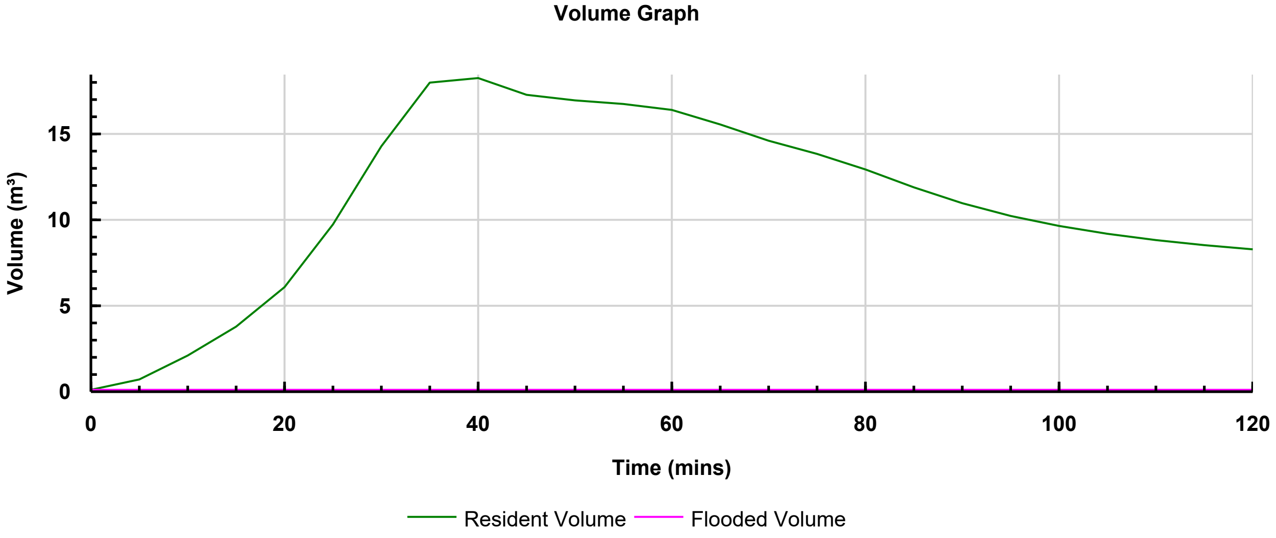
Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Swale
Critical by Return Period: FEH: 100 years: Increase Rainfall (%): +45: 60 mins: Summer

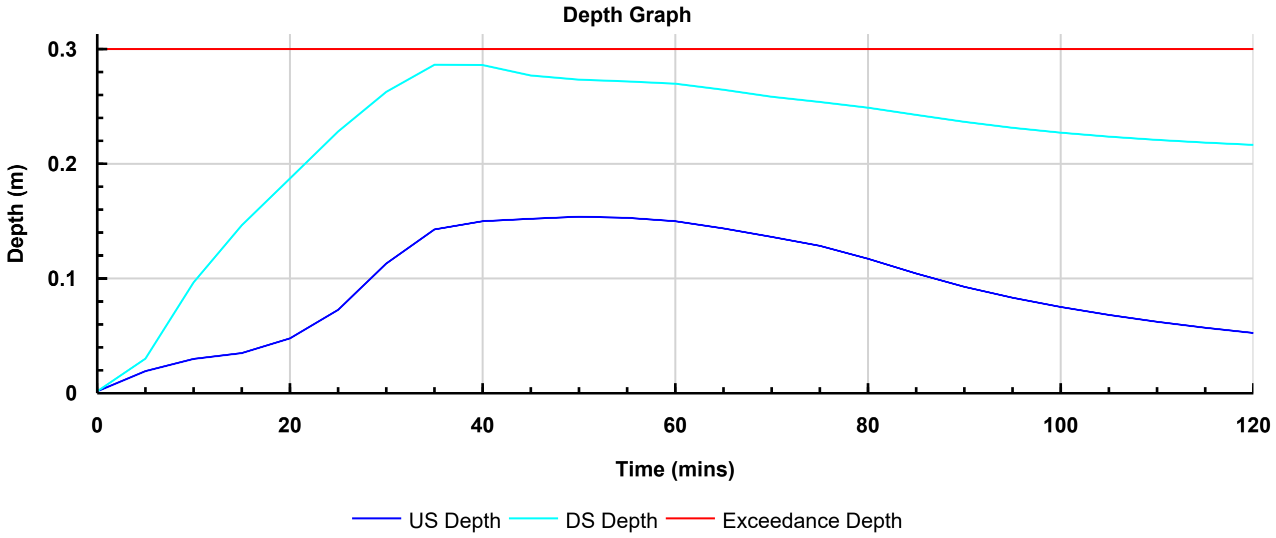
Type : Swale

Graphs





Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

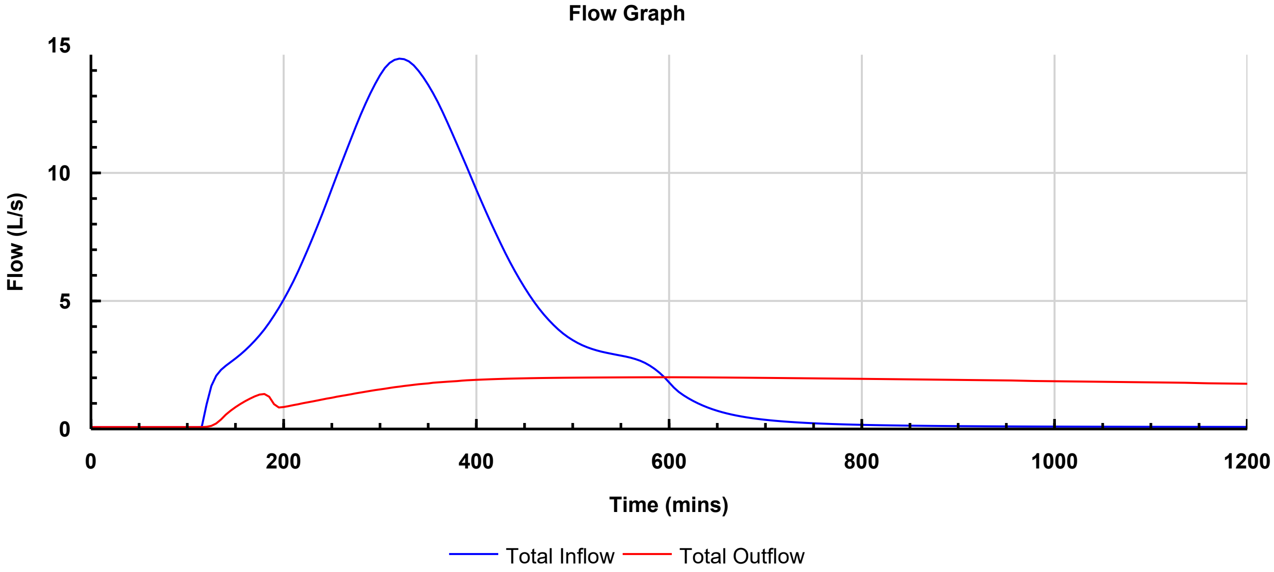


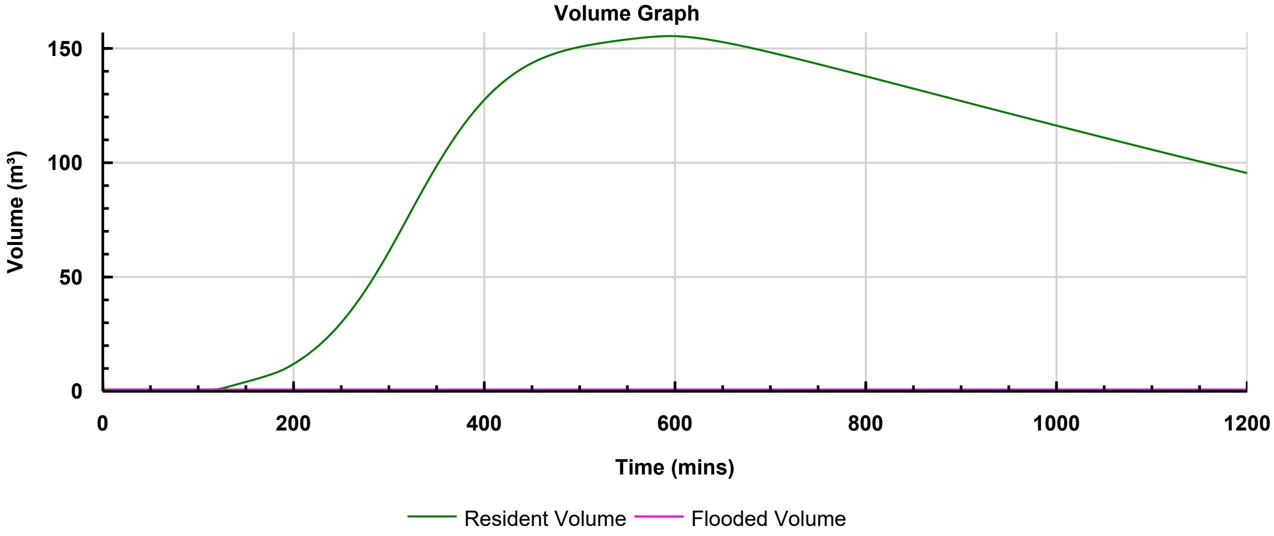
Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Detention Basin
Critical by Return Period: FEH: 100 years: Increase Rainfall (%): +45: 600 mins: Winter

Type : Tank

Graphs





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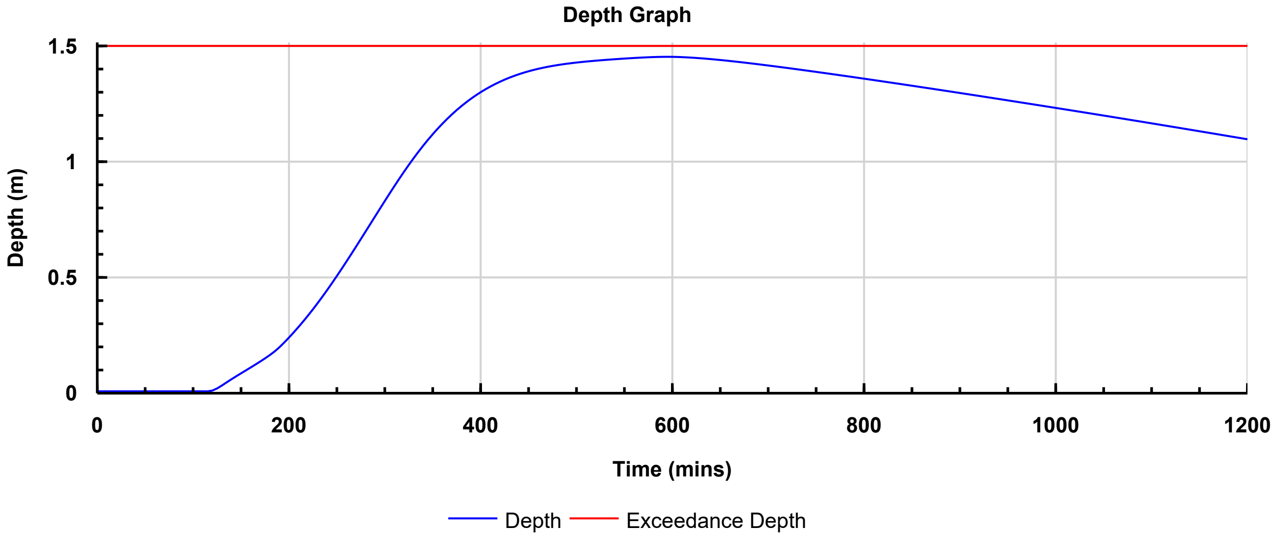
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

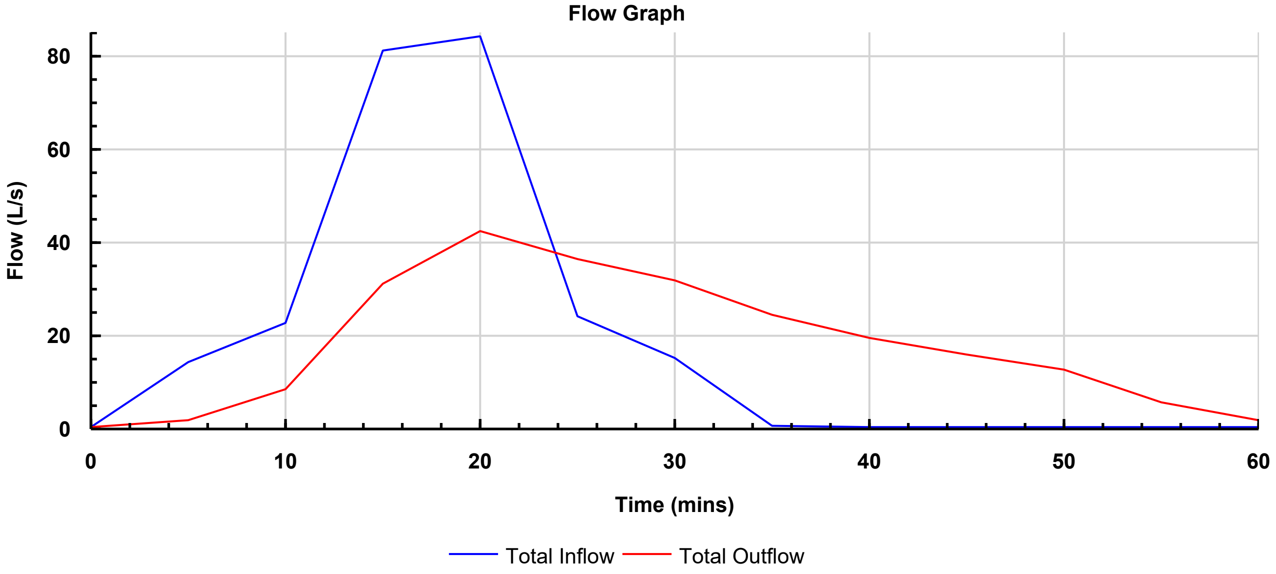


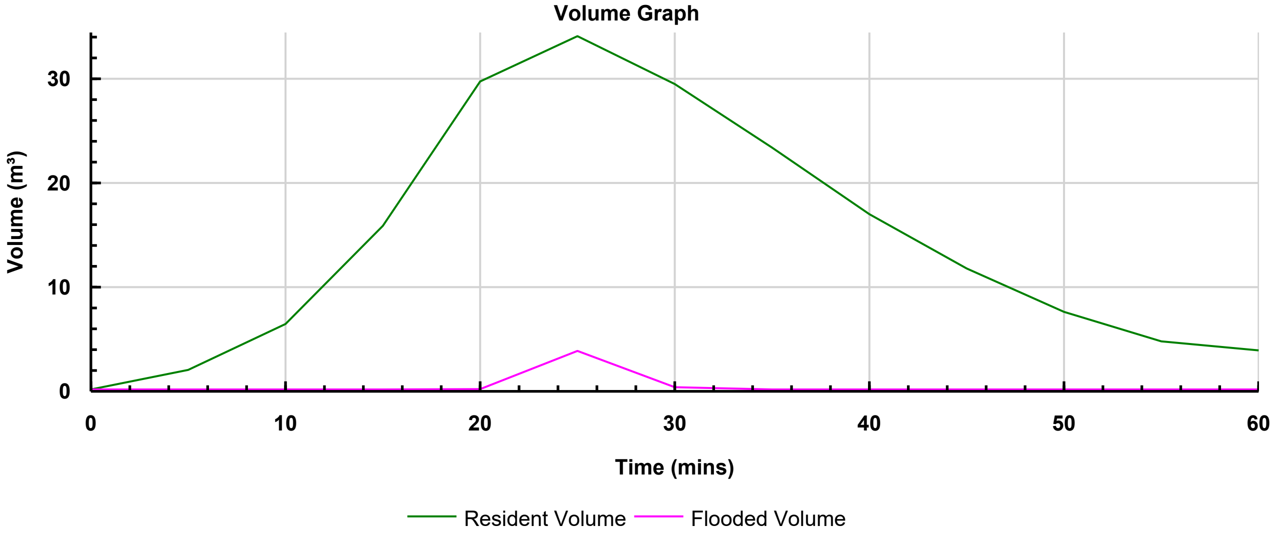
Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

French Drain
Critical by Return Period: FEH: 100 years: Increase Rainfall (%): +45: 30 mins: Summer

Type : Infiltration Trench

Graphs





Project: HWTWRP BPT-K	Date: 28/10/2025		
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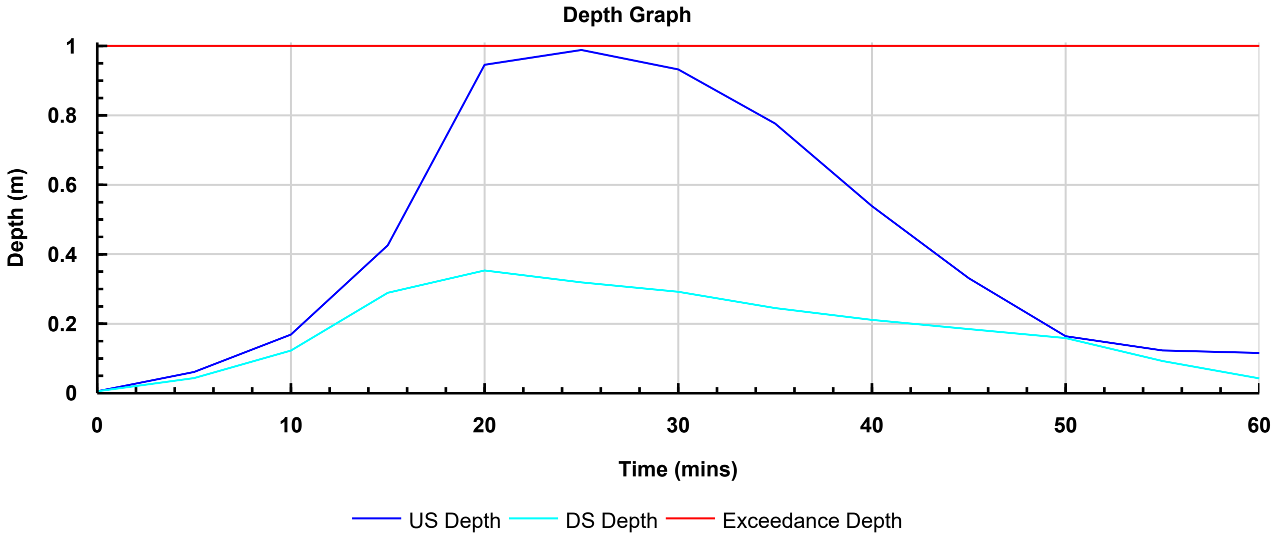
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

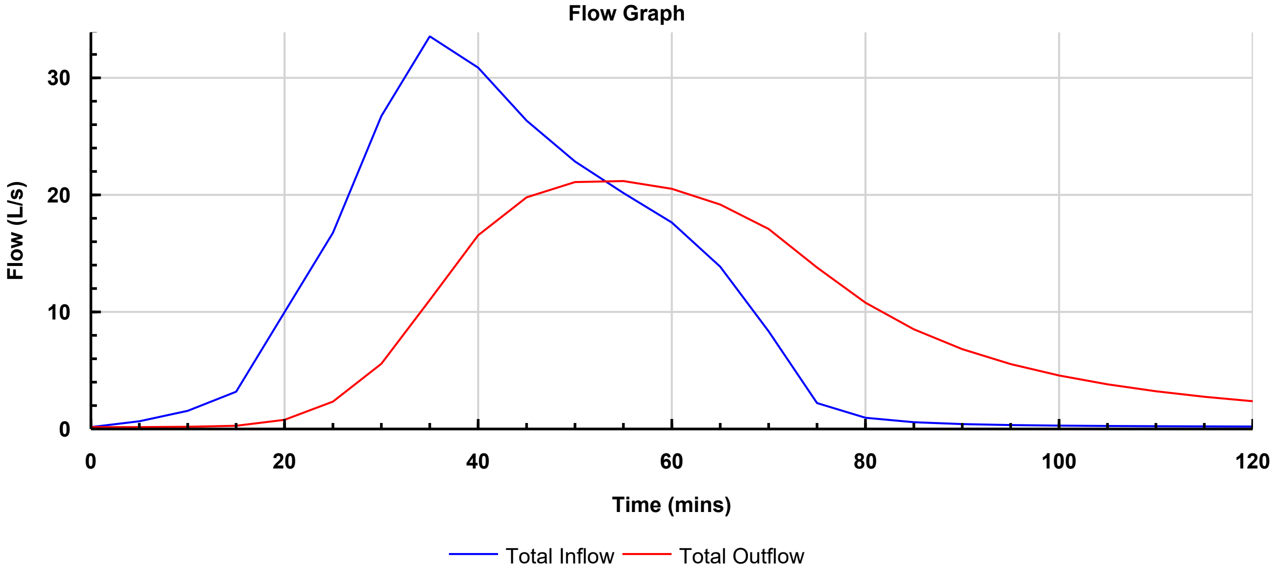


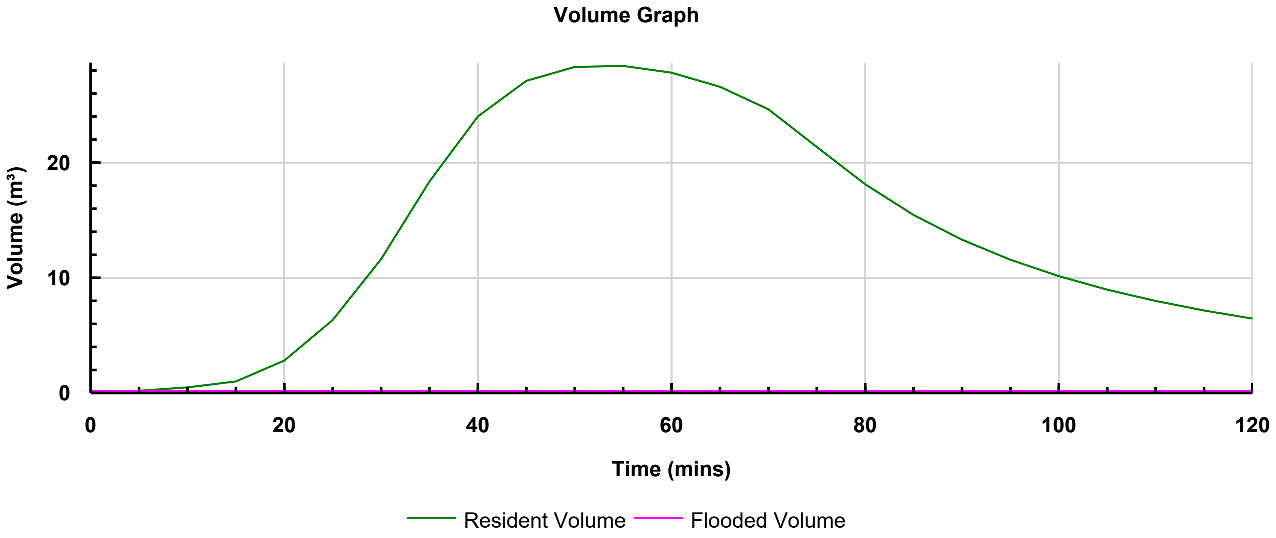
Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Loose Gravel Cover
Critical by Return Period: FEH: 30 years: Increase Rainfall (%): +45: 60 mins: Summer

Type : Tank

Graphs





Project: HWTWRP BPT-K	Date: 28/10/2025		
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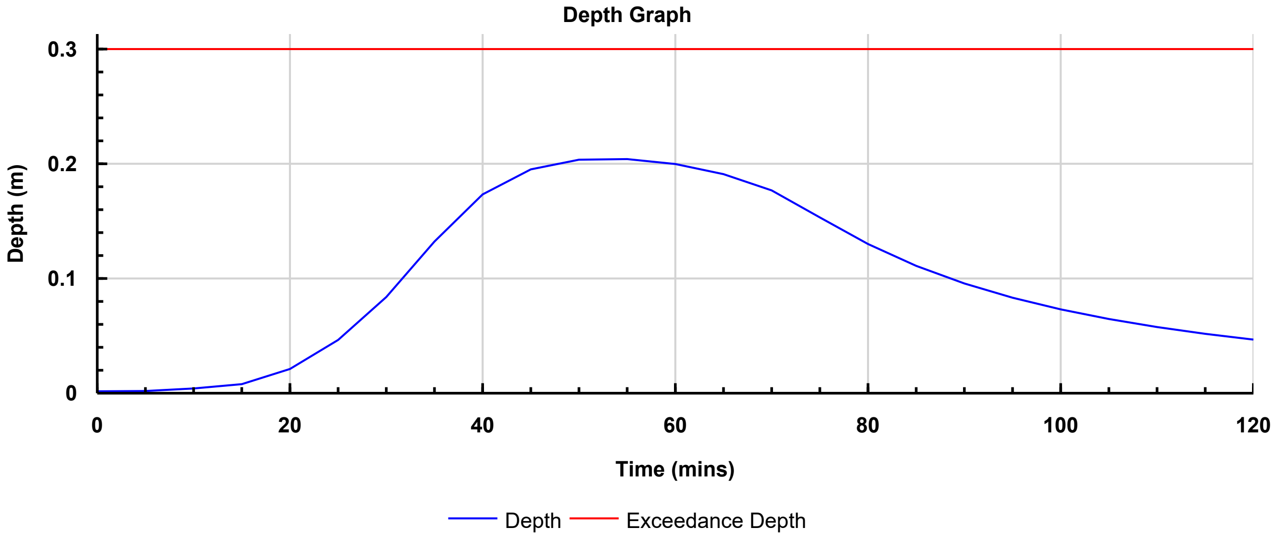
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

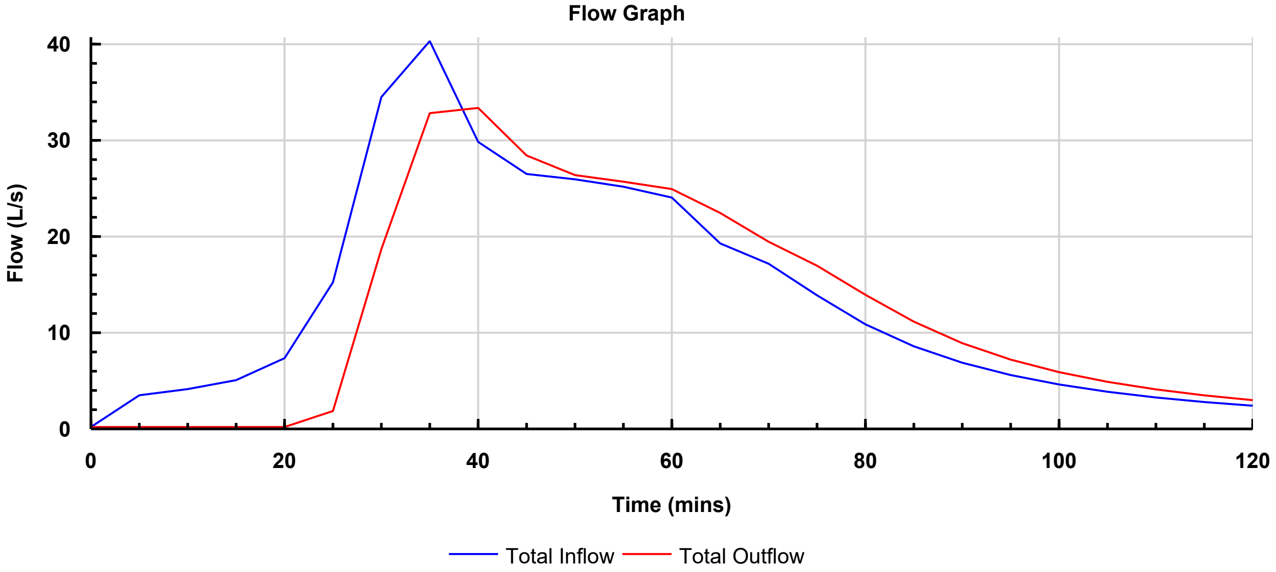


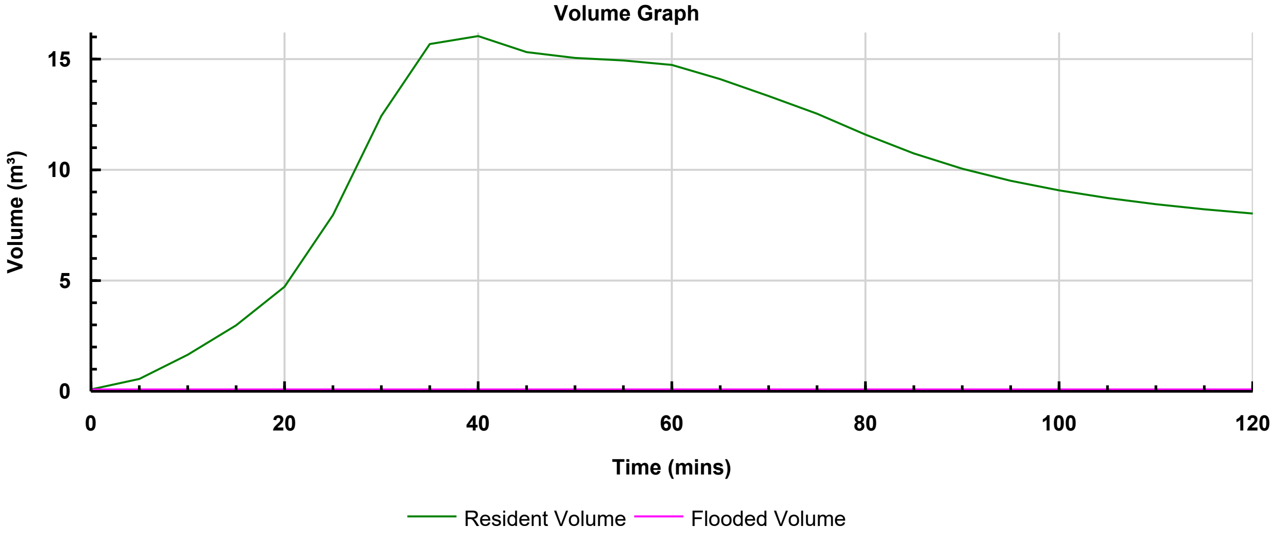
Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Swale
Critical by Return Period: FEH: 30 years: Increase Rainfall (%): +45: 60 mins: Summer

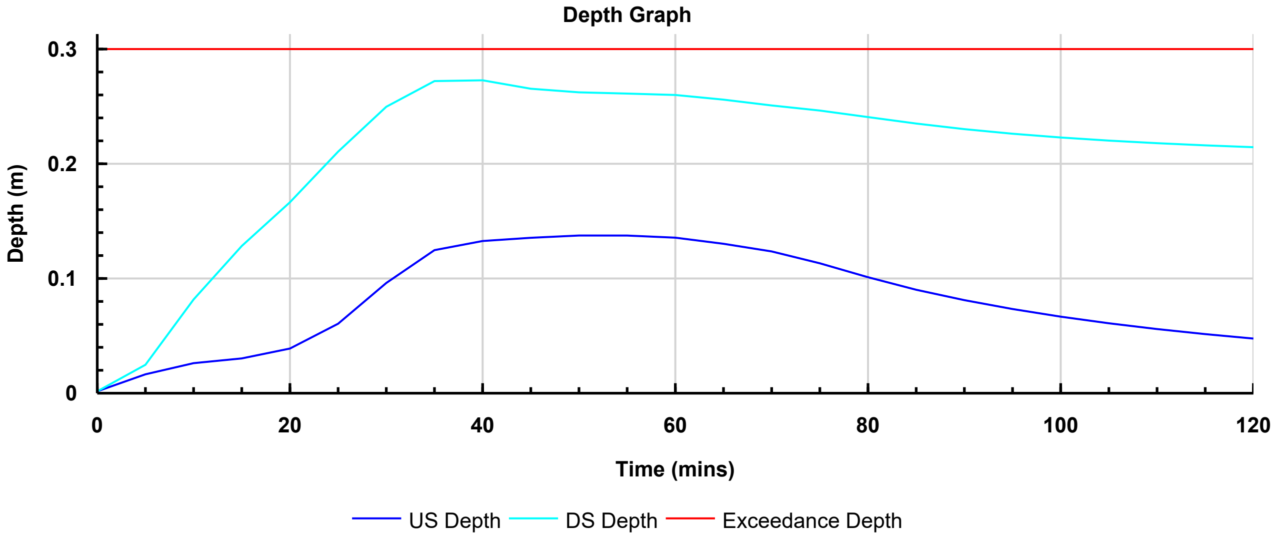
Type : Swale

Graphs





Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

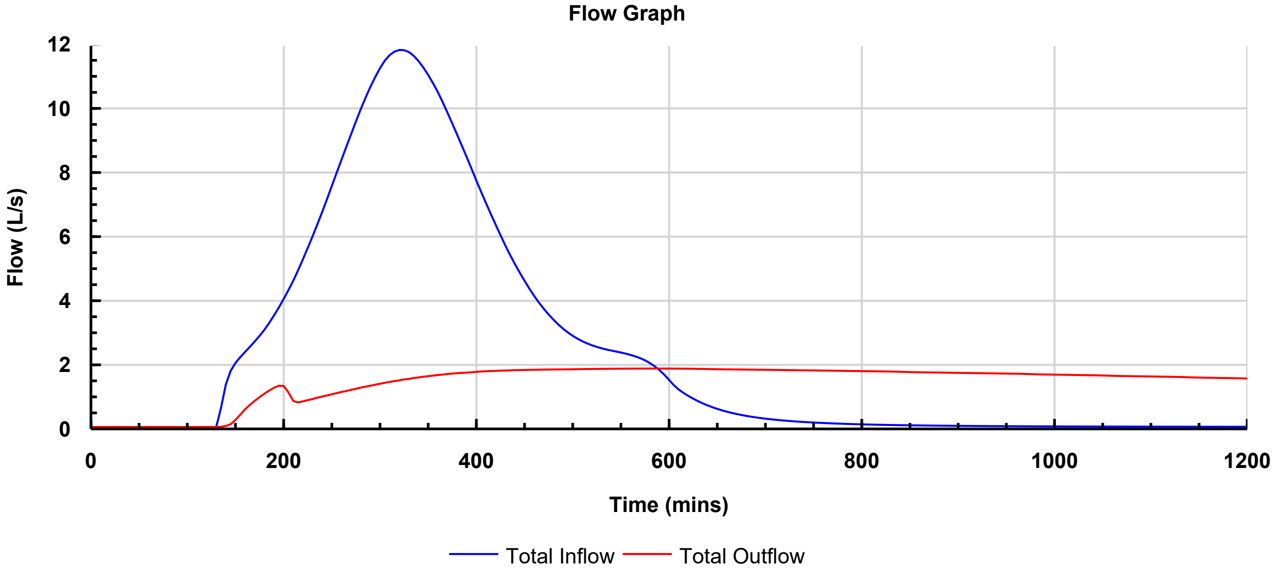


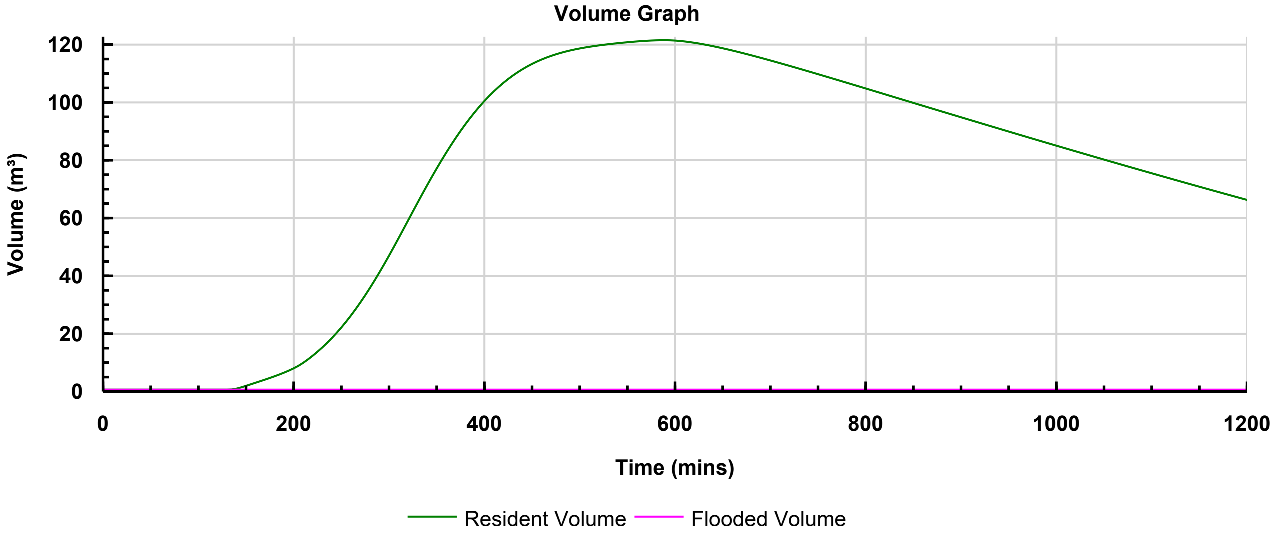
Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Detention Basin
Critical by Return Period: FEH: 30 years: Increase Rainfall (%): +45: 600 mins: Winter

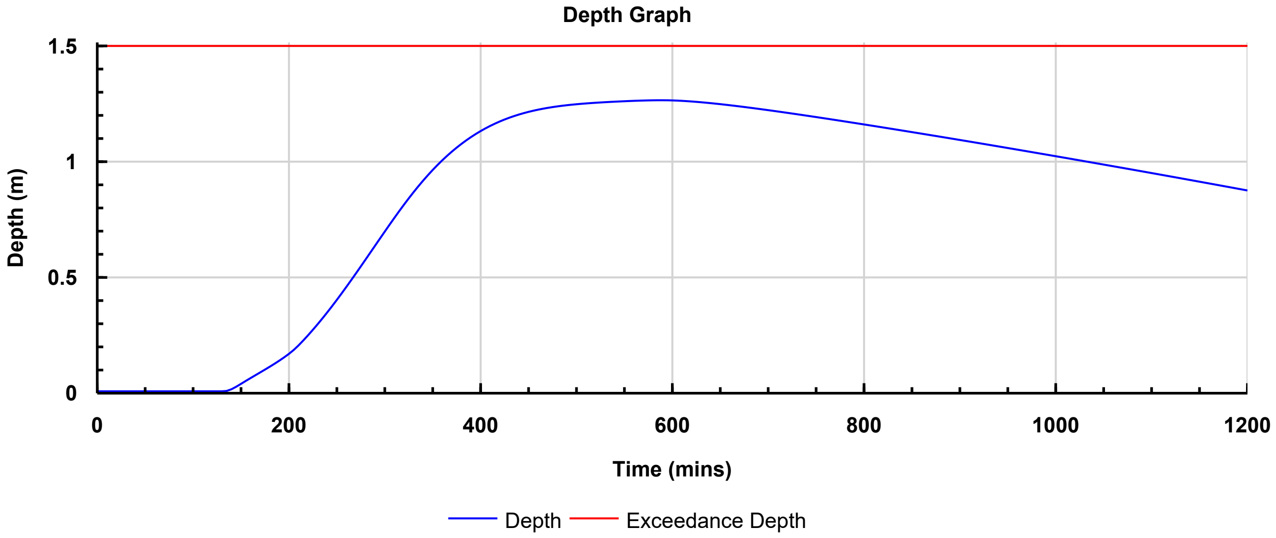
Type : Tank

Graphs





Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

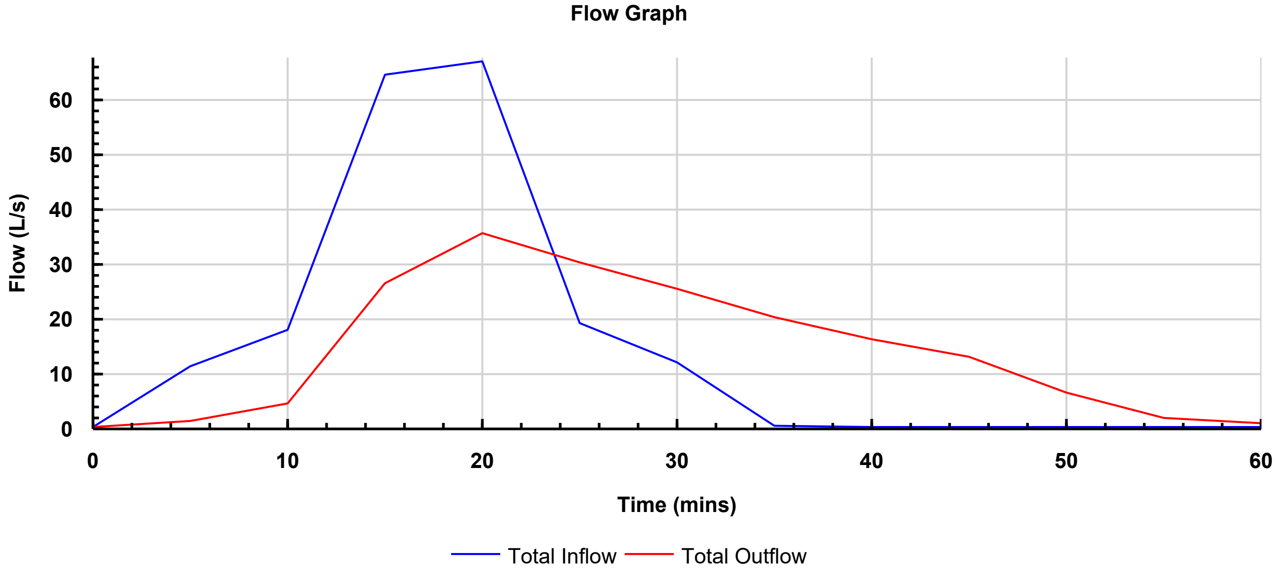


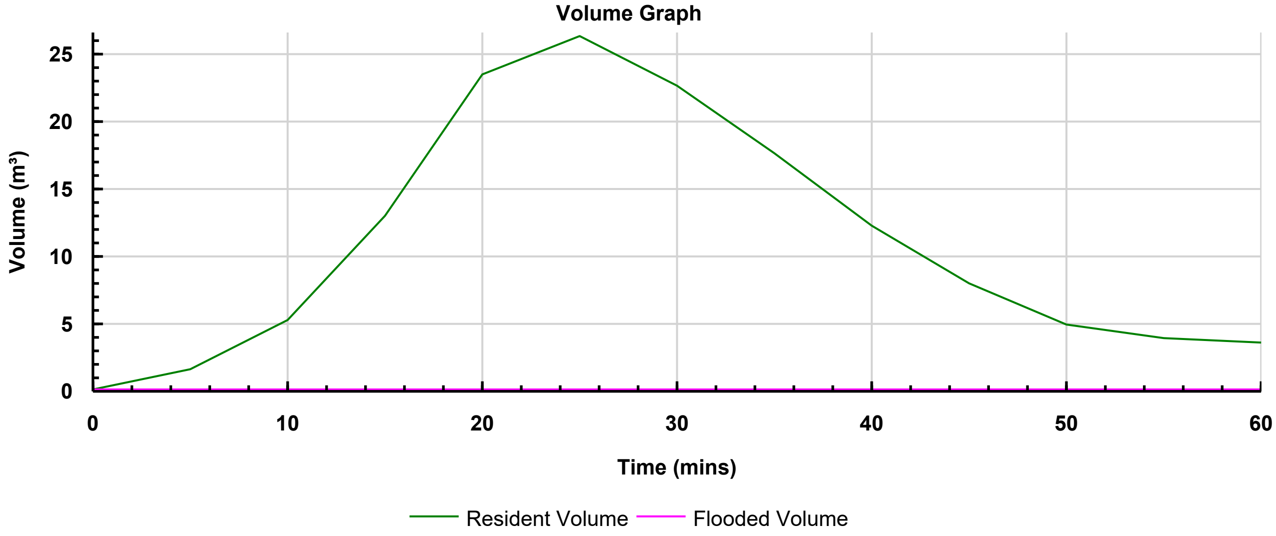
Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

French Drain
Critical by Return Period: FEH: 30 years: Increase Rainfall (%): +45: 30 mins: Summer

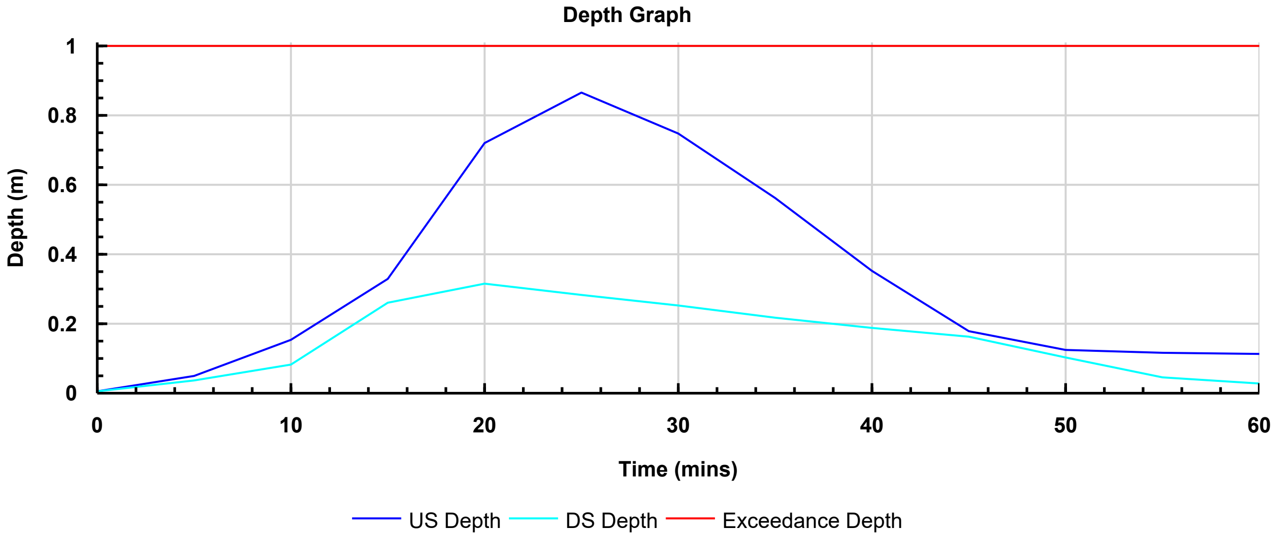
Type : Infiltration Trench

Graphs





Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

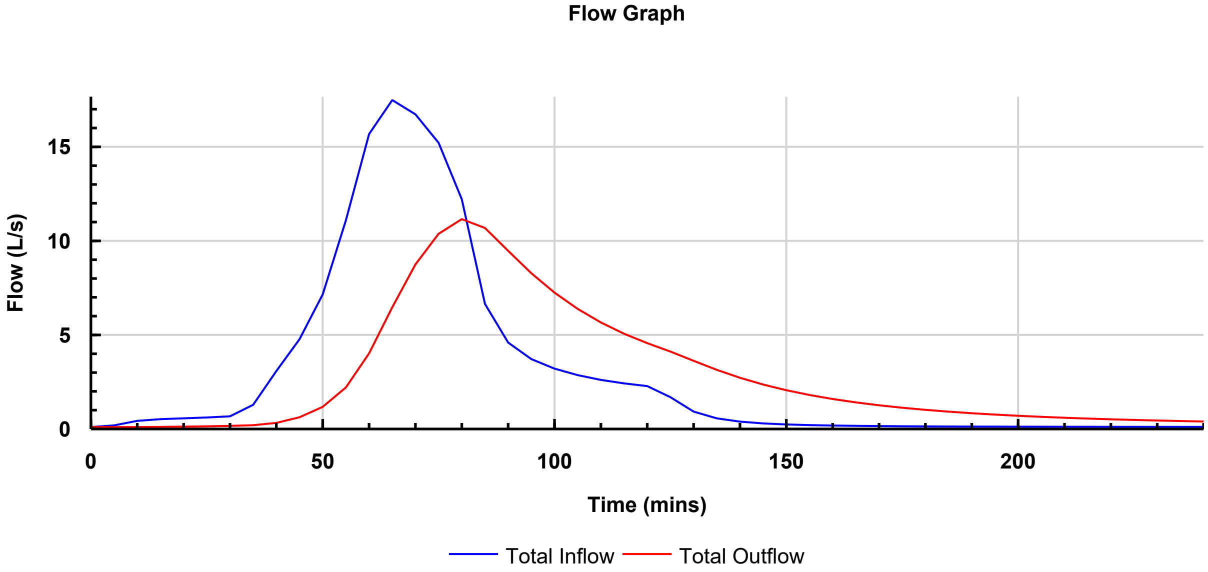


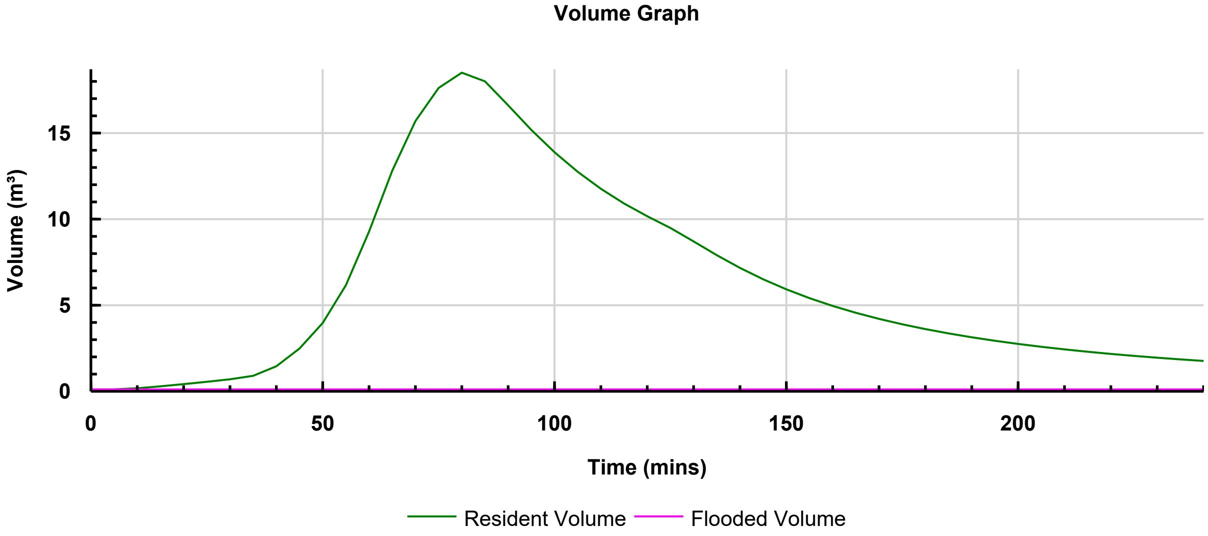
Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Loose Gravel Cover
Critical by Return Period: FEH: 2 years: Increase Rainfall (%): +45: 120 mins: Summer

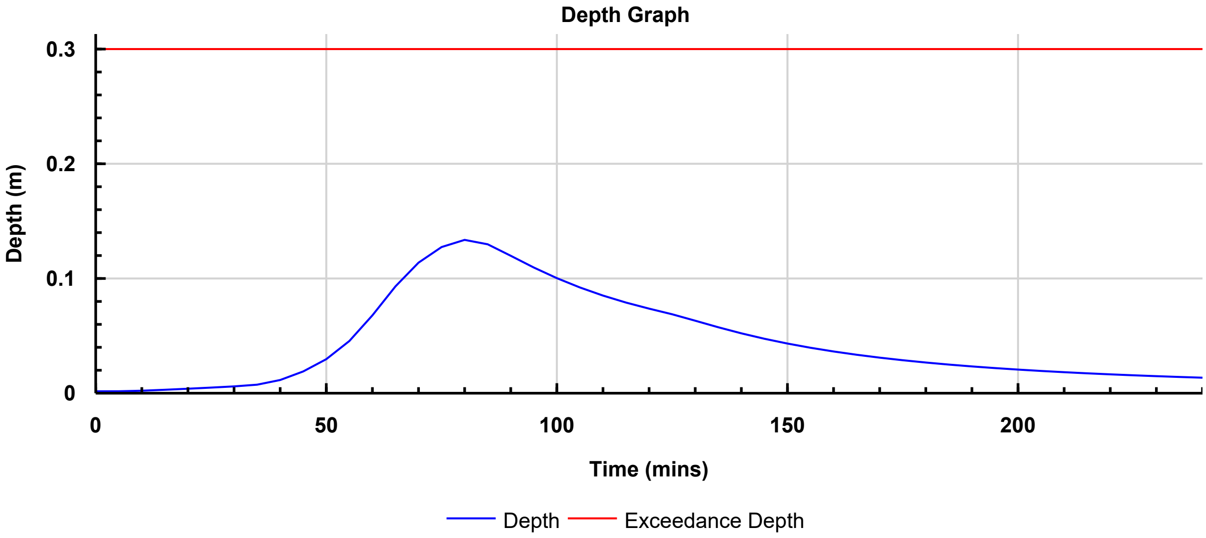
Type : Tank

Graphs





Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		



Project:
HWTWRP
BPT-K

Date:
28/10/2025

Designed by:
WB

Checked by:
KL

Approved By:
KL

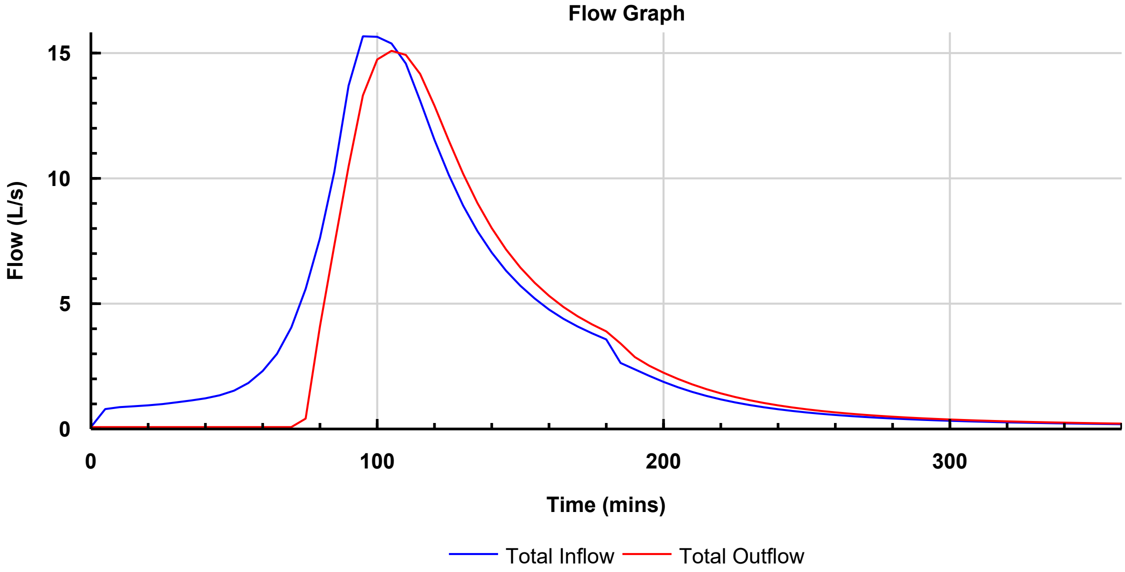
Report Details:
Type: Stormwater Control Results
Storm Phase: Phase

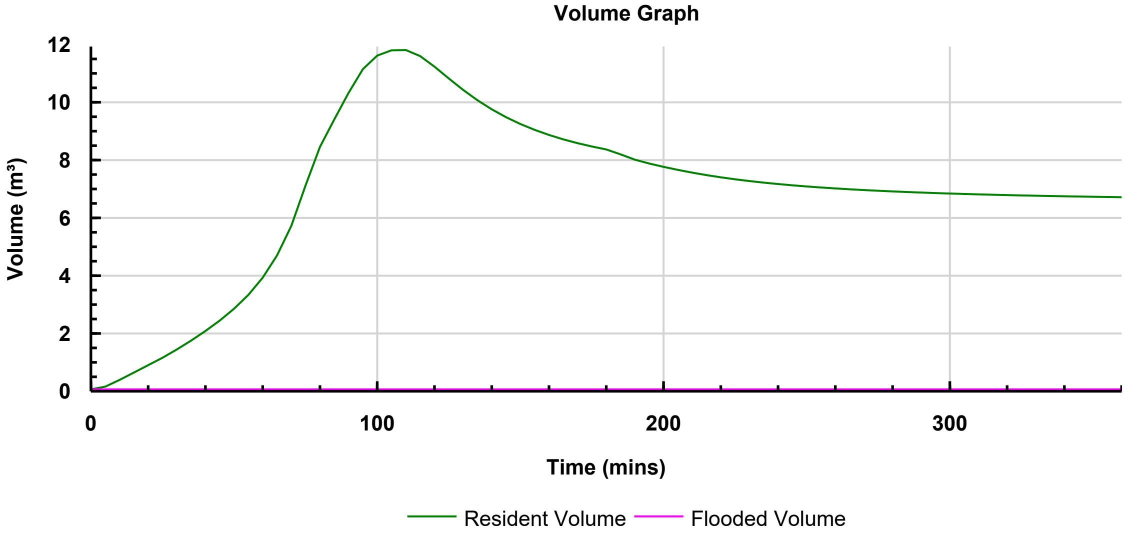
Company Address:

Swale
Critical by Return Period: FEH: 2 years: Increase Rainfall (%): +45: 180 mins: Summer

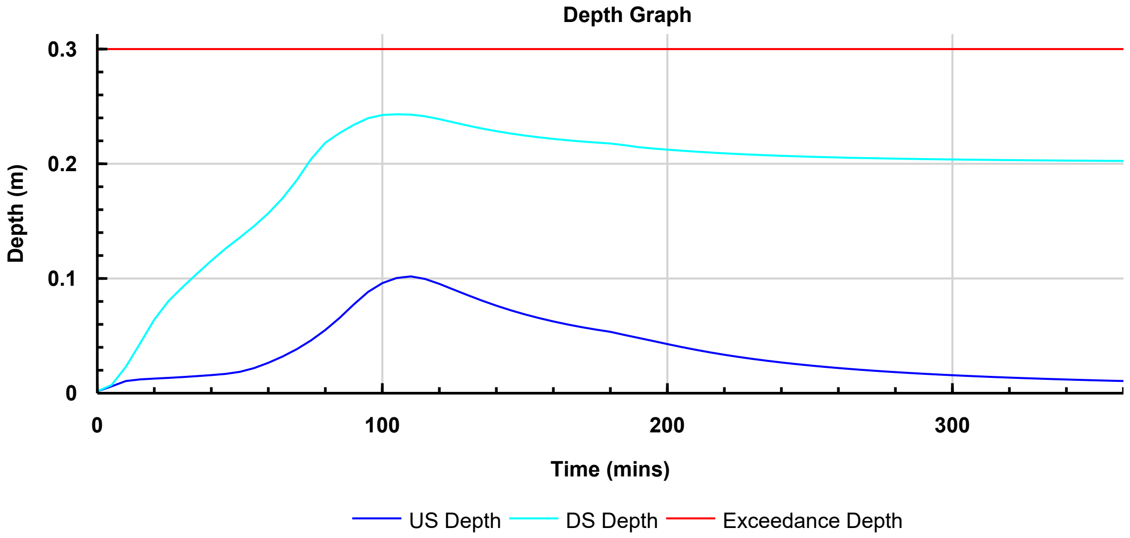
Type : Swale

Graphs





Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

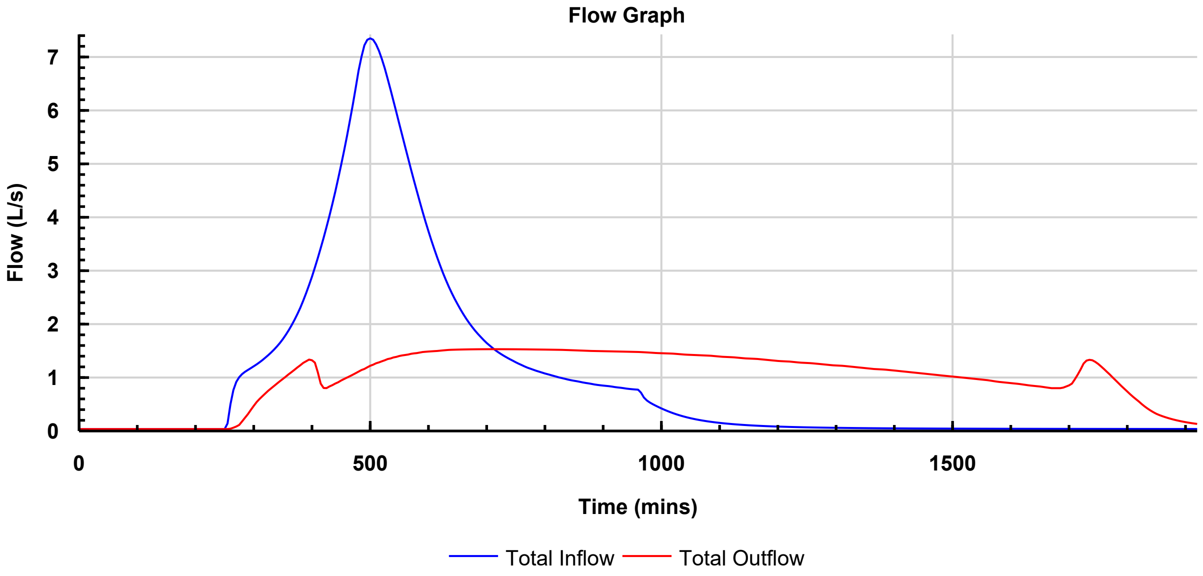


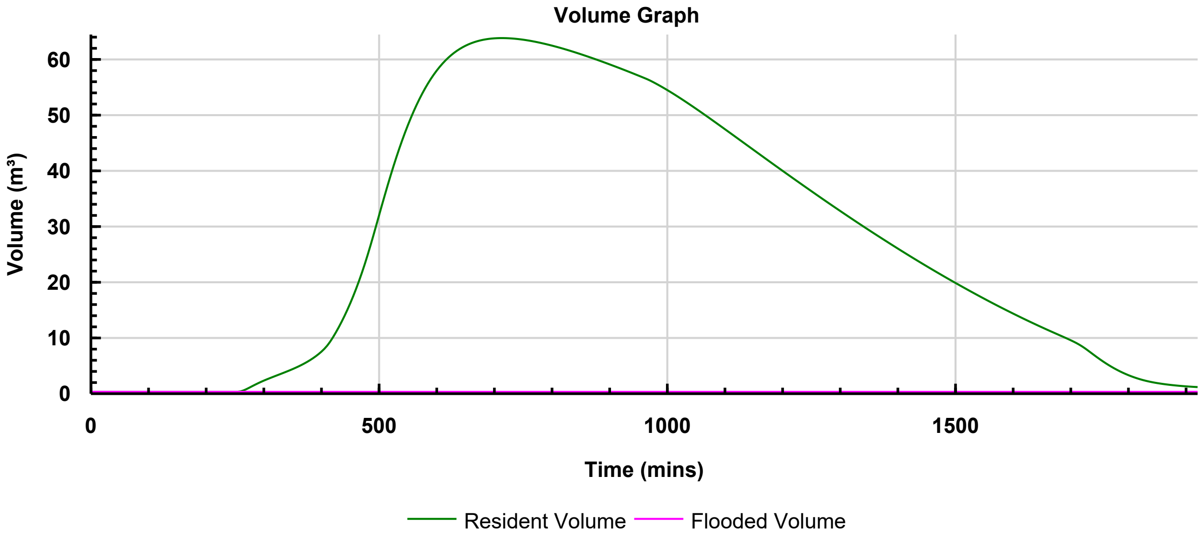
Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Detention Basin
Critical by Return Period: FEH: 2 years: Increase Rainfall (%): +45: 960 mins: Summer

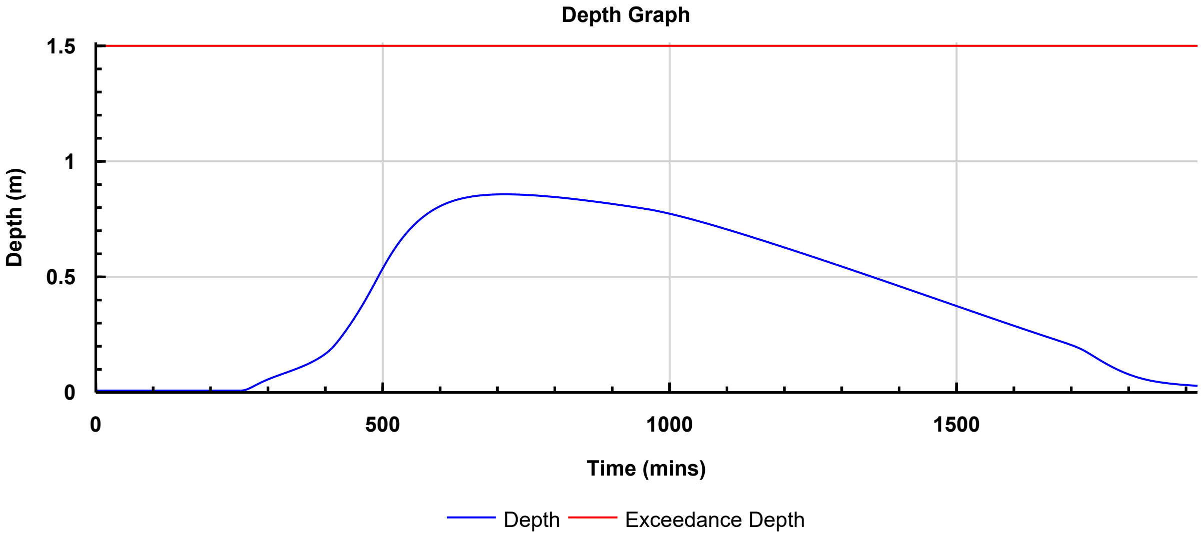
Type : Tank

Graphs





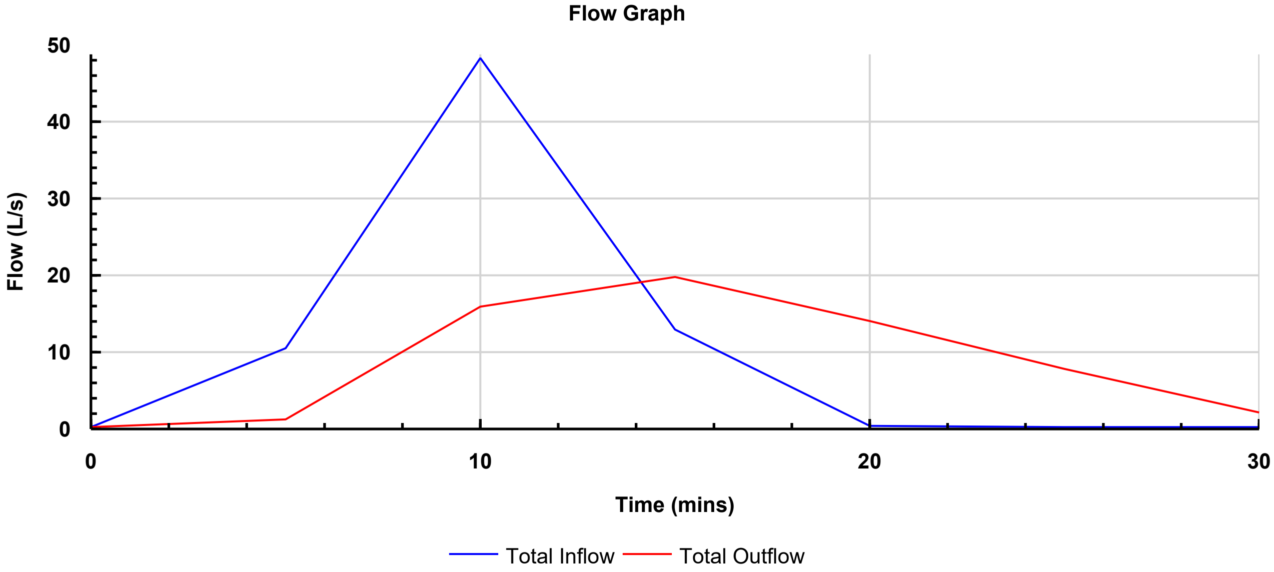
Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

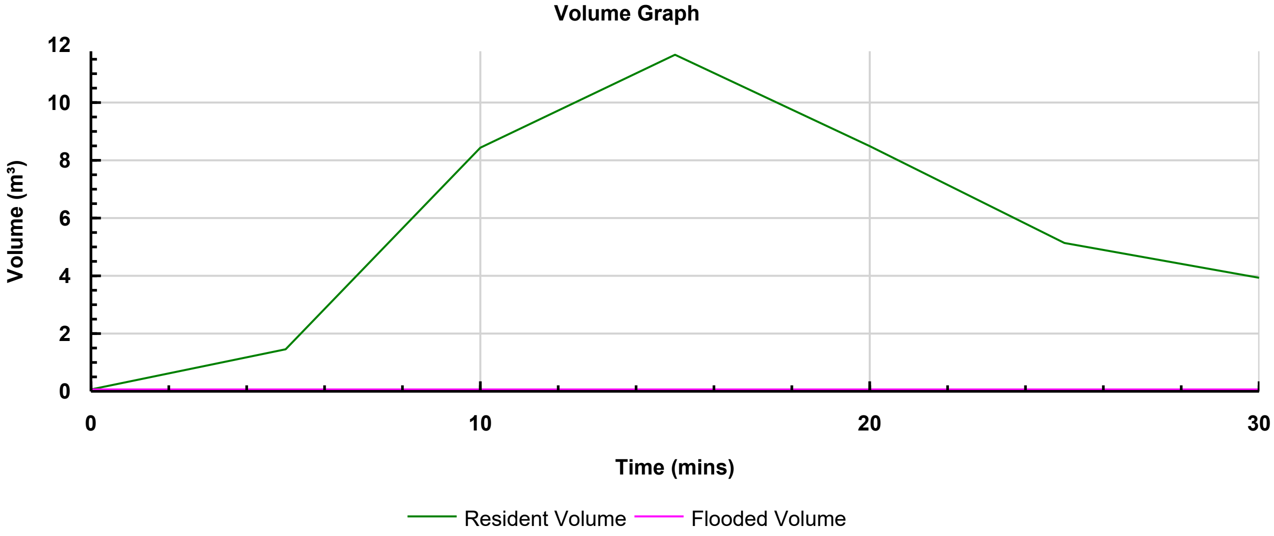


French Drain
Critical by Return Period: FEH: 2 years: Increase Rainfall (%): +45: 15 mins: Summer

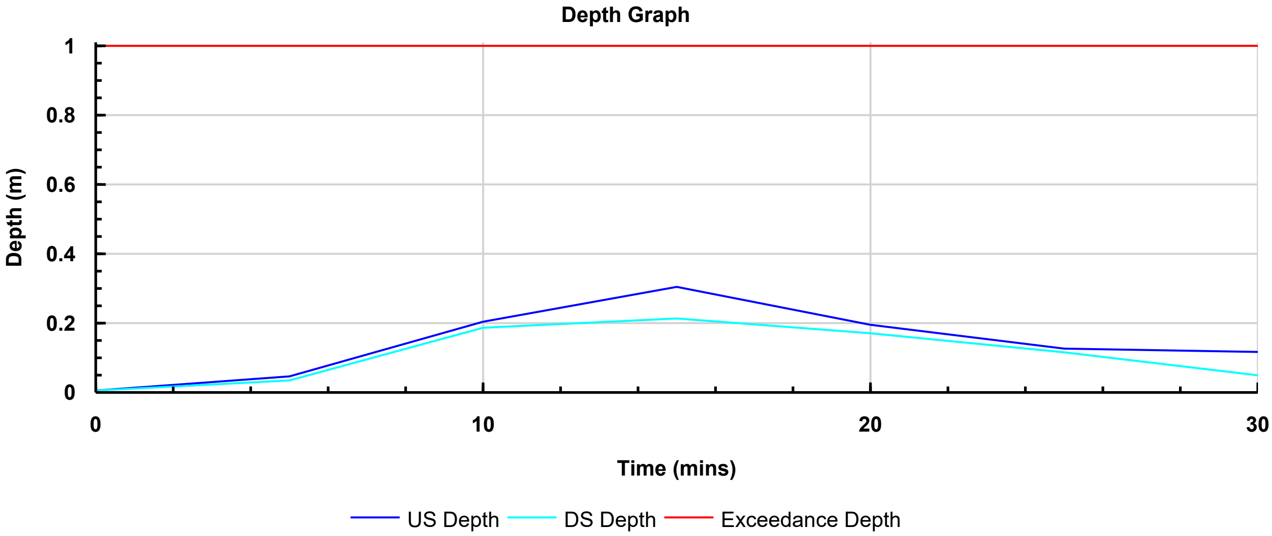
Type : Infiltration Trench

Graphs





Project: HWTWRP BPT-K	Date: 28/10/2025		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		



APPENDIX D.5 - WRP Access InfoDrainage Results

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FEH

Type: FEH

Site Location	GB 470165 105634 SU 70165 05634
Rainfall Version	2022
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
2.0	40.000
30.0	40.000
100.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Project:
HWTWRP
Proposed WRP Access Road SuDS

Date:
02/03/2026

Designed by:
WB

Checked by:
KL

Approved By:
KL

Report Details:
Type: Inflows
Storm Phase: Phase

Company Address:

New WRP Access Road Catchment Area

Type : Catchment Area

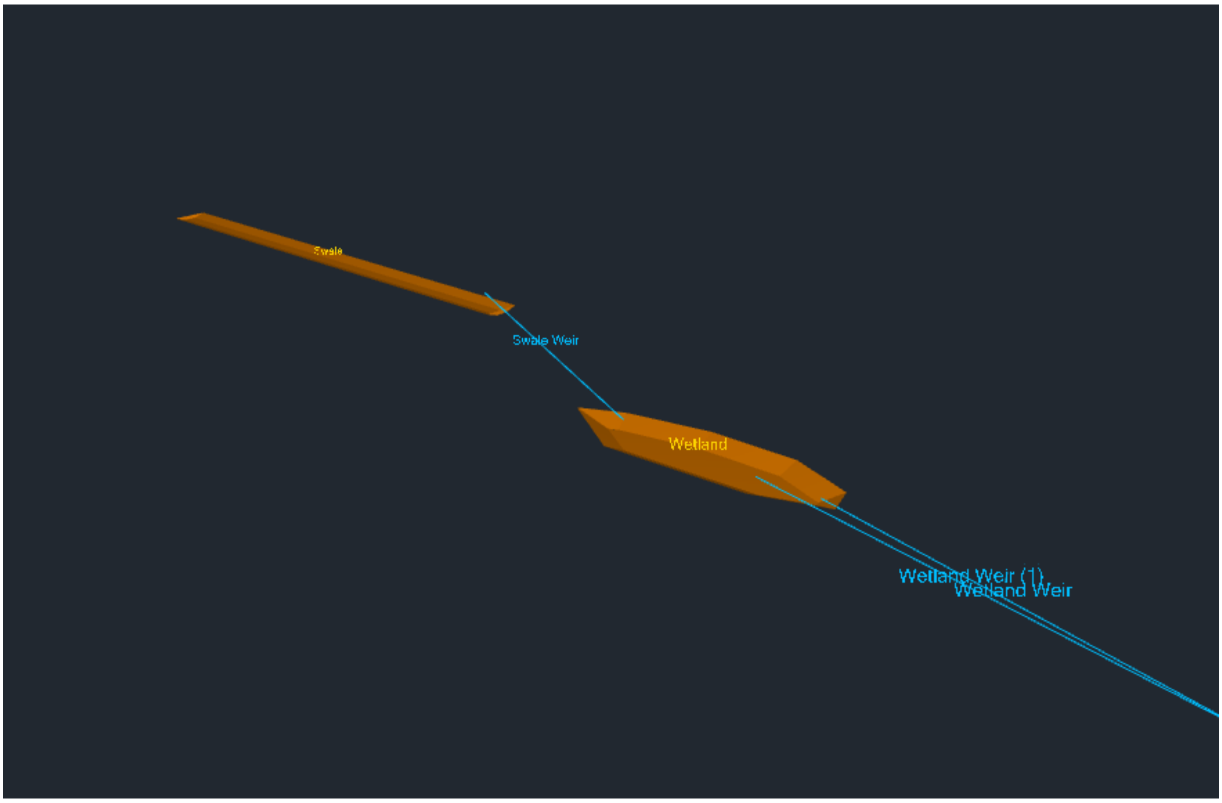
Area (ha)	0.096

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.900
Winter Volumetric Runoff	0.900
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project: HWTWRP Proposed WRP Access Road SuDS	Date: 02/03/2026		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address:		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
New WRP Access Road Catchment Area	Swale		Time of Concentration	0.096	100	0	100	0.096
TOTAL		**0.0**		**0.096**				**0.096**



Project: HWTWRP Proposed WRP Access Road SuDS	Date: 02/03/2026		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Swale

Type : Swale

Swale

Exceedance Level (m)	6.000
Depth (m)	0.300
Base Level (m)	5.700
Top Width (m)	3.000
Side Slope (1:X)	3.33
Base Width (m)	1.000
Freeboard (mm)	0
Length (m)	40.000
Long. Slope (1:X)	40.00
Filtration Rate (m/hr)	0.0
Friction Scheme	Manning's n
n	0.035
Total Volume (m³)	24.000

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	New WRP Access Road Catchment Area
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Swale Weir
Outlet Type	Weir

Width (m)	1.000
Coefficient of Discharge	0.544
Crest Level (m)	5.850

Advanced

Swale

Porosity (%)	100

Project: HWTWRP Proposed WRP Access Road SuDS	Date: 02/03/2026		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		

Wetland Type : Pond

Dimensions

Exceedance Level (m)	6.000
Depth (m)	0.600
Base Level (m)	5.400
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	3.009
Total Volume (m³)	32.876

Depth (m)	Area (m²)	Volume (m³)
0.000	33.00	0.000
0.600	80.00	32.876

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Swale Weir
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Wetland Weir
Outlet Type	Weir

Width (m)	0.075
Coefficient of Discharge	0.544
Crest Level (m)	5.700

Outlet (1)

Outgoing Connection	Wetland Weir (1)
Outlet Type	Weir

Width (m)	0.050
Coefficient of Discharge	0.544
Crest Level (m)	5.400

Advanced

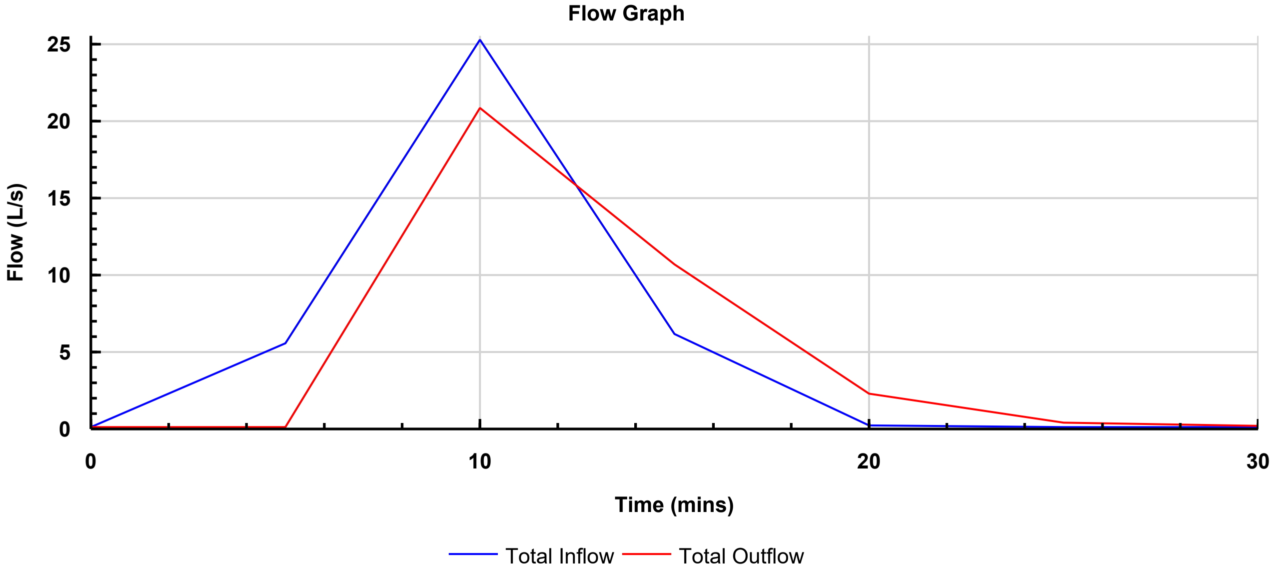
Perimeter	Circular
Length (m)	36.686
Friction Scheme	Manning's n
n	0.07

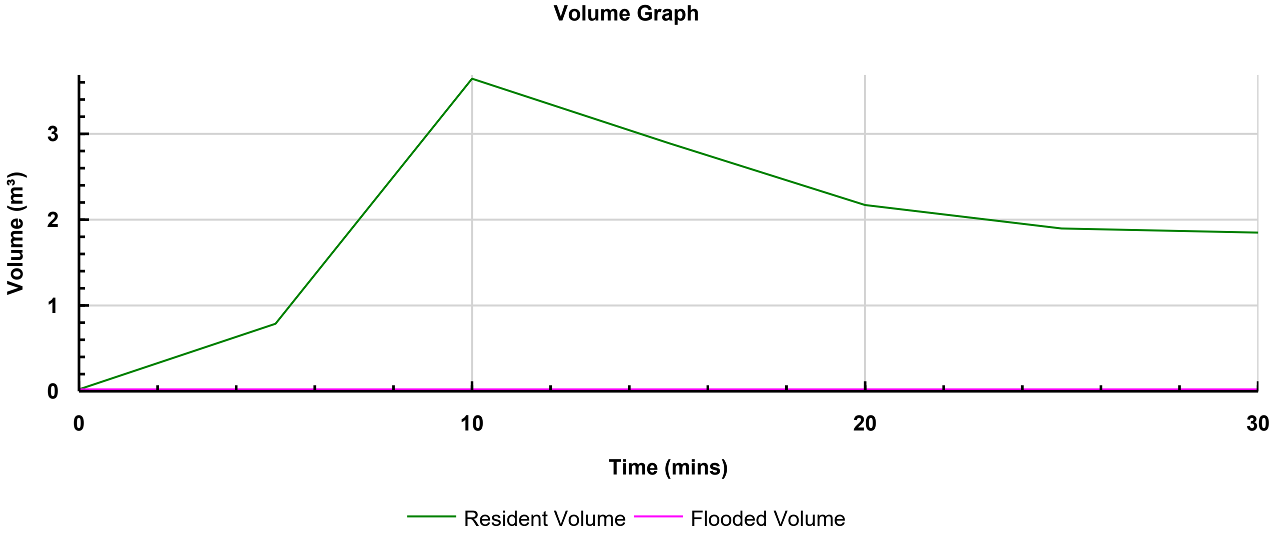
Project: HWTWRP Proposed WRP Access Road SuDS	Date: 02/03/2026		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Swale
Critical by Return Period: FEH: 2 years: Increase Rainfall (%): +40: 15 mins: Summer

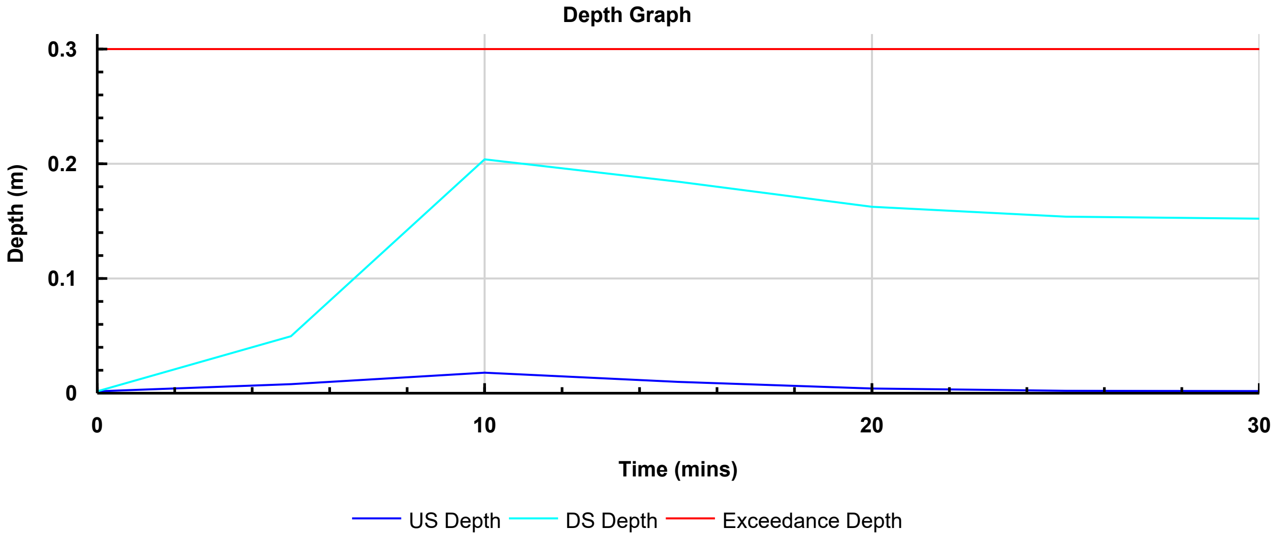
Type : Swale

Graphs





Project: HWTWRP Proposed WRP Access Road SuDS	Date: 02/03/2026		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

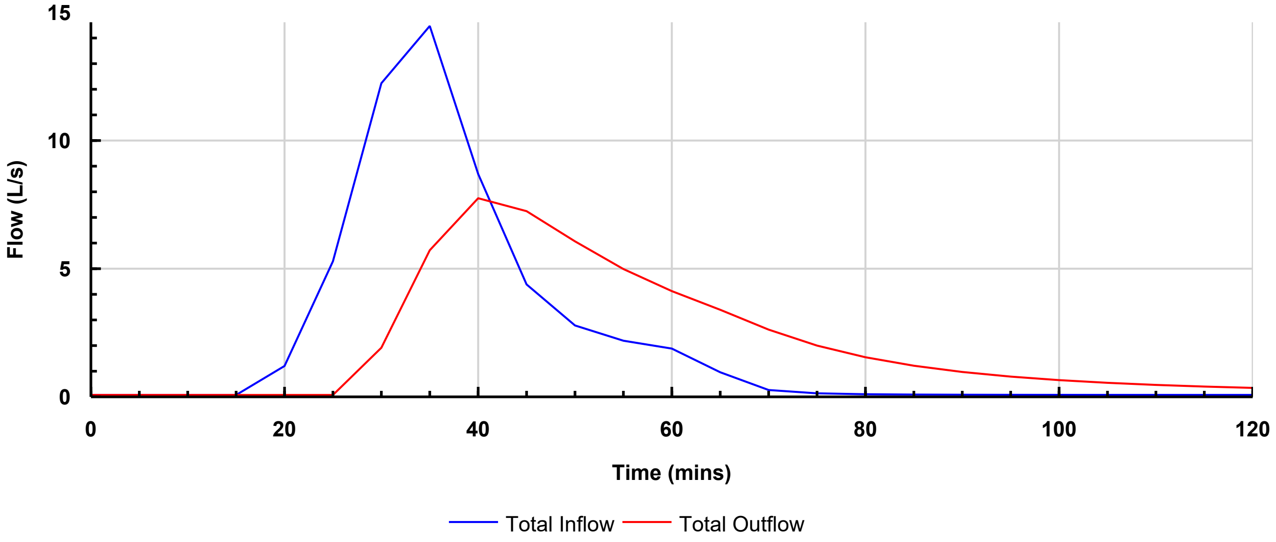


Wetland
Critical by Return Period: FEH: 2 years: Increase Rainfall (%): +40: 60 mins: Summer

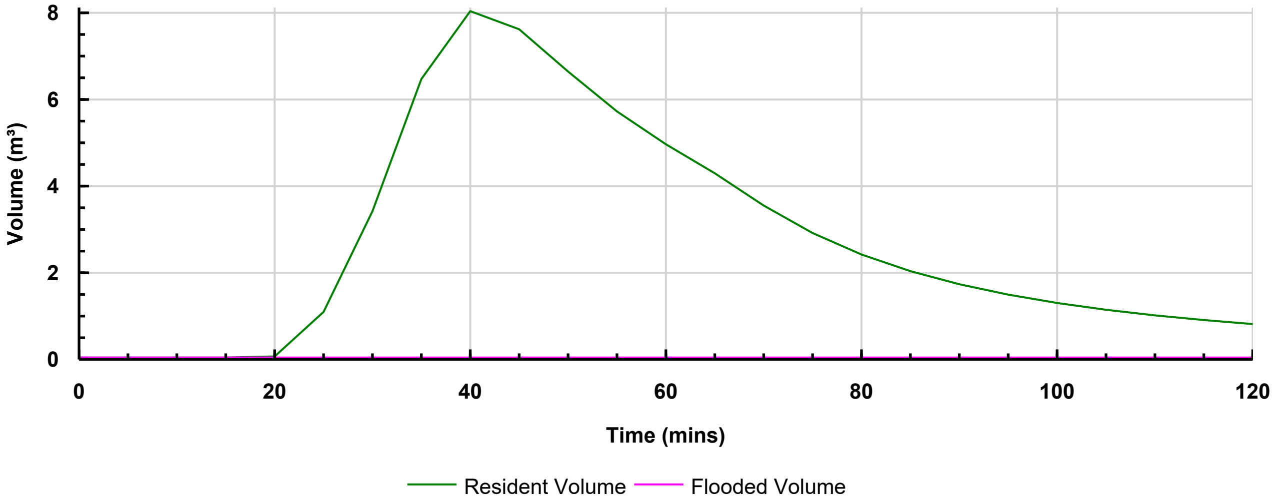
Type : Pond

Graphs

Flow Graph



Volume Graph



Project: HWTWRP Proposed WRP Access Road SuDS	Date: 02/03/2026		
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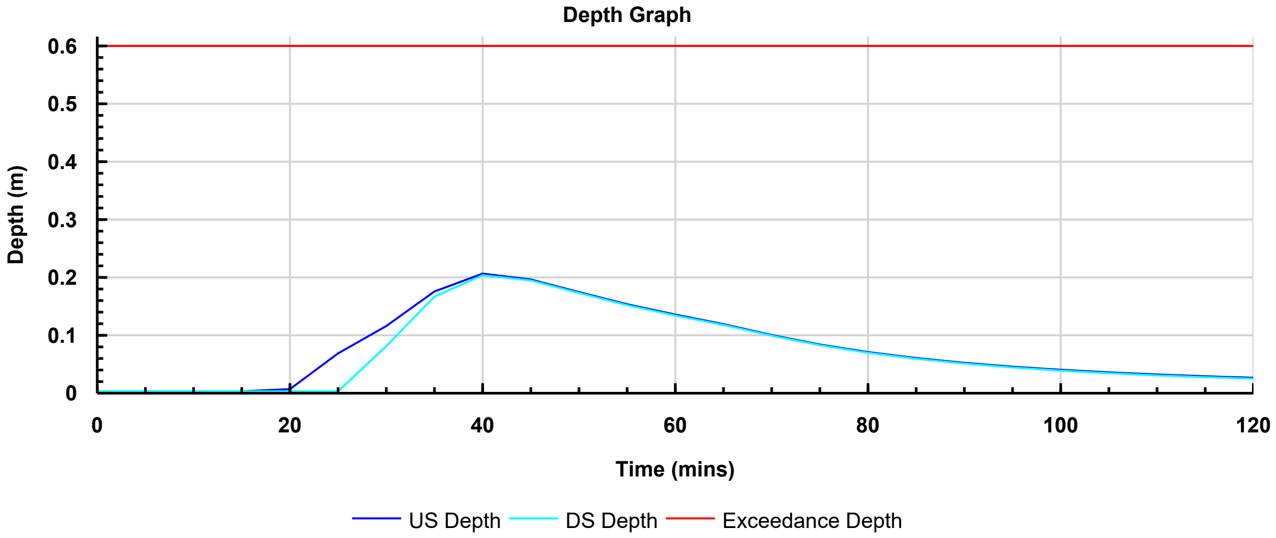
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

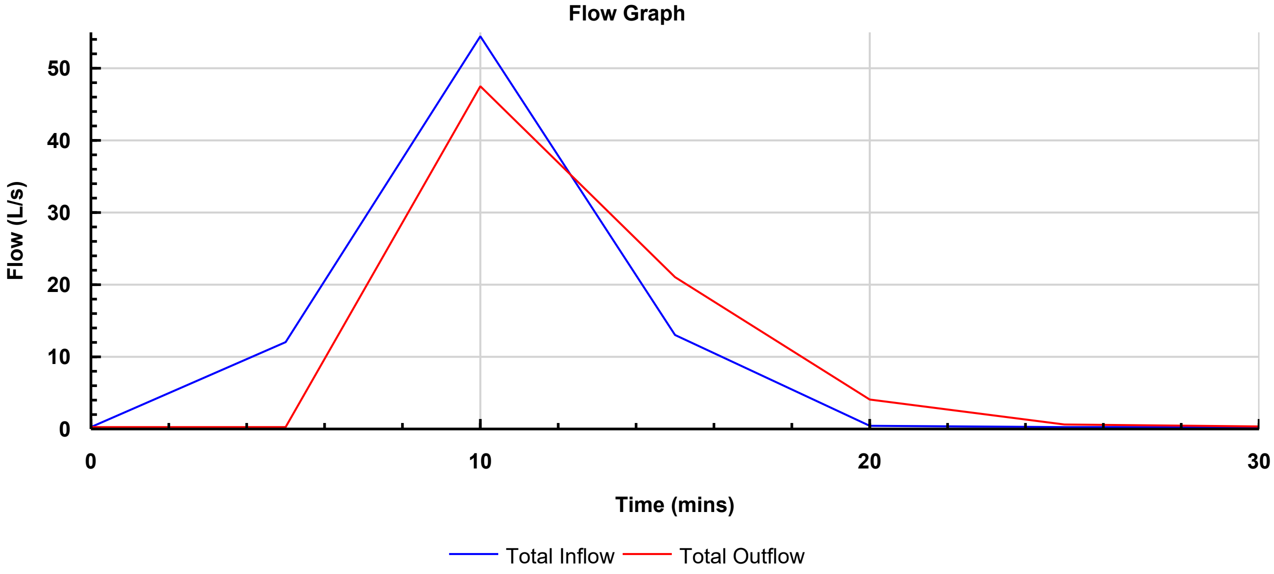


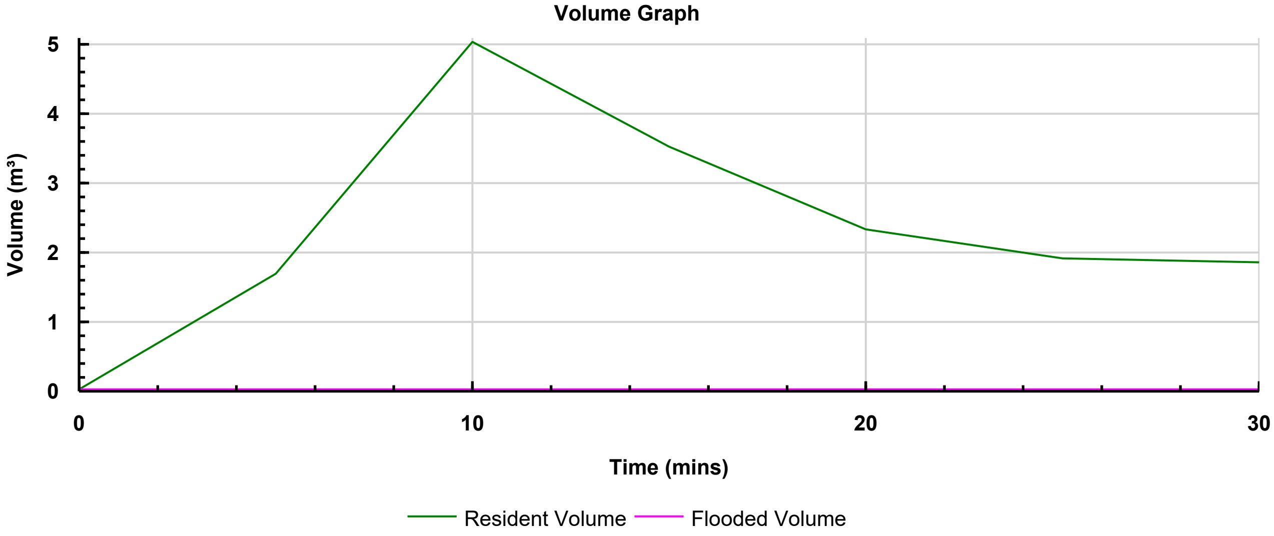
Project: HWTWRP Proposed WRP Access Road SuDS	Date: 02/03/2026		
	Designed by: WB	Checked by: KL	Approved By: KL
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

Swale
Critical by Return Period: FEH: 30 years: Increase Rainfall (%): +40: 15 mins: Summer

Type : Swale

Graphs





Project: HWTWRP Proposed WRP Access Road SuDS	Date: 02/03/2026		
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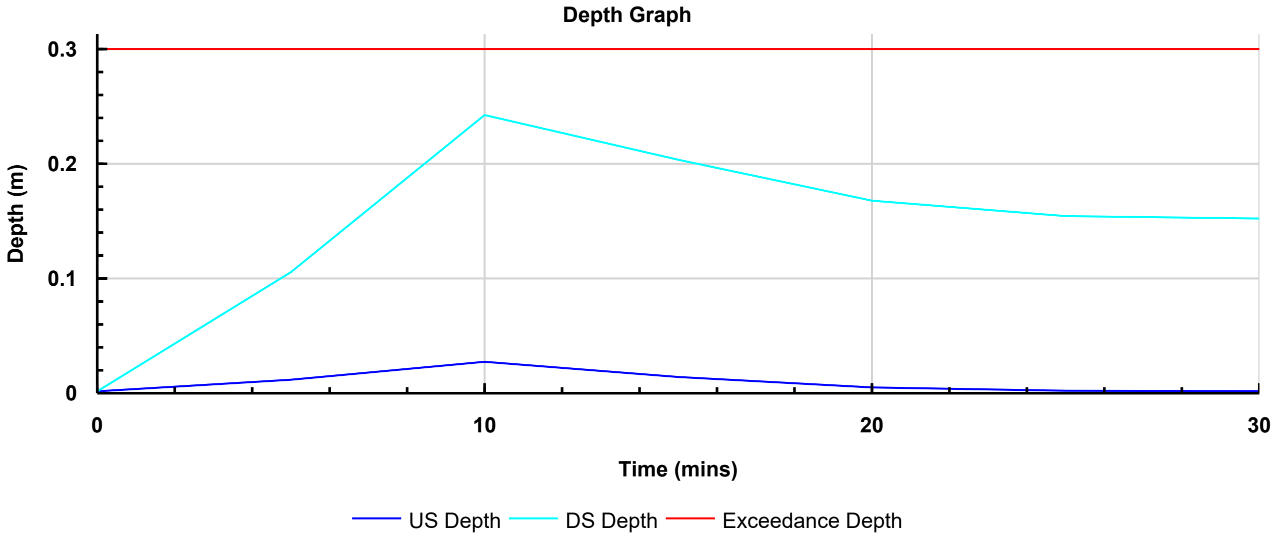
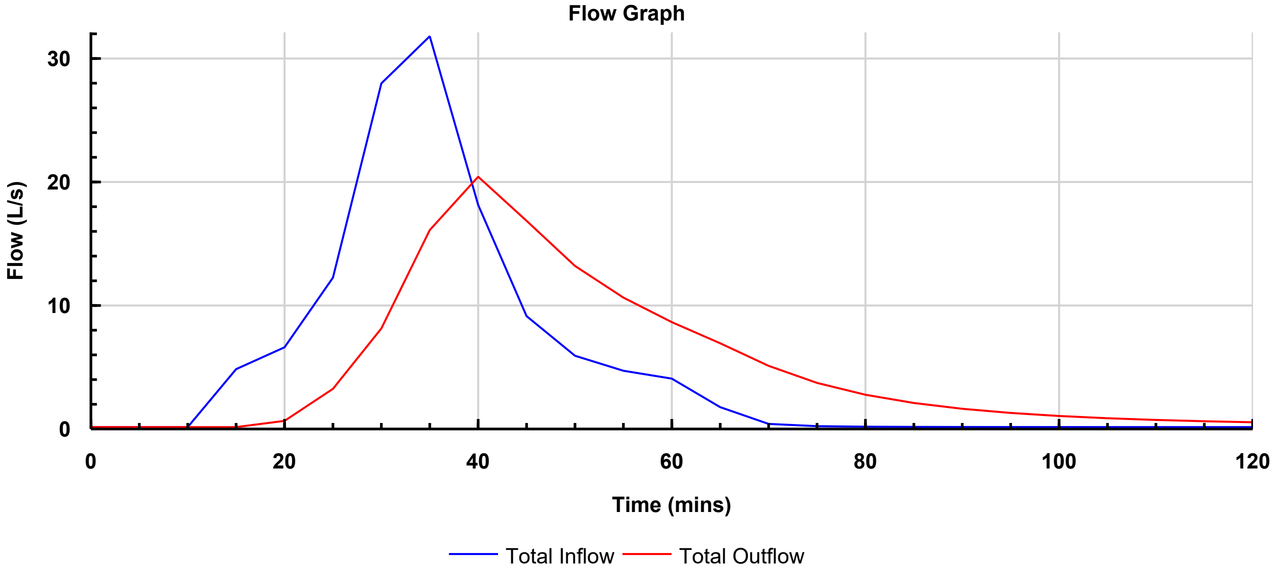
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

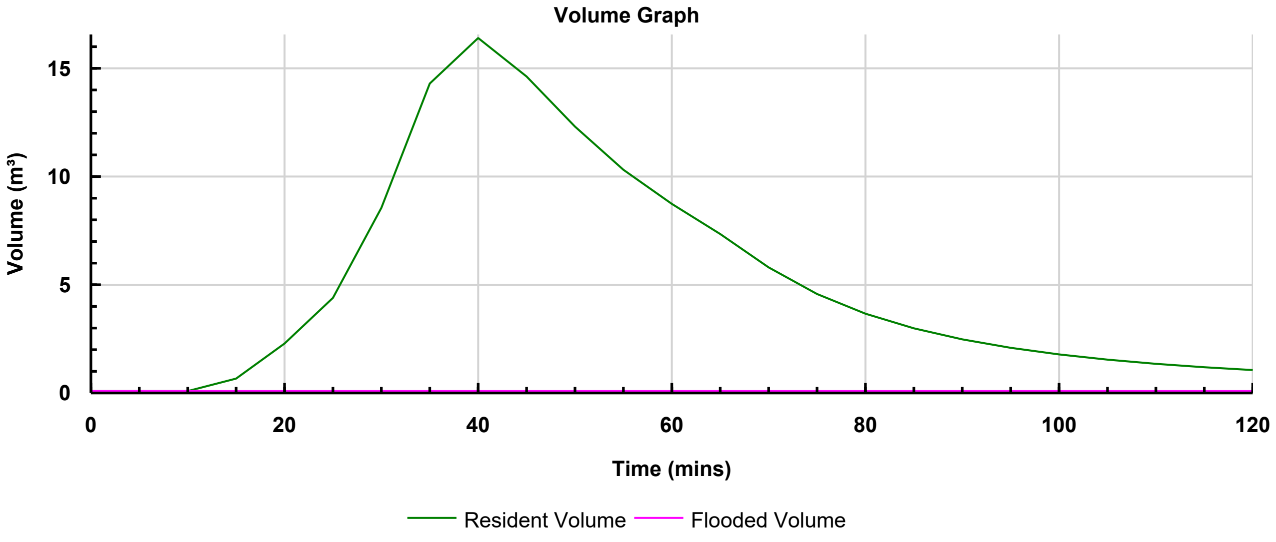


Wetland
Critical by Return Period: FEH: 30 years: Increase Rainfall (%): +40: 60 mins: Summer

Type : Pond

Graphs





Project: HWTWRP Proposed WRP Access Road SuDS	Date: 02/03/2026		
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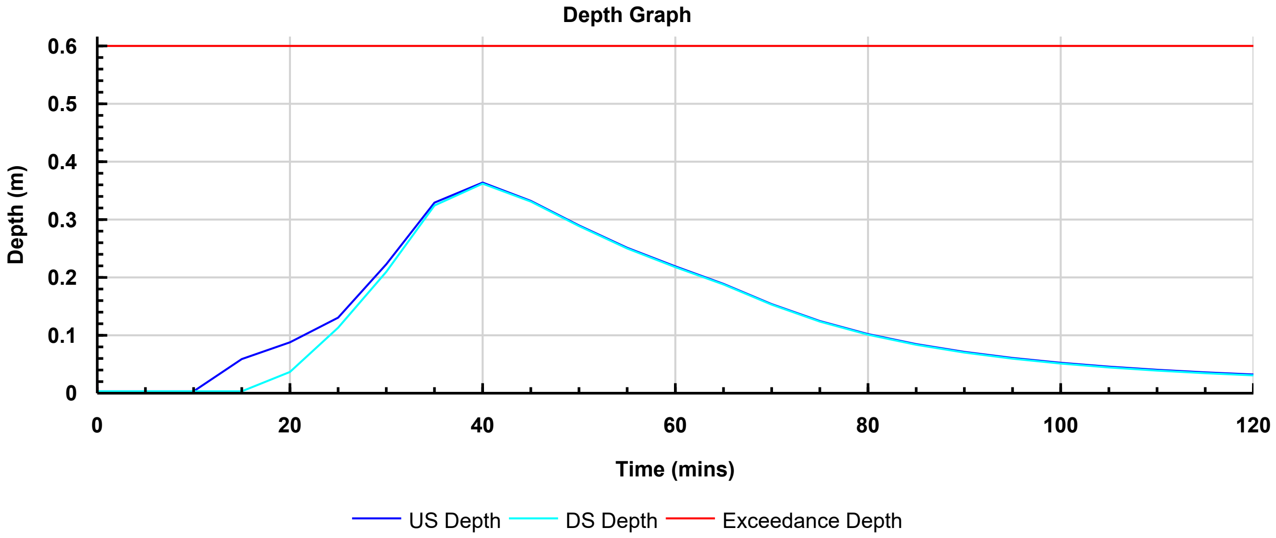
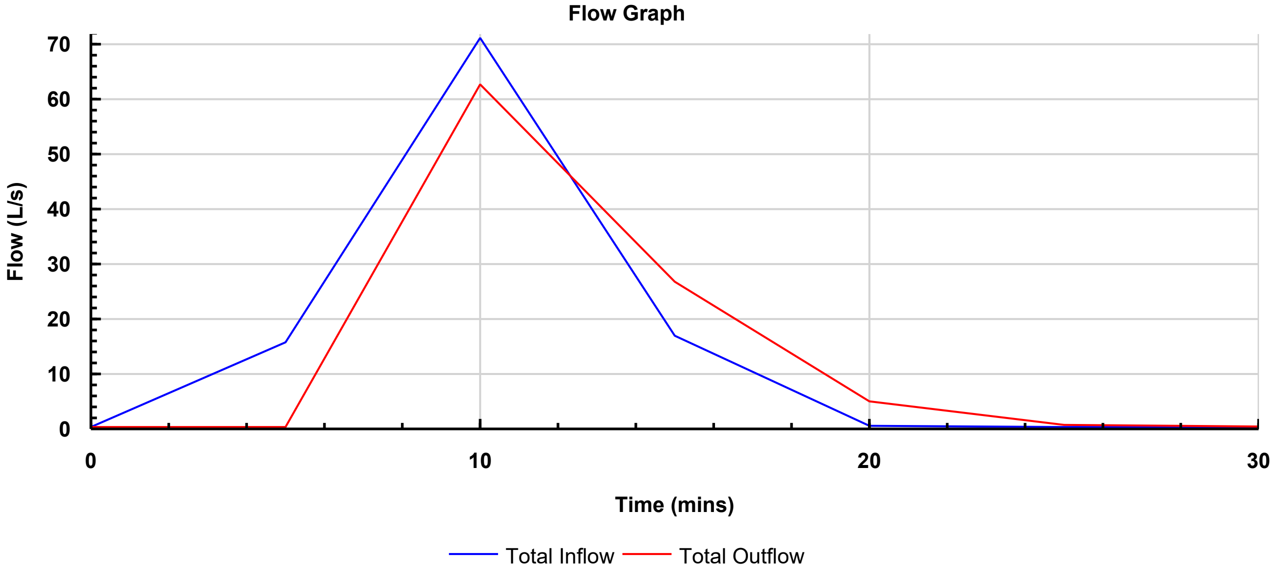
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

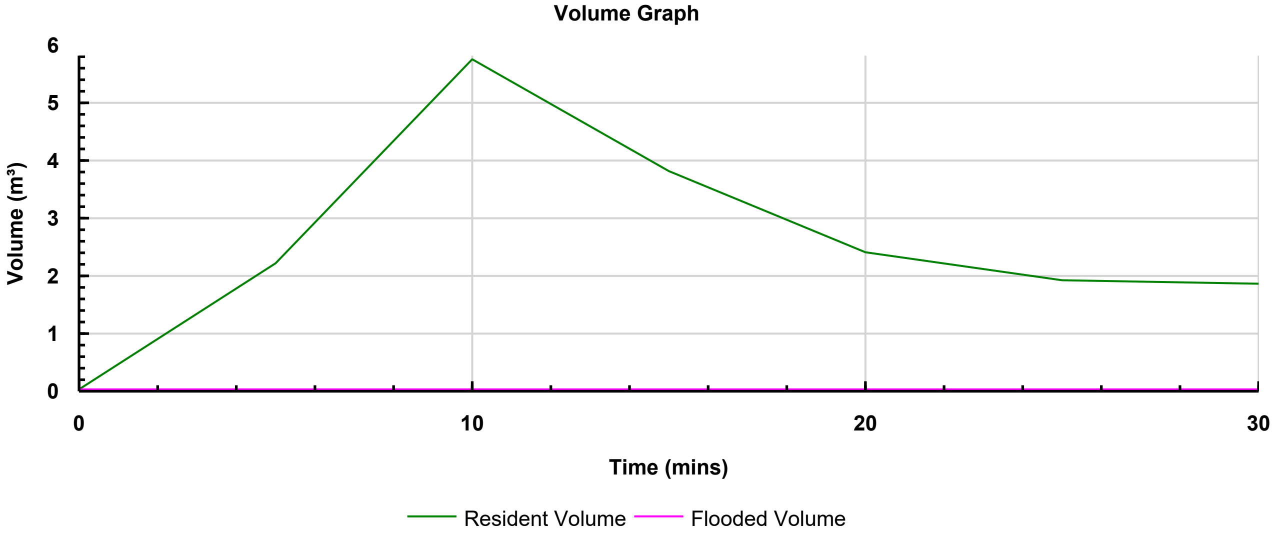


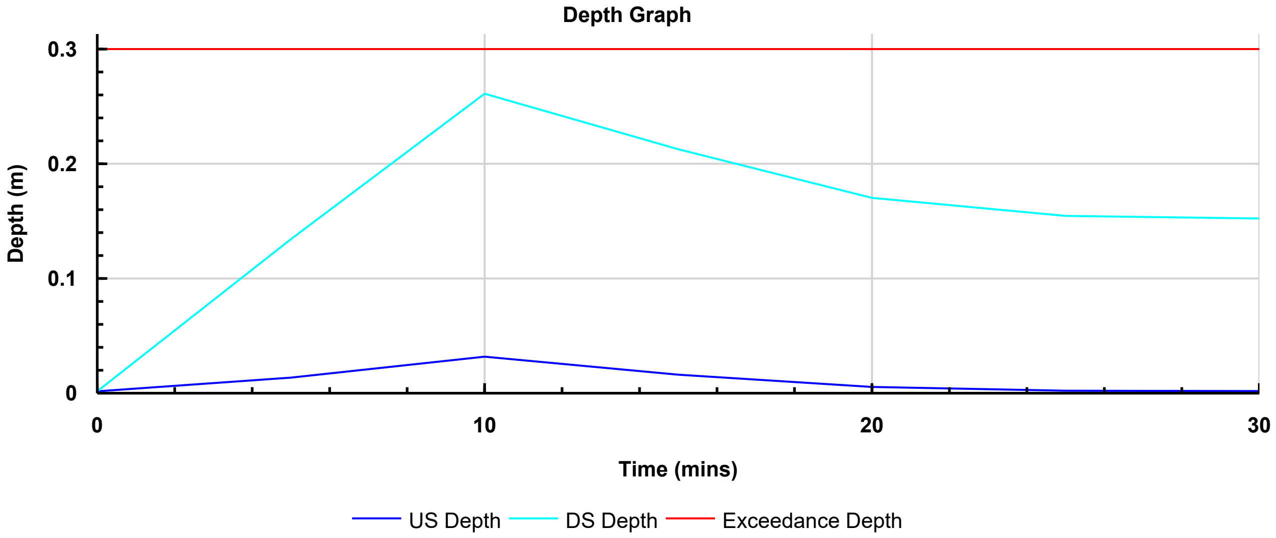
Swale
Critical by Return Period: FEH: 100 years: Increase Rainfall (%): +45: 15 mins: Summer

Type : Swale

Graphs





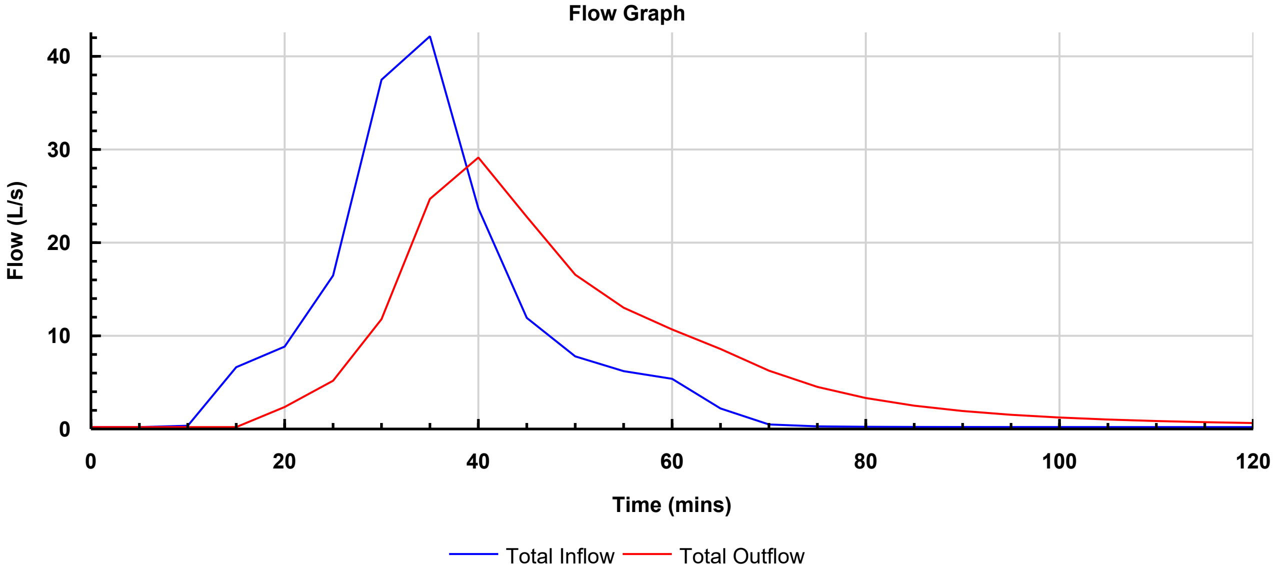


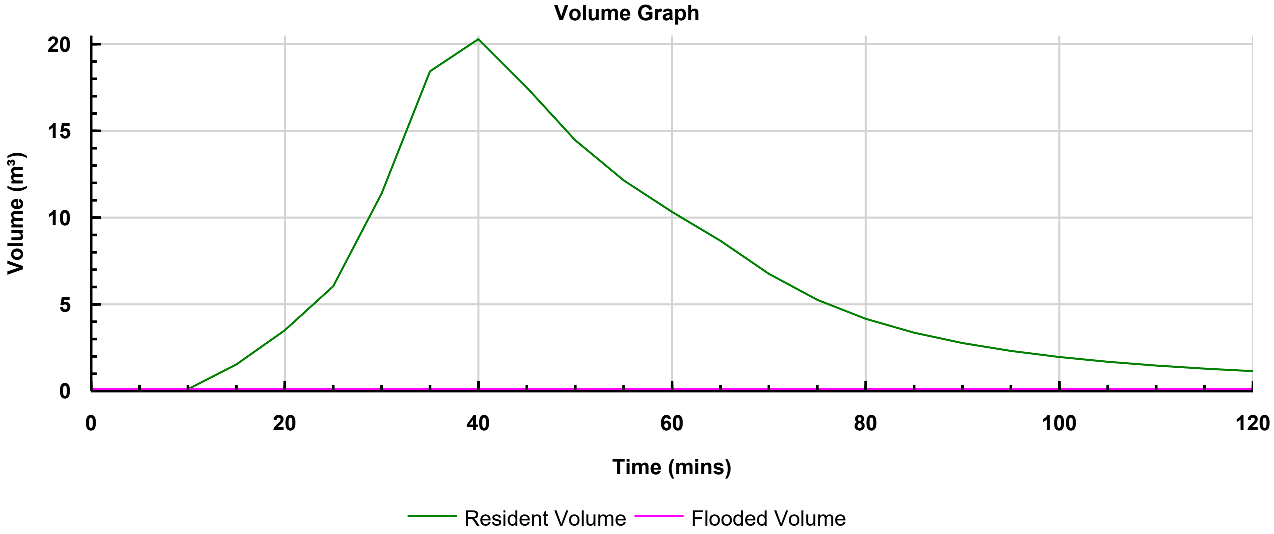
Depth Graph
Depth (m)
0.3
0.2
0.1
0
0
10
20
30
Time (mins)
US Depth
DS Depth
Exceedance Depth

Wetland
Critical by Return Period: FEH: 100 years: Increase Rainfall (%): +45: 60 mins: Summer

Type : Pond

Graphs





Project: HWTWRP Proposed WRP Access Road SuDS	Date: 02/03/2026		
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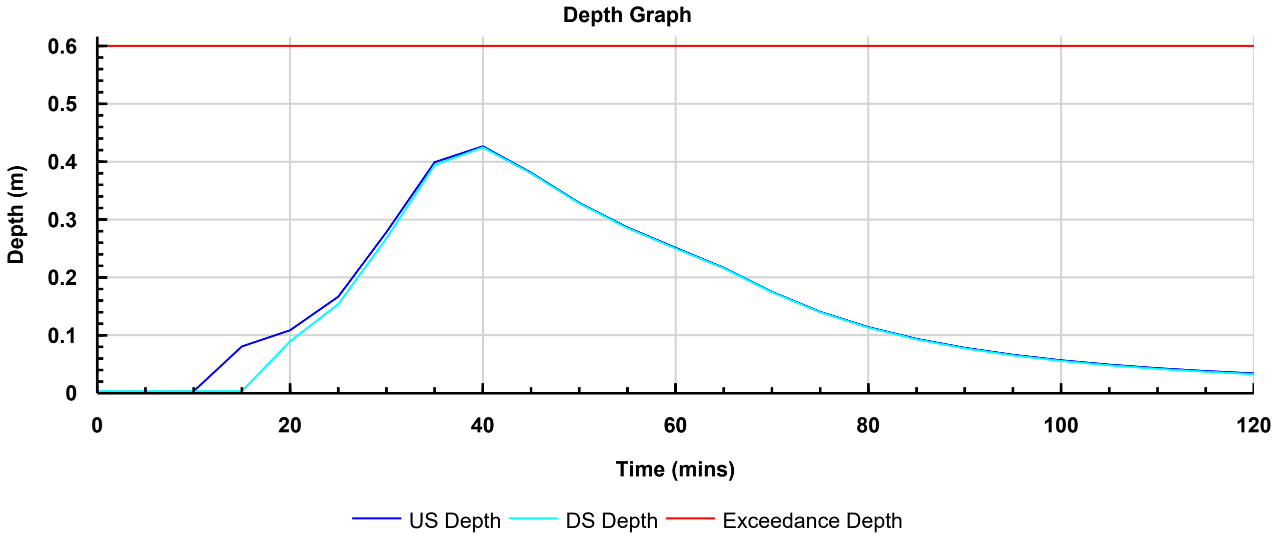
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		



Appendix E CIRIA Simple index approach

SIMPLE INDEX APPROACH: TOOL

1. The steps set out in the tool should be applied for each inflow or 'runoff area' (ie each impermeable surface area separately discharging to a SuDS component).

2. The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.

3. Relevant design examples are included in the SuDS Manual Appendix C.

4. Each of the steps below are part of the process set out in the flowchart on Sheet 3.

5. Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

🟦	**DROP DOWN LIST**	**RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP**
🟩	**USER ENTRY**	**USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL**

STEP 1: Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', either:

- use the land use type with the highest Pollution Hazard Index
- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment.

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in the row below the drop down lists.

			Pollution Hazard Indices		
	Runoff Area Land Use Description	*Hazard Level*	Total Suspended Solids	Metals	Hydrocarbons
Select land use type from the drop down list (or 'Other' if none applicable): →	Site where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured	High	0.8	0.8	0.9
If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:					
	Landuse Pollution Hazard Index	**High**	**0.8**	**0.8**	**0.9**

DESIGN CONDITIONS

1	2
These indices should only be used if considered appropriate by the required risk assessment and where approved by the regulator. If they are not considered appropriate, the risk assessment should use alternative measures of pollution hazard for the site.	In Scotland and Northern Ireland, the environmental regulator should be consulted as part of the licensing process required for High Risk sites. In England and Wales, the environmental regulator should be consulted prior to design (for pre-permitting advice) to determine the most appropriate design approach and requirements for risk assessment.

STEP 2A: Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

If you have fewer than 3 components, select 'None' for the components that are not required

If the proposed component is bespoke and/or a proprietary treatment product and not generically described by the suggested components, then 'Proprietary treatment system' or 'User defined indices' should be selected and a description of the component and agreed user defined indices should be entered in the rows below the drop down lists

		Pollution Mitigation Indices			***DESIGN CONDITIONS***		
	SuDS Component Description	Total Suspended Solids	Metals	Hydrocarbons	1	2	3
Select SuDS Component 1 (i.e. the upstream SuDS component) from the drop down list: →	Filter strip	0.4	0.4	0.5	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B		
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list: →	Swale	0.5	0.6	0.6	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B		
Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list: →	Detention basin	0.5	0.5	0.6	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B		
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows:							
	Aggregated Surface Water Pollution Mitigation Index	**0.9**	**0.95**	**>0.95**			

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

Is the runoff now discharged to an infiltration component?

Yes ? Go to Step 2B
No ? Go to Step 2C

STEP 2B: Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

Where the discharge is to surface waters and risks to groundwater need not be considered, select 'None'

If the proposed groundwater protection is bespoke and/or a proprietary product and not generically described by the suggested measures, then a description of the protection and agreed user defined indices should be entered in the row below the drop down list

		Pollution Mitigation Indices			***DESIGN CONDITIONS***			
		Total Suspended Solids	Metals	Hydrocarbons	1	2	3	4
Select type of groundwater protection from the drop down list: →	None							
If the proposed groundwater protection is bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary product' or 'User defined indices' and enter a description of the protection and agreed user defined indices in this row:								
	Groundwater Protection Pollution Mitigation Index	**0**	**0**	**0**				

STEP 2C: Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

	Combined Pollution Mitigation Indices		
	Total Suspended Solids	Metals	Hydrocarbons
Combined Pollution Mitigation Indices for the Runoff Area	**0.9**	**0.95**	**>0.95**

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

STEP 2D: Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (ie over and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unexpected pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more precautionary approach may be required and this should be checked with the environmental regulator on a site by site basis.

Sufficiency of Pollution Mitigation Indices			***DESIGN CONDITIONS***
Total Suspended Solids	Metals	Hydrocarbons	1
Sufficient	**Sufficient**	**Sufficient**	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see *Chapter 7 The SuDS design process*). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England

Appendix F Sustainable drainage systems planting and maintenance statement

Landscape Planting and Maintenance Statement

Typical planting and maintenance requirements for Sustainable Drainage Systems (SuDS) associated with the Hampshire Water Transfer and Water Recycling Project

Date 29th January 2026
Version Second Issue

Revision	Description	Author	Date	Quality Check	Date	Independent Review	Date
P01	First Issue	GD	25/10/24	LS	14/11/24	MH	25/10/24
P02	Second Issue	GD	29/01/26	WB	29/01/26	MH	29/01/26

Contents

The conclusions in the Report titled Landscape Planting and Maintenance Statement are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

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Prepared by	Reviewed by	Approved by
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

1. Introduction

This document forms high level planting and maintenance descriptions to accompany the newly created habitat areas within the Sustainable Drainage Systems (SuDS) features for Hampshire Water Transfer and Water Recycling Project.

The recommendations suggested within this report relating to potential planting and seeding mixes, as well as associated landscape maintenance tasks, have been based on desk-based research and high-level project information received. As such, these are indicative and intended to assist the EIA assessment and pricing of the emerging scheme design. They will need to be reassessed once the full spectrum of scheme and site information becomes available and is progressed as part of the detailed design stage.

The high-level principles and approaches suggested for the design and maintenance of the respective SuDS features are based on the illustrative scheme design, but have been indicatively tailored to follow the early design aspirations for the site, and broadly follow CIRA SuDS Manual (C753) 2015 guidance. Due to the outline nature of the SuDS design at this project stage, some assumptions have been made on the detail of the likely composition and appearance of the respective scheme, in order to provide some high-level information within this report for the respective SuDS elements. Due to these constraints, if a conflict is identified between the indicative suggested design approach, and hydraulic, engineering, water quality or any other intrinsically important aspects of the SuDS and drainage design (covered by the SuDS Manual (C753) 2015), then it should be assumed that the proposed planting/seeding and/or landscape focussed maintenance tasks will be amended to suit.

There will be five permanent above-ground infrastructure sites along the pipeline route that will have SuDS as part of their surface water drainage strategy. These sites include:

- Water Recycling Plant (WRP), SuDS plan Ref: 460440, 86160
- Break Pressure Tank/Intermediate Pumping Station (BPT/IPS) E, SuDS plan Ref: 466400, 106530
- IPS-F, SuDS plan Ref:, 458250, 109020
- IPS-G, SuDS plan Ref: 456365, 111675
- Break Pressure Tank K (BPT-K), SuDS plan Ref: 452810, 118610

2. Proposed SuDS Design

The following planting and grassland species mixes have been identified to support the SuDS design based on the following criteria:

i. The use of UK Native species where practicable.

ii. Suitable species that are tolerant of seasonal fluctuations between drier and wetter conditions.

iii. Species identified that will complement and enhance local ecology.

iv. Species selected for their dense growth characteristics that will help distribute water over the area and will protect the soils from erosion.

v. Plants identified for their nutrient uptake ability.

As discussed in Section 1 of this report, while locally appropriate planting/grass seed species have been prioritised, these suggestions are based on the desk-based information available. Further, more detailed Ecological survey data (undertaken or available at later project stages) may identify additional or different species could be utilised within these area mixes, to help maximise the BNG and habitat value these features offer.

A balance has been sought within these suggestions between the ecological and landscape benefits this planting/seeding can afford, while being cognisant of the site's likely operational requirements, and the associated maintenance tasks to manage each respective planting/seeding mix.

2.1. Filter strips

Design considerations (to facilitate management)

Recommended as a minimum 6m width sufficient for mowing equipment access. Designed to provide a water depth ≤50mm for the water quality treatment event. Planted using a mix of dry area and wet area grasses to promote resilience to varying conditions.

The filter strips are to be seeded with a General Purpose Meadow Grass Mixture (such as available from *Emorsgate EG1*), contains low maintenance species that are low growing and produce a short, open 'flower-friendly' sward. Sowing rate: 5g/m². Including 20% grasses and 80% wildflower. EG1 is a 100% grass seed mix.

Table 1 Potential Filter Strip Grass Seed Mix

Botanical Name	Common Name
10% Agrostis capillaris	Common Bent
35% Cynosurus cristatus	Crested Dogstail
30% Festuca rubra	Red Fescue
5% Phleum bertolonii	Smaller Cat's tail
20% Poa pratensis	Smooth-stalked Meadow grass

2.2. Bio-retention Areas (WRP site only)

Design considerations (to facilitate management)

Plant selection includes a generally open meadow (native) grassland and occasional (native) shrubs species. Soil depth (minimum 600mm for shrubs and 150mm for grasses). Mulch layer – max 75mm depth. Plants selected are well adapted to free draining conditions and have extensive root systems. Plants also need to be shade tolerant (due to existing vegetation along the southern boundary of the WRP site and the proposed above ground structures), tolerant of occasional inundation and also tolerant of free-draining sandy soils. Note that species more tolerant of drier conditions are to be planted on any batters/slopes.

Table 2 Potential Bio-retention Areas Planting

Botanical Name	Common Name
Native Shrubs	
Corylus avellana*	Hazel
Rosa Canina*	Dog Rose
Crataegus monogyna*	Hawthorn
Prunus spinosa*	Blackthorn
Salix caprea	Goat Willow
Salix cinerea	Common Sallow
Viburnum opulus*	Guelder Rose

The bioretention areas are to be seeded with a shade tolerant complete seed mix such as Woodland Mixture (such as available from *Emorsgate EW1*), contains species suitable for free draining soils. Sowing rate: 4g/m². Including 20% grasses and 80% wildflower. EW1 is a complete mix composed of 20% native wildflowers and 80% slow growing grasses (by weight) suitable for sowing in moderately developed shade. EW1 is a very good mixture of woodland wildflowers and grasses that will bloom in spring and early summer

Table 3 Potential Bio-retention Areas Grass Seed Mix

Botanical Name	Common Name
Wildflowers 20%	
1% Allium ursinum	Ramsons
2% Alliaria petriolata	Garlic Mustard
0.50% Angelica sylvestris	Wild Angelica
1.4% Anthrisus sylvestris	Cow Parsley
0.20% Arum maculatum	Lords and Ladies
4% Digitalis purpurea	Foxglove
0.1% Eupatorium cannabinum	Hemp agrimony
0.9% Filipendula ulmaria	Meadowsweet
1.5% Galium album	Hedge Bedstraw
0.1% Geum urbanum	Wood Avens
1.6% Hyacinthoides non-scripta	Bluebell
0.1% Primula vulgaris	Primrose
1% Prunella vulgaris	Selfheal
0.4% Ranunculus acris	Meadow Buttercup
3% Silene diocia	Red Campion
0.2% Teucrium scorodonia	Wood Sage
Grasses 80%	
2.4% Agrostis capillaris	Common Bent
1.6% Anthoxanthum ordoratum	Sweet Vernal grass
0.8% Brachypodium sylvaticum	False Brome
48% Cynosurus cristatus	Crested Dogstail
1.6% Deschampia cespitosa	Tufted Hair grass
19.2% Festuca rubra	Red Fescue
6.4% Poa nemoralis	Wood Meadow grass

2.3. Swales

Design considerations (to facilitate management)

Recommended ≤1:3 side slopes, ideally 1:4-5 to maximise contact with vegetation thus enhancing treatment, reduce erosion risk and facilitate mowing. Minimum longitudinal slope of 1:200 for conveyance swales preventing ponding; no minimum requirement for under drained swales. Minimum length of 30m (ideally 60m) to maximise treatment and facilitate mowing. Minimise point inflow to prevent erosion (use kerb cuts or low earth weir). Plant selection base on vigour-ness, soil type; ability to tolerate silt, available light etc. Do not water through until grass establishment.

The swales are likely to be primarily dry (unless there is a rainfall event) and plants can be places as turf or seeds. Turfing provides immediate protection, provided the seams are protected by laying the strips perpendicular to the flow and hand tamping them after laying. Turf should also be secured with pegs where high flow velocities are expected and on side slopes that are greater than 1:4. If seeding, seed during spring and early summer to give seed the whole season to establish.

The detention basin base is to be seeded with A3 Embankments & Droughts mix (*such as available from Germinal Seeds A3*), contains a blend of grass species which can tolerate for seasonally wet soils and dry conditions. Sowing rate: 50g/m². A3 is a complete mix composed of 100% advanced growing grasses.

Table 4 Potential Swales Grass Seed Mix

Botanical Name	Common Name
Grasses 80%	
5% Agrostis castellana	Highland Browntop bentgrass
25% Festuca arundinacea	Debussy 1 tall fescue
30% Festuca rubra rubra	Corail strong creeping Red fescue
10% Festuca longifolia	Sword Hard Fescue
30% Lolium Perenne	Zurich creeping perennial ryegrass

2.4. Detention Basins

Design considerations (to facilitate management)

Volumetric allowances for vegetation of up to 25% should be provided to ensure flood control criteria are met. Side slopes should not usually exceed 1 in 3 for mowing and maintenance with consideration given to changes in slope being suitable for machinery. The recommended length/width ratio for detention basins is between 3:1 and 5:1. Level basin floor to minimise flow velocities. Incorporate benches at edges for maintenance access, stabilise soil & prevent erosion.

The detention basins will be generally open meadow (native) grassland, with some occasional groups of native trees and shrubs to enhance the appearance and biodiversity value of the basin. Soil depth (minimum 600mm for trees/shrubs and 100mm subsoil for wildflower grassland). Mulch layer – max 75mm depth.

The detention basin is likely to be seasonally wet and plants can be seeded or turfed but commercially due to the scale of the basin seeding maybe more appropriate. Seed during spring and early summer to give seed the whole season to establish.

The detention basin base is to be seeded with A3 Embankments & Droughts mix (*such as available from Germinal Seeds A3*), contains a blend of grass species which can tolerate for seasonally wet soils and dry conditions. Sowing rate: 50g/m². A3 is a complete mix composed of 100% advanced growing grasses.

Table 5 Potential Detention Basin Grass Seed Mix

Botanical Name	Common Name
Grasses 80%	
5% Agrostis castellana	Highland Browntop bentgrass
25% Festuca arundinacea	Debussy 1 tall fescue
30% Festuca rubra rubra	Corail strong creeping Red fescue
10% Festuca longifolia	Sword Hard Fescue
30% Lolium Perenne	Zurich creeping perennial ryegrass

Plants also need to be tolerant of occasional inundation and also tolerant of free-draining sandy soils. Drier species to be planted on any batters/slopes.

Table 6 Potential Detention Basin Planting

Botanical Name	Common Name
Native Trees and Shrubs	
Alnus glutinosa	Alder
Betula pubescens	Downy Birch
Corylus avellana*	Hazel
Rosa Canina*	Dog Rose
Crataegus monogyna*	Hawthorn
Prunus spinosa*	Blackthorn
Salix caprea	Goat Willow
Salix cinerea	Common Sallow
Viburnum opulus*	Guelder Rose

3. Landscape maintenance tasks

Management and maintenance requirements are specific to each SuDS element although in many cases can easily be aligned with ambient site management programmes and specifications.

The tasks suggested within this section are indicative (as detailed in Section 1 of this document) and are focussed primarily on the maintenance of the proposed planting/seeding within the SuDS features. As such, this management does not cover any other elements of the SuDS design, such as the maintenance of the hydrological or engineered functions, capacity, build up or any associated infrastructure. Whilst the landscape maintenance tasks covered here are high-level and are not based on a detailed SuDS design, they are broadly inline with typical (landscape specific) SuDS maintenance requirements advocated in CIRA SuDS Manual (C753) 2015 and are not intended to contradict any of the prescribed non-landscape focussed management requirements of this guidance. As such there will be additional (non-landscape) maintenance and management requirements to ensure the ongoing operational capacity of the SuDS features, which are not covered in this report.

At a later project stage all of the landscape maintenance discussed within this document will need to be reappraised (including the site constraints, frequencies of work, removal/control of pollutants, planting/seeding requirements, etc) as/when a detailed SuDS and Landscape design is progressed.

3.1. Filter strips

Typical management and maintenance techniques/considerations

Table 7 Typical management and maintenance techniques/considerations

Maintenance schedule	Required action	Typical frequency
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	First cut to be at least 50 mm. Subsequent Cuts – to retain grass height within to 75 -100 mm range and remove clippings from site	Monthly (during the growing season); or as required
	Manage other vegetation and remove nuisance plants*	Monthly (at start, then as requested)
	Inspect filter strip surface to identify evidence of erosion, poor vegetation growth, compaction, ponding, sedimentation and contamination (e.g., soils)	Monthly (at start, then half yearly)
	Check flow spreader and filter strip surface for even gradients	Monthly (at start, then half yearly)
	Inspect gravel flow spreader upstream of filter strip for clogging	Monthly (at start, then half yearly)
	Inspect silt accumulation rates and remove sediment.	Monthly (at start, then half yearly)
Occasional Maintenance	Reseed areas of poor vegetation growth; after plant types to better suit conditions, if required	As required or if bare soil is exposed over ≥10% of the filter strip area.
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader (if used) or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

**Nuisance plants may comprise of weeds, perennial plants within the proposed mix that need thinning, or invasive species (which will need to be treated/removed in accordance to the appropriate guidance)*

3.2. Bio-retention Areas (WRP site only)

Typical management and maintenance techniques/consideration

Table 8 Typical management and maintenance techniques/considerations

Maintenance schedule	Required action	Typical frequency
Regular Inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, presence of nuisance plants* within beds, poor growth, and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage Quarterly	
Regular Maintenance	Remove litter and surface debris and weeds/nuisance plants*	Quarterly
	First cut to be at least 50 mm. Cut grass – to retain grass ideal height of 100 mm and remove clippings from site	Monthly (during the growing season); or as required
	Replace any plants, to maintain planting density	As required
	Remove sediment, letter and debris build-up from around inlets or from forebays	As required
Occasional Maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be ≥ 20 years

**Nuisance plants may comprise of weeds, perennial plants within the proposed mix that need thinning, or invasive species (which will need to be treated/removed in accordance to the appropriate guidance).*

3.3. Swales

Typical management and maintenance techniques/considerations

Table 9 Typical management and maintenance techniques/considerations

Maintenance schedule	Required action	Typical frequency
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	First cut to be at least 50 mm. Subsequent Cuts – to retain grass ideal height 100 mm range and remove clippings from site	Monthly (during the growing season); or as required
	Manage other vegetation and remove nuisance plants*	Monthly (at start, then as requested)
	Inspect inlets, outlets and overflows and check dams for blockages, and clear if necessary	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for ≤48 hours	Monthly or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Manage OMH plants in base – where provided	Annually
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional Maintenance	Reseed areas of poor vegetation growth; after plant types to better suit conditions, if required	As required or if bare soil is exposed over ≥10% of the swale treatment area.
Remedial actions	Repair eroded grass or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of swale	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

**Nuisance plants may comprise of weeds, perennial plants within the proposed mix that need thinning, or invasive species (which will need to be treated/removed in accordance to the appropriate guidance).*

3.4. Detention Basins

Typical management and maintenance techniques/considerations

Table 10 Typical management and maintenance techniques

Maintenance schedule	Required action	Typical frequency
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	First cut to be at least 50 mm. Subsequent Cuts – to retain grass ideal height 100 mm range and remove clippings from site	Monthly (during the growing season); or as required around spillways, inlets and outlets Half yearly (spring -before nesting season, and September for meadow grass in and around basin)
	Manage other vegetation and remove nuisance plants*	Monthly (at start, then as requested)
	Inspect inlets, outlets and overflows for blockages, and clear if necessary	Monthly
	Inspect banksides, structure, pipework etc for evidence of physical damage and report	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage OMH plants in outlet pool – where provided	Annually
Occasional Maintenance	Reseed areas of poor vegetation growth; after plant types to better suit conditions, if required	As required or if bare soil is exposed over ≥10% of the detention area.
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required

	Realignment of gabions	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

**Nuisance plants may comprise of weeds, perennial plants within the proposed mix that need thinning, or invasive species (which will need to be treated/removed in accordance to the appropriate guidance).*

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