



Drainage Strategy

Scout Moor II Further Environmental Information

June 2026

P e l l F r i s c h m a n n

Scout Moor II Wind Farm

Drainage Strategy

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Report Ref.	230509 Scout Moor II Drainage					
File Path	https://pellf.sharepoint.com/sites/EdinburghOfficeTeam/Shared Documents/General/Projects/10109692 Cubico Scout Moor/01 - WIP/Reports/Water/230509 Scout Moor II Drainage.docx					
Rev	Suit	Description	Date	Originator	Checker	Approver
P01	S2	Preliminary Issue	12-05-25	D Warren	N McKim	D Warren
S01	S1	Final Version	23-05-2025	D Warren	N McKim	D Warren
S02	S1	Final Version following Cubico Comments	13-06-2025	D Warren	N McKim	D Warren
S03	S1	Updated in accordance with consultee comments	15-05-2026	D Warren	N McKim	D Warren
S04	S1	Updated in accordance with consultee comments	26-05-2026	N McKim	D Warren	D Warren
S05	S1	Updated to include laydown area drainage	29-05-2026	D Warren	D Warren	D Warren
Ref. reference. Rev revision. Suit suitability.						

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1 Introduction

1.1 Project Brief

- 1.1.1 This Drainage Strategy (DS) has been prepared by Pell Frischmann on behalf of Cubico UK Development (Wind 1) Limited ('the Applicant' or 'Cubico'). It is submitted as part of Further Environmental Information in respect of the cross-boundary applications for full planning permission ('the Applications') relating to the construction and operation of a new onshore wind farm (to be known as 'Scout Moor II'), alongside a comprehensive moorland restoration scheme (the 'Proposed Development'), on land at Rooley Moor ('the Site').
- 1.1.2 The Site crosses the administrative boundaries of Rossendale Borough Council ('RBC') and Rochdale Metropolitan Borough Council ('RMBC') (collectively referred to as 'the Councils'). The Councils are the Local Planning Authorities ('LPA's') responsible for the determination of the Applications, which were originally submitted on 23 July 2025 and were validated by the Councils on 07 August 2025 (RBC ref. 2025/0267 and RMBC ref. 25/00680/FUL).
- 1.1.3 Following the completion of an extended period of statutory consultation on the Applications, the Applicant has evolved the Proposed Development to respond to comments received from statutory and non-statutory consultees, the public and other interested stakeholders and is hereby formally amending the Applications through the submission of Further Environmental Information ('FEI'). The FEI supersedes the information submitted in July 2025 ('the 2025 Submission') and will be subject to further statutory consultation by the Councils. A summary of the amendments to the Applications is set out in detail the Planning, Design and Access Statement (prepared by Turley), but in summary includes the reduction in turbine numbers from 'up to 17 turbines' to 'up to 12 turbines', alongside the relocation/repositioning of turbine positioning, access track layout and the layout and design of other associated infrastructure.
- 1.1.4 This report provides an outline surface water management strategy to mitigate any impact from surface water runoff attributed to the Proposed Development, as identified within the Flood Risk Assessment, prepared by Pell Frischmann (report ref. 130125 Rev P05). The strategy is developed in accordance with sustainable drainage principles and allows the Site to mitigate flood risk during design storm events, whilst ensuring no increase of flood risk to offsite receptors and avoiding deterioration of the water environment.
- 1.1.5 To complete the DS, the following key stages of work have been undertaken;
- Collation of desk-based information and a review of publicly available information, including local data, policy and guidance.
 - A desktop review of other data that has been made available such as topographical surveys/elevation information and Proposed Development layout plans.
 - Estimation of the required surface water attenuation storage and provision of outline Sustainable Urban Drainage Systems (SuDS) features arrangement.
- 1.1.6 The DS has been prepared in accordance with the advice and requirements prescribed in current best practice documents relating to management of flood risk in development, published by the Construction Industry Research and Information Association (CIRIA)¹ & the British Standards Institution (BSI) BS8533², as well as National Planning Policy Framework (NPPF) (December 2024) and Planning Practice Guidance (PPG) (August 2022).

1.2 Site Location

- 1.2.1 The Site is located approximately 7.5 kilometres (km) north-west of Rochdale and approximately 5km to the south-east of Rawtenstall in moorland constituting part of the South Pennines. The location of the Site is shown in **Figure 1-1**.

¹ CIRIA Drainage Guidance can be found here: <https://www.susdrain.org/resources/ciria-guidance.html>

² Information on BSI 8533 can be found here: <https://standardsdevelopment.bsigroup.com/projects/2016-03028>



Figure 1-1 Site Location Plan

1.3 Topography & Geology

- 1.3.1 A summary of the topography and geological conditions on site is included in the Flood Risk Assessment (report ref. 130125 Rev P05).

1.4 Existing Drainage & Watercourses

- 1.4.1 A review of the OS OpenRivers dataset shows several named and unnamed watercourses within and around the Site. Naden Brook extends from Naden Higher Reservoir into the southwest of the Site, along with other unnamed watercourses. Cowm Brook extends from Cown Reservoir, along the western boundary of the Site, from which Fern Isle Brook enters the Site. Greens Clough watercourse, a tributary of the River Irwell, encroaches into the north of the Site.
- 1.4.2 Internal Drainage Board (IDB) mapping suggests that the Site and associated local watercourses are outside of any IDB catchment.
- 1.4.3 Due to the rural nature of the Site, no sewer or piped drainage networks are believed to be present within the upland area of the Site. Along the proposed grid connection routes, which are along sections of the public highway, road drainage is present in the form of gullies and sewers which will drain the surface water.

1.5 Proposed Development

- 1.5.1 The proposed development would include:
- Up to 12 wind turbines, each up to 180 metres (m) to tip;
 - A substation and underground electrical cabling infrastructure;
 - A network of access tracks and track improvements;
 - A temporary construction compound;
 - Temporary laydown areas for materials and equipment;
 - Two underground cable route options to connect the proposed substation to the grid at Rawtenstall Bulk Supply Point (BSP); and
 - A comprehensive moorland restoration and management plan, comprising habitat enhancement and restoration works, as well as fencing.
- 1.5.2 A complete description of the Proposed Development is provided in the Environmental Statement (ES Volume I: Chapter 4), as well as the Planning, Design & Access Statement which are also submitted as part of the planning application.

2 Surface Water Drainage Strategy

2.1.1 Current best practice relating to sustainable surface water management is outlined in the SuDS Manual (CIRIA Report C753) which provides details on the use of SuDS for managing surface water runoff:

- Prevention – the use of good site design and housekeeping measures on individual sites to prevent runoff and pollution (e.g. minimise areas of hard standing).
- Source Control – control of runoff at or very near its source (such as the use of rainwater harvesting, permeable paving or green roofs).
- Site Control – management of water from several sub-catchments (including routing water from roofs and car parks to one or several soakaways or attenuation ponds for the whole site).
- Regional Control – management of runoff from several sites, typically in a retention pond or wetland.

2.1.2 It is generally accepted that implementation of SuDS, as opposed to conventional drainage systems, provides several benefits by:

- Reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream.
- Reducing the volumes and frequency of water flowing directly to watercourses or sewers by removing pollutants from diffuse pollutant sources.
- Improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources.
- Reducing potable water demand through rainwater harvesting.
- Improving amenity through the provision of public open spaces and providing biodiversity and wildlife habitat enhancements.
- Replicating natural drainage patterns, including the recharge of groundwater so that the baseflows are maintained.

2.1.3 The Surface Water Drainage Strategy for the Proposed Development will comprise the management of surface water runoff from the hardstanding and impermeable areas. In accordance with CIRIA Report C753, the hierarchy for favoured disposal of surface water runoff from development sites is as follows:

1. Water reuse, where a demand is identified.
2. Infiltration to Ground, where ground conditions permit.
3. Discharge to Surface Waters.
4. Discharge to Sewer.

2.2 Existing Runoff

2.2.1 Greenfield runoff rates have been estimated through application of methodology outlined in IH124 as set out within the Interim Code of Practice for SuDS (ICPSuDS). The IH124 method can be used to estimate Greenfield runoff rates for a range of Annual Exceedance Probability (AEP) events, or return periods, by applying regional growth curve factors to the mean annual peak runoff (i.e. QBAR). The UK hydrological region for the Site is Region 10 therefore the appropriate growth curve factors for this region have been incorporated into the analysis undertaken in the MicroDrainage software suite. The hydrological characteristics for the catchment have been incorporated into the runoff modelling and results are presented below in [Table 2-1](#) for a range of AEP storm events. Full Calculations are included in Appendix A.

- Site Component Areas: Substation Platform – 0.413ha; Turbine Hardstanding – 0.891ha; Construction Compound – 1ha; Laydown area – 0.76ha; access tracks – vary in area.
- Average Annual Rainfall (SAAR): 1301
- Soil Index: 0.5
- UK Hydrological Region: 10
- Urban Extent: 0

Table 2-1 Estimation of Greenfield Runoff Rates (Pre-development)

AEP (%)	Return Period	Greenfield Runoff (l/s/ha)
50	2	10.67
	<u>QBAR</u>	11.45
3.3	30	19.35
1	100	23.70

- 2.2.2 As the Site is large and covers a number of drainage sub-catchments, a catchment delineation exercise has been undertaken to identify drainage watersheds and pathways for all drainage channels and watercourses in and around the site. Drawing SK24 in Appendix B illustrates these existing sub-catchments, overlaid with the proposed development layout. This allows the proposed drainage to be designed to ensure that existing flow paths and flow rates are maintained, and no flows will be diverted to other sub-catchment areas. Refer to section 2.5 for further details.
- 2.2.3 During consultation the Whitworth Flood Forum had stated that Whitworth had experienced severe flooding on several occasions, with a notable event during Storm Eva in 2015. Due to its topographic location, Whitworth received a significant amount of surface runoff from the surrounding hills as they were saturated from preceding rainfall events.
- 2.2.4 As development within the higher moorland areas can have an impact upon surface runoff in the lower catchment, the drainage strategy has been developed to ensure that there would be no increase in peak flows within any watercourses or channels routing from the Site, thus ensuring any future rainfall events would not be made worse by the Proposed Development.
- 2.2.5 It should also be noted that the sub-catchments that receive runoff from the Proposed Development drain into the River Spodden downstream of Whitworth and so there would be no impact upon flows through the town.

2.3 Proposed Runoff Rates

- 2.3.1 In accordance with DEFRA guidance³ the limiting discharge rate for surface water drainage from impermeable surfaces on the proposed development should be limited to the greenfield runoff for the equivalent return period. Therefore, the discharge restrictions for the substation, turbine hardstandings and construction compound are detailed in Table 2-2. As a conservative approach it has been assumed that these areas would be 100% impermeable, however it is likely that a large portion of this would be constructed from crushed stone and would allow for a degree of infiltration.
- 2.3.2 The substation, construction compound and laydown area are single elements of the Site, however there are multiple turbines across the Site with associated hardstandings. The hardstanding impermeable area will be the same for all turbines, and so the calculations have been undertaken for just one. Each turbine hardstanding will then be designed with individual drainage and SuDS features which will drain to the existing sub-catchment, as illustrated on drawing SK24 in Appendix B.
- 2.3.3 Track drainage covers a number of different existing sub-catchments across the site, and so the proposed discharge points vary according to the drainage catchment they are located in. Drawing SK26 illustrates the areas of the tracks draining to the individual catchments, along with the proposed restricted runoff rates.

Table 2-2 Proposed Discharge Restrictions

Location	Return Period	Limiting Discharge (l/s)	Attenuation requirements (m³)
Substation (0.413ha)	2	4.4	50
	30	8.0	92

³ <https://assets.publishing.service.gov.uk/media/5a815646ed915d74e6231b43/sustainable-drainage-technical-standards.pdf>

	100	9.8	215
One Individual Turbine Hardstanding (0.891ha)	2	9.5	110
	30	17.2	205
	100	21.1	470
Construction Compound (1ha)	2	10.6	125
	30	19.3	230
	100	23.7	530
Laydown Area (0.76ha)	2	8.11	93
	30	14.71	172
	100	18.01	400

2.4 Surface Water Attenuation

- 2.4.1 In order to treat and attenuation the surface water runoff prior to discharge, SuDS features are proposed which will facilitate this for each of the areas of hardstanding across the site.
- 2.4.2 Table 2-2 also presents proposed attenuation volumes required for each return period for each location on site based upon the limiting discharge rates. The 100yr events also include a 45% uplift allowance for climate change. A climate change allowance has been taken as the design value as the upper end allowance for the 2050s epoch.
- 2.4.3 Discharge rates are to be limited to the equivalent greenfield runoff rate for each return period by means of a flow control, and the outlets will be piped to the watercourses within each sub-catchment. The flow controls are to allow a variable discharge based upon the return period event, such as weir walls and orifice controls. Exact details of their operation will be covered at the detailed design stage.
- 2.4.4 It is proposed that the attenuation features are designed to accommodate the 1 in 30yr event, with any exceedance flows routing overland and following existing overland flow pathways to the watercourses. As the site is rural in nature, overland exceedance flows will be retained on site and will not have any impact upon buildings or third-party properties.

2.5 SUDS Features

- 2.5.1 The proposed strategy is based on sustainable drainage principles, employing SuDS features to manage the surface water runoff across the site. Principally, all surface water will ultimately be discharged into the small watercourses running through the site.
- 2.5.2 Whilst attenuation basins are principally selected to address the quantity of water that is to be attenuated, they also have water quality benefits, especially if planted with vegetation. They can also provide additional habitats for wildlife and increase biodiversity.

Trackside Drainage

- 2.5.3 The proposed typical trackside drainage layout for the Proposed Development is shown in Drawing SK26 (Appendix C).
- 2.5.4 The ditches or swales will be sized by the contractor at the detailed design stage (and secured via planning condition) to accommodate surface runoff from the track for the 1 in 30-year design storm event.
- 2.5.5 As the access tracks cover a number of different existing drainage sub-catchments, the drainage of the tracks will ensure that no flows are routed to other sub-catchments and thus potentially increasing flows.
- 2.5.6 Drawing SK26 in Appendix B presents the track areas, proposed discharge rates and attenuation requirements for each portion of the access tracks. At the downstream end of the drainage channels, a flow control measure will restrict the flows to Qbar rate for all events up to the 30 year storm, and the outlet will be piped to the respective watercourse. Attenuation will be within the channels themselves, or if required an attenuation basin feature. This will be covered at the detailed design stage, in conjunction with the contractor, and will be secured via planning condition.
- 2.5.7 At locations where the track routes to another drainage sub-catchment, a linear cut-off drain should be included across the track to establish a drainage boundary.
- 2.5.8 All permanent drainage should be installed concurrently with all adjacent infrastructure. All drainage channels should be sufficiently wide as is practicable to allow wildlife to safely enter and exit the channel. The channel banks shall be at a minimum slope of 1 in 3.
- 2.5.9 Permanent check dams should be specified at the detailed design stage. They should be spaced at regular intervals within the drainage ditches. Check dams are required to reduce the velocity and slow down sediment transportation while also preventing channel scour.
- 2.5.10 The drainage ditches are to be vegetated with robust grass plating to slow flows, provide treatment and also to reduce erosion risk.
- 2.5.11 Check dams are proposed to be constructed of clean aggregate graded 50mm-300mm and embedded into the side walls and invert of the excavation by at least 100mm. The number and location of check dams will be dependent on the slope gradient with a minimum spacing of 1 check dam per 75m length of ditch.

- 2.5.12 The spacing of relief drains crossing the access tracks should be determined at the detailed design stage. The spacing of relief drains should not exceed 200m as per best practice.
- 2.5.13 Drainage ditches will be provided on both sides of the access track, with the upslope ditch intercepting and conveying surface runoff from the adjacent land, to maintain existing flow routing pathways. Collected flows will be directed into the swale system, where they will undergo treatment through natural filtration and settlement processes. This approach allows sediments to settle and improves water quality before discharge. The treated water will then be released at a controlled rate, replicating existing natural drainage patterns and ensuring that post-development runoff conditions closely mimic the current baseline.

Attenuation Basins

- 2.5.14 Attenuation features will be located adjacent to and downslope of each turbine hardstanding area, with runoff shedding overland into the basin/swale features. These will be vegetated basins which will allow any exceedance flows to overtop and shed back into the surrounding downslope, thus maintaining existing overland flow routes within the catchment. These flows eventually route into the watercourses within and adjacent to the Site.
- 2.5.15 The features are designed to accommodate the 1 in 30 year event, with a conservative estimate of all flows from the temporary and permanent working areas contributing. This is shown by the red hatched areas in Figure 2-1.

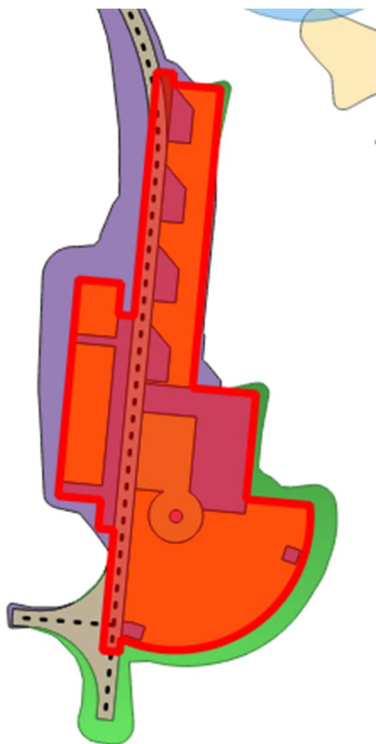


Figure 2-1 Turbine hardstanding contributing areas

- 2.5.16 The attenuation basin is designed to drain down in a controlled manner following rainfall events, ensuring that stored surface water is gradually released rather than discharged rapidly. Water collected within the basin will be conveyed via a piped outfall system, which directs flows safely to a nearby watercourse. To prevent downstream flooding and maintain greenfield runoff conditions, a flow control structure will be installed at the outlet, restricting discharge to the agreed greenfield runoff rate. This controlled release mimics natural drainage patterns, reducing peak flows and supporting sustainable water management within the site.
- 2.5.17 They would run the length of the contributing area, approximately 150m long and 0.5m deep. Side slopes of 1 in 2 and a 2m side base would provide a volume of approximately 225m³.
- 2.5.18 Should additional storage be required these could be underdrained with filter drains to provide both storage and treatment.

- 2.5.19 A similar feature would be proposed for adjacent to the substation platform, with a vegetated swale/basin on the downslope side. This would also be sized to accommodate the 30 year flows.
- 2.5.20 This basin would be approximately 62m in length with a depth of 0.5m and base width of 2m. 1 in 2 side slopes would provide a volume of approximately 92m³.
- 2.5.21 Adjacent to the construction compound a vegetated feature 100m in length and 0.75m deep would be located to provide treatment and attenuation. This would have a 2m wide base and 1 in 2 side slopes and would provide approximately 260m³ of storage.
- 2.5.22 Adjacent to the laydown area a vegetated feature 100m in length and 0.65m deep would be located to provide treatment and attenuation. This would have a 2m wide base and 1 in 2 side slopes and would provide approximately 180m³ of storage.

Interception drainage

- 2.5.23 Where new infrastructure or hardstanding is proposed on site, existing overland flow paths may be severed, preventing the surface water from its natural flow through the catchment. In order to maintain these flow paths, interception drains should be included on the upslope side of any hardstanding to capture the clean runoff and route it around to the downslope side. This can be by means of swale or drainage ditch, which is then piped to the downslope side and released in a controlled way, such as unlined filter drain or swale. This linear discharge is to ensure there is no increase in flood risk or erosion from a point discharge.
- 2.5.24 The details of these interception drains will be covered at the detailed design stage.
- 2.5.25 The proposed laydown area along the access track to the site is situated in a location where existing drainage channels for the existing track route into the New Gate Brook. At this location it is proposed to intercept this drainage channel and any others adjacent to it and divert it around the new hardstanding area. This new channel would be a natural channel to replicate the existing and would route the flows to the same downstream location without increasing any flow rates or downstream flood risk. The runoff generated from the new laydown hardstanding will be captured and attenuated separately as noted above. This is illustrated on drawing SK27 in Appendix C.

Grid Connection Routes

- 2.5.26 The proposed grid connection routes from the substation on site to the Rawtenstall Bulk Supply Point (BSP) will route along the public highway for a portion of the route. Existing surface water drainage, along with other services, are likely to be present along these routes, including road gullies and sewers. The grid connection will require to ensure that the drainage along these routes is maintained at current standards with no increase in runoff rates and volumes. This will be covered during the detailed design stage.

Water Quality

- 2.5.27 The Simple Index Approach for assessing pollution prevention outlined in the SuDS Manual has been used to quantify the water quality impacts of the proposed SuDS solution to determine their effectiveness.
- 2.5.28 The proposed use of the development would be considered a low pollution hazard level, so pollution values have been copied from the SuDS Manual and compared to the mitigation index values as per Table 2-3.

Table 2-3 SuDS Mitigation Indices (from CIRIA SuDS Manual)

SuDS Component	Mitigation Indices		
	<i>Total Suspended Solids</i>	<i>Metals</i>	<i>Hydrocarbons</i>
Land Use Pollution Index			
Low Traffic Roads	0.5	0.4	0.4
SuDS Mitigation Index			
Detention Basin	0.5	0.5	0.6
Mitigation Requirement Met?	Yes	Yes	Yes

- 2.5.29 Therefore, the detention basins are considered suitable SuDS features to manage the surface water pollution potential expected from the proposed development to ensure suitable water quality standards in the downstream receiving watercourses.

Maintenance and Adoption

- 2.5.30 For the proposed surface water drainage system to function correctly, it will need to be appropriately maintained.
- 2.5.31 The maintenance schedule for the network must be comprehensive and detail the specific maintenance requirements for each element of the drainage system. The CIRIA SuDS Manual has extensive information relating to the maintenance of SuDS which should be consulted when specifying the requirements.
- 2.5.32 For pipes, manholes and gullies, both general best practice and specific manufacturer maintenance protocols should be followed. Example maintenance activities and frequencies for the proposed attenuation basins given in [Table 2-4](#).
- 2.5.33 Long term maintenance and funding for this work is to be agreed at the detailed design stage, and the below activities should be adhered to.

Table 2-4 Operation and Maintenance Requirements for Attenuation Basins

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove Litter and Debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies	Monthly (for first year), then annually or 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 wetland plants in outlets pool – where provided	Annually (as set out in Chapter 23)
Occasional Maintenance	Reseed areas of poor vegetation growth	As required
	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 reseedling or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets, and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

3 Watercourse Crossings

- 3.1.1 Watercourses within the site boundary shall be crossed only after the design of appropriate crossing structures has been completed and approved in accordance with relevant regulatory, environmental, and engineering standards. Typical watercourse crossing details shall be in accordance with Standard Detail SK15 – the detailed design will be secured via planning condition. Where feasible and practicable, culverting of ordinary watercourses will be avoided.
- 3.1.2 Prior to the commencing construction works, the contractor will produce a detailed watercourse crossing proposals which will be submitted to and approved by the Local Planning Authority via a planning condition. This will contain the construction details for the proposed watercourse crossings. The CEMP must make reference to relevant SEPA guidance.
- 3.1.3 The Contractor retains overall responsibility for the detailed design and specification of the new water crossings, along with producing the final watercourse crossing proposals.

4 Conclusions

- 4.1.1 This Drainage Strategy has been written to support an application for full planning permission for the development known as Scout Moor II.
- 4.1.2 The below summarises the outline drainage strategy for the Site:
- The proposed access tracks will be served by a network of surface water drainage ditches adjacent to the tracks. The trackside drainage will utilise relief drains crossing the access track longitudinally to ensure the drainage ditches do not surcharge. The proposed drains should utilise silt traps/catch pits at the inlet of all cross drains to prevent the pipes becoming blocked. These trackside drains will be drained to the existing drainage sub-catchments across the site at a controlled rate to ensure no increase in flows.
 - The proposed trackside drainage should be designed so that it allows wildlife to cross safely.
 - Erosion protection should be utilised at all inlets and outlets.
 - It is proposed that runoff from the proposed substation platform, laydown area, construction compound and the wind turbine hardstandings is captured by basin/swale features that will treat and attenuate the flows before being discharged back to the downstream catchments at greenfield runoff rates.
 - Watercourse crossings shall be designed to ensure that no detrimental impact is caused, and the Contractor retains overall responsibility for the detailed design and specification of the new water crossings.
 - All surface water flows generated from new hardstanding across the site will be captured, treated, attenuated and discharged at the equivalent greenfield runoff rates to ensure that downstream flood risk is not increased.
- 4.1.3 The detailed drainage design is proposed to be secured through pre-commencement planning conditions attached to the future full planning permission.

Appendix A MicroDrainage Calculations

Pell Frischmann				Page 1		
5 Manchester Square London W1U 3PD						
Date 29/05/2026 13:11		Designed by DWarren				
File 2yr attenuation - BTA.SRCX		Checked by				
Innovyze			Source Control 2020.1.3			
Summary of Results for 2 year Return Period						
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	
15 min Summer	0.392	0.392	8.1	39.2	0 K	
30 min Summer	0.532	0.532	8.1	53.2	0 K	
60 min Summer	0.671	0.671	8.1	67.1	0 K	
120 min Summer	0.770	0.770	8.1	77.0	Flood Risk	
180 min Summer	0.808	0.808	8.1	80.8	Flood Risk	
240 min Summer	0.823	0.823	8.1	82.3	Flood Risk	
360 min Summer	0.822	0.822	8.1	82.2	Flood Risk	
480 min Summer	0.804	0.804	8.1	80.4	Flood Risk	
600 min Summer	0.778	0.778	8.1	77.8	Flood Risk	
720 min Summer	0.746	0.746	8.1	74.6	Flood Risk	
960 min Summer	0.665	0.665	8.1	66.5	0 K	
1440 min Summer	0.483	0.483	8.1	48.3	0 K	
2160 min Summer	0.303	0.303	8.1	30.3	0 K	
2880 min Summer	0.204	0.204	7.9	20.4	0 K	
4320 min Summer	0.137	0.137	6.9	13.7	0 K	
5760 min Summer	0.117	0.117	5.8	11.7	0 K	
7200 min Summer	0.104	0.104	5.1	10.4	0 K	
8640 min Summer	0.096	0.096	4.5	9.6	0 K	
10080 min Summer	0.090	0.090	4.1	9.0	0 K	
15 min Winter	0.445	0.445	8.1	44.5	0 K	
30 min Winter	0.607	0.607	8.1	60.7	0 K	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)		
15 min Summer	32.654	0.0	46.4	23		
30 min Summer	22.732	0.0	64.6	35		
60 min Summer	15.352	0.0	87.4	62		
120 min Summer	10.205	0.0	116.2	104		
180 min Summer	8.009	0.0	136.9	138		
240 min Summer	6.721	0.0	153.1	172		
360 min Summer	5.237	0.0	179.0	244		
480 min Summer	4.387	0.0	199.9	314		
600 min Summer	3.824	0.0	217.8	382		
720 min Summer	3.418	0.0	233.7	452		
960 min Summer	2.862	0.0	260.9	588		
1440 min Summer	2.228	0.0	304.6	824		
2160 min Summer	1.736	0.0	356.1	1168		
2880 min Summer	1.452	0.0	397.1	1504		
4320 min Summer	1.127	0.0	462.4	2204		
5760 min Summer	0.941	0.0	514.9	2936		
7200 min Summer	0.816	0.0	558.1	3672		
8640 min Summer	0.726	0.0	596.1	4400		
10080 min Summer	0.658	0.0	630.1	5136		
15 min Winter	32.654	0.0	51.9	23		
30 min Winter	22.732	0.0	72.4	36		
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Date 29/05/2026 13:11 File 2yr attenuation - BTA.SRCX						
Innovyze			Designed by DWarren Checked by Source Control 2020.1.3			
Summary of Results for 2 year Return Period						
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	
60 min Winter	0.769	0.769	8.1	76.9	Flood	Risk
120 min Winter	0.883	0.883	8.1	88.3	Flood	Risk
180 min Winter	0.923	0.923	8.1	92.3	Flood	Risk
240 min Winter	0.933	0.933	8.1	93.3	Flood	Risk
360 min Winter	0.911	0.911	8.1	91.1	Flood	Risk
480 min Winter	0.866	0.866	8.1	86.6	Flood	Risk
600 min Winter	0.811	0.811	8.1	81.1	Flood	Risk
720 min Winter	0.749	0.749	8.1	74.9	Flood	Risk
960 min Winter	0.579	0.579	8.1	57.9	0	K
1440 min Winter	0.321	0.321	8.1	32.1	0	K
2160 min Winter	0.157	0.157	7.6	15.7	0	K
2880 min Winter	0.128	0.128	6.5	12.8	0	K
4320 min Winter	0.104	0.104	5.1	10.4	0	K
5760 min Winter	0.092	0.092	4.2	9.2	0	K
7200 min Winter	0.084	0.084	3.7	8.4	0	K
8640 min Winter	0.079	0.079	3.3	7.9	0	K
10080 min Winter	0.074	0.074	3.0	7.4	0	K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)		
60 min Winter	15.352	0.0	97.9	62		
120 min Winter	10.205	0.0	130.2	114		
180 min Winter	8.009	0.0	153.3	146		
240 min Winter	6.721	0.0	171.5	184		
360 min Winter	5.237	0.0	200.5	262		
480 min Winter	4.387	0.0	223.9	338		
600 min Winter	3.824	0.0	244.0	414		
720 min Winter	3.418	0.0	261.7	488		
960 min Winter	2.862	0.0	292.2	616		
1440 min Winter	2.228	0.0	341.2	838		
2160 min Winter	1.736	0.0	398.9	1132		
2880 min Winter	1.452	0.0	444.8	1472		
4320 min Winter	1.127	0.0	517.9	2200		
5760 min Winter	0.941	0.0	576.7	2872		
7200 min Winter	0.816	0.0	625.1	3584		
8640 min Winter	0.726	0.0	667.6	4328		
10080 min Winter	0.658	0.0	705.7	5096		
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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.252	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.760

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.254	4 8	0.253	8 12	0.253

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5 Manchester Square London W1U 3PD																																																																																																	
Date 29/05/2026 13:11 File 2yr attenuation - BTA.SRCX	Designed by DWarren Checked by																																																																																																
Innovyze	Source Control 2020.1.3																																																																																																
Model Details Storage is Online Cover Level (m) 1.000 Tank or Pond Structure Invert Level (m) 0.000 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>100.0</td><td>1.000</td><td>100.0</td></tr></tbody></table> Hydro-Brake® Optimum Outflow Control Unit Reference MD-SHE-0132-8100-1000-8100 Design Head (m)1.000 Design Flow (l/s)8.1 Flush-Flo™Calculated ObjectiveMinimise upstream storage ApplicationSurface Sump AvailableYes Diameter (mm)132 Invert Level (m)0.000 Minimum Outlet Pipe Diameter (mm)150 Suggested Manhole Diameter (mm)1200 <table><thead><tr><th>Control Points</th><th>Head (m)</th><th>Flow (l/s)</th></tr></thead><tbody><tr><td>Design Point (Calculated)</td><td>1.000</td><td>8.1</td></tr><tr><td>Flush-Flo™</td><td>0.300</td><td>8.1</td></tr><tr><td>Kick-Flo®</td><td>0.664</td><td>6.7</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>7.0</td></tr></tbody></table> The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated <table><thead><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr></thead><tbody><tr><td>0.100</td><td>4.8</td><td>1.200</td><td>8.8</td><td>3.000</td><td>13.6</td><td>7.000</td><td>20.4</td></tr><tr><td>0.200</td><td>7.9</td><td>1.400</td><td>9.5</td><td>3.500</td><td>14.6</td><td>7.500</td><td>21.1</td></tr><tr><td>0.300</td><td>8.1</td><td>1.600</td><td>10.1</td><td>4.000</td><td>15.6</td><td>8.000</td><td>21.8</td></tr><tr><td>0.400</td><td>8.0</td><td>1.800</td><td>10.7</td><td>4.500</td><td>16.5</td><td>8.500</td><td>22.4</td></tr><tr><td>0.500</td><td>7.8</td><td>2.000</td><td>11.2</td><td>5.000</td><td>17.4</td><td>9.000</td><td>23.0</td></tr><tr><td>0.600</td><td>7.3</td><td>2.200</td><td>11.7</td><td>5.500</td><td>18.2</td><td>9.500</td><td>23.6</td></tr><tr><td>0.800</td><td>7.3</td><td>2.400</td><td>12.2</td><td>6.000</td><td>18.9</td><td></td><td></td></tr><tr><td>1.000</td><td>8.1</td><td>2.600</td><td>12.7</td><td>6.500</td><td>19.7</td><td></td><td></td></tr></tbody></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	100.0	1.000	100.0	Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	1.000	8.1	Flush-Flo™	0.300	8.1	Kick-Flo®	0.664	6.7	Mean Flow over Head Range	-	7.0	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	4.8	1.200	8.8	3.000	13.6	7.000	20.4	0.200	7.9	1.400	9.5	3.500	14.6	7.500	21.1	0.300	8.1	1.600	10.1	4.000	15.6	8.000	21.8	0.400	8.0	1.800	10.7	4.500	16.5	8.500	22.4	0.500	7.8	2.000	11.2	5.000	17.4	9.000	23.0	0.600	7.3	2.200	11.7	5.500	18.2	9.500	23.6	0.800	7.3	2.400	12.2	6.000	18.9			1.000	8.1	2.600	12.7	6.500	19.7		
Depth (m)	Area (m²)	Depth (m)	Area (m²)																																																																																														
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Mean Flow over Head Range	-	7.0																																																																																															
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)																																																																																										
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0.200	7.9	1.400	9.5	3.500	14.6	7.500	21.1																																																																																										
0.300	8.1	1.600	10.1	4.000	15.6	8.000	21.8																																																																																										
0.400	8.0	1.800	10.7	4.500	16.5	8.500	22.4																																																																																										
0.500	7.8	2.000	11.2	5.000	17.4	9.000	23.0																																																																																										
0.600	7.3	2.200	11.7	5.500	18.2	9.500	23.6																																																																																										
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Innovyze		Source Control 2020.1.3			
Summary of Results for 2 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.414	0.414	10.6	51.7	O K
30 min Summer	0.561	0.561	10.6	70.2	O K
60 min Summer	0.710	0.710	10.6	88.7	Flood Risk
120 min Summer	0.813	0.813	10.6	101.6	Flood Risk
180 min Summer	0.854	0.854	10.6	106.7	Flood Risk
240 min Summer	0.870	0.870	10.6	108.7	Flood Risk
360 min Summer	0.869	0.869	10.6	108.6	Flood Risk
480 min Summer	0.850	0.850	10.6	106.3	Flood Risk
600 min Summer	0.823	0.823	10.6	102.9	Flood Risk
720 min Summer	0.791	0.791	10.6	98.8	Flood Risk
960 min Summer	0.713	0.713	10.6	89.1	Flood Risk
1440 min Summer	0.521	0.521	10.6	65.1	O K
2160 min Summer	0.327	0.327	10.6	40.9	O K
2880 min Summer	0.221	0.221	10.4	27.6	O K
4320 min Summer	0.150	0.150	9.1	18.7	O K
5760 min Summer	0.128	0.128	7.7	16.0	O K
7200 min Summer	0.115	0.115	6.7	14.4	O K
8640 min Summer	0.107	0.107	6.0	13.3	O K
10080 min Summer	0.100	0.100	5.4	12.5	O K
15 min Winter	0.470	0.470	10.6	58.7	O K
30 min Winter	0.641	0.641	10.6	80.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	32.654	0.0	61.0	23	
30 min Summer	22.732	0.0	85.0	35	
60 min Summer	15.352	0.0	115.0	62	
120 min Summer	10.205	0.0	152.9	102	
180 min Summer	8.009	0.0	180.1	136	
240 min Summer	6.721	0.0	201.5	172	
360 min Summer	5.237	0.0	235.5	242	
480 min Summer	4.387	0.0	263.1	312	
600 min Summer	3.824	0.0	286.6	382	
720 min Summer	3.418	0.0	307.4	450	
960 min Summer	2.862	0.0	343.2	588	
1440 min Summer	2.228	0.0	400.7	826	
2160 min Summer	1.736	0.0	468.6	1168	
2880 min Summer	1.452	0.0	522.5	1504	
4320 min Summer	1.127	0.0	608.4	2204	
5760 min Summer	0.941	0.0	677.5	2936	
7200 min Summer	0.816	0.0	734.4	3648	
8640 min Summer	0.726	0.0	784.3	4384	
10080 min Summer	0.658	0.0	829.1	5136	
15 min Winter	32.654	0.0	68.3	23	
30 min Winter	22.732	0.0	95.2	36	
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Summary of Results for 2 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.811	0.811	10.6	101.3	Flood Risk
120 min Winter	0.931	0.931	10.6	116.3	Flood Risk
180 min Winter	0.974	0.974	10.6	121.7	Flood Risk
240 min Winter	0.984	0.984	10.6	123.0	Flood Risk
360 min Winter	0.962	0.962	10.6	120.2	Flood Risk
480 min Winter	0.915	0.915	10.6	114.4	Flood Risk
600 min Winter	0.859	0.859	10.6	107.4	Flood Risk
720 min Winter	0.796	0.796	10.6	99.5	Flood Risk
960 min Winter	0.627	0.627	10.6	78.4	O K
1440 min Winter	0.348	0.348	10.6	43.4	O K
2160 min Winter	0.170	0.170	10.0	21.2	O K
2880 min Winter	0.141	0.141	8.5	17.6	O K
4320 min Winter	0.115	0.115	6.7	14.4	O K
5760 min Winter	0.102	0.102	5.6	12.8	O K
7200 min Winter	0.093	0.093	4.8	11.6	O K
8640 min Winter	0.087	0.087	4.3	10.9	O K
10080 min Winter	0.082	0.082	3.9	10.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	15.352	0.0	128.8	62
120 min Winter	10.205	0.0	171.3	114
180 min Winter	8.009	0.0	201.7	144
240 min Winter	6.721	0.0	225.7	184
360 min Winter	5.237	0.0	263.8	262
480 min Winter	4.387	0.0	294.6	338
600 min Winter	3.824	0.0	321.0	412
720 min Winter	3.418	0.0	344.4	486
960 min Winter	2.862	0.0	384.4	622
1440 min Winter	2.228	0.0	448.9	840
2160 min Winter	1.736	0.0	524.8	1132
2880 min Winter	1.452	0.0	585.3	1472
4320 min Winter	1.127	0.0	681.5	2200
5760 min Winter	0.941	0.0	758.8	2912
7200 min Winter	0.816	0.0	822.5	3672
8640 min Winter	0.726	0.0	878.4	4400
10080 min Winter	0.658	0.0	928.6	5104

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.252	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 1.000

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.333	4 8	0.333	8 12	0.333

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Model Details

Storage is Online Cover Level (m) 1.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	125.0	1.000	125.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0150-1060-1000-1060
Design Head (m)	1.000
Design Flow (l/s)	10.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	150
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	10.6
Flush-Flo™	0.309	10.6
Kick-Flo®	0.682	8.8
Mean Flow over Head Range	-	9.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.4	1.200	11.5	3.000	17.8	7.000	26.7
0.200	10.2	1.400	12.4	3.500	19.2	7.500	27.6
0.300	10.6	1.600	13.2	4.000	20.4	8.000	28.5
0.400	10.5	1.800	14.0	4.500	21.6	8.500	29.4
0.500	10.2	2.000	14.7	5.000	22.7	9.000	30.2
0.600	9.8	2.200	15.4	5.500	23.8	9.500	31.0
0.800	9.5	2.400	16.0	6.000	24.8		
1.000	10.6	2.600	16.6	6.500	25.8		

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Date 09/05/2025 15:04 File 2yr Attenuation - Substa...		Designed by DWarren Checked by			
Innovyze		Source Control 2020.1.3			
Summary of Results for 2 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.422	0.422	4.4	21.1	O K
30 min Summer	0.574	0.574	4.4	28.7	O K
60 min Summer	0.721	0.721	4.4	36.0	Flood Risk
120 min Summer	0.816	0.816	4.4	40.8	Flood Risk
180 min Summer	0.854	0.854	4.4	42.7	Flood Risk
240 min Summer	0.867	0.867	4.4	43.4	Flood Risk
360 min Summer	0.865	0.865	4.4	43.3	Flood Risk
480 min Summer	0.846	0.846	4.4	42.3	Flood Risk
600 min Summer	0.819	0.819	4.4	40.9	Flood Risk
720 min Summer	0.786	0.786	4.4	39.3	Flood Risk
960 min Summer	0.709	0.709	4.4	35.5	Flood Risk
1440 min Summer	0.503	0.503	4.4	25.2	O K
2160 min Summer	0.303	0.303	4.4	15.2	O K
2880 min Summer	0.197	0.197	4.3	9.9	O K
4320 min Summer	0.117	0.117	3.8	5.8	O K
5760 min Summer	0.097	0.097	3.2	4.9	O K
7200 min Summer	0.086	0.086	2.8	4.3	O K
8640 min Summer	0.078	0.078	2.5	3.9	O K
10080 min Summer	0.073	0.073	2.2	3.7	O K
15 min Winter	0.481	0.481	4.4	24.0	O K
30 min Winter	0.659	0.659	4.4	32.9	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	32.654	0.0	25.2	23	
30 min Summer	22.732	0.0	35.2	36	
60 min Summer	15.352	0.0	47.5	62	
120 min Summer	10.205	0.0	63.2	102	
180 min Summer	8.009	0.0	74.4	136	
240 min Summer	6.721	0.0	83.3	172	
360 min Summer	5.237	0.0	97.3	242	
480 min Summer	4.387	0.0	108.7	312	
600 min Summer	3.824	0.0	118.4	382	
720 min Summer	3.418	0.0	127.0	450	
960 min Summer	2.862	0.0	141.8	586	
1440 min Summer	2.228	0.0	165.6	826	
2160 min Summer	1.736	0.0	193.5	1168	
2880 min Summer	1.452	0.0	215.8	1504	
4320 min Summer	1.127	0.0	251.3	2204	
5760 min Summer	0.941	0.0	279.8	2920	
7200 min Summer	0.816	0.0	303.3	3672	
8640 min Summer	0.726	0.0	323.9	4336	
10080 min Summer	0.658	0.0	342.5	5080	
15 min Winter	32.654	0.0	28.3	23	
30 min Winter	22.732	0.0	39.4	37	
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5 Manchester Square					
London					
W1U 3PD					
Date 09/05/2025 15:04		Designed by DWarren			
File 2yr Attenuation - Substa...		Checked by			
Innovyze		Source Control 2020.1.3			
Summary of Results for 2 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.825	0.825	4.4	41.3	Flood Risk
120 min Winter	0.940	0.940	4.4	47.0	Flood Risk
180 min Winter	0.979	0.979	4.4	49.0	Flood Risk
240 min Winter	0.987	0.987	4.4	49.3	Flood Risk
360 min Winter	0.961	0.961	4.4	48.0	Flood Risk
480 min Winter	0.913	0.913	4.4	45.7	Flood Risk
600 min Winter	0.855	0.855	4.4	42.8	Flood Risk
720 min Winter	0.791	0.791	4.4	39.6	Flood Risk
960 min Winter	0.631	0.631	4.4	31.6	O K
1440 min Winter	0.323	0.323	4.4	16.2	O K
2160 min Winter	0.148	0.148	4.1	7.4	O K
2880 min Winter	0.108	0.108	3.5	5.4	O K
4320 min Winter	0.085	0.085	2.7	4.3	O K
5760 min Winter	0.075	0.075	2.3	3.7	O K
7200 min Winter	0.068	0.068	2.0	3.4	O K
8640 min Winter	0.063	0.063	1.8	3.2	O K
10080 min Winter	0.060	0.060	1.6	3.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	15.352	0.0	53.2	62	
120 min Winter	10.205	0.0	70.8	112	
180 min Winter	8.009	0.0	83.3	144	
240 min Winter	6.721	0.0	93.2	184	
360 min Winter	5.237	0.0	109.0	262	
480 min Winter	4.387	0.0	121.7	336	
600 min Winter	3.824	0.0	132.6	412	
720 min Winter	3.418	0.0	142.3	484	
960 min Winter	2.862	0.0	158.8	634	
1440 min Winter	2.228	0.0	185.4	838	
2160 min Winter	1.736	0.0	216.8	1148	
2880 min Winter	1.452	0.0	241.7	1472	
4320 min Winter	1.127	0.0	281.5	2204	
5760 min Winter	0.941	0.0	313.4	2920	
7200 min Winter	0.816	0.0	339.7	3656	
8640 min Winter	0.726	0.0	362.8	4280	
10080 min Winter	0.658	0.0	383.6	5128	
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5 Manchester Square London W1U 3PD		
Date 09/05/2025 15:04	Designed by DWarren	
File 2yr Attenuation - Substa...	Checked by	
Innovyze	Source Control 2020.1.3	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.252	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.413

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.138	4 8	0.138	8 12	0.138

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5 Manchester Square London W1U 3PD		
Date 09/05/2025 15:04 File 2yr Attenuation - Substa...	Designed by DWarren Checked by	
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Model Details

Storage is Online Cover Level (m) 1.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	50.0	1.000	50.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0099-4400-1000-4400
Design Head (m)	1.000
Design Flow (l/s)	4.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	99
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	4.4
Flush-Flo™	0.297	4.4
Kick-Flo®	0.636	3.6
Mean Flow over Head Range	-	3.8

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	4.8	3.000	7.3	7.000	11.0
0.200	4.3	1.400	5.1	3.500	7.9	7.500	11.3
0.300	4.4	1.600	5.5	4.000	8.4	8.000	11.7
0.400	4.3	1.800	5.8	4.500	8.9	8.500	12.0
0.500	4.2	2.000	6.1	5.000	9.4	9.000	12.4
0.600	3.8	2.200	6.4	5.500	9.8	9.500	12.7
0.800	4.0	2.400	6.6	6.000	10.2		
1.000	4.4	2.600	6.9	6.500	10.6		

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5 Manchester Square London W1U 3PD					
Date 09/05/2025 15:03 File 2yr Attenuation - Turbin...			Designed by DWarren Checked by		
Innovyze			Source Control 2020.1.3		
Summary of Results for 2 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.418	0.418	9.5	45.9	O K
30 min Summer	0.567	0.567	9.5	62.3	O K
60 min Summer	0.715	0.715	9.5	78.7	Flood Risk
120 min Summer	0.817	0.817	9.5	89.9	Flood Risk
180 min Summer	0.857	0.857	9.5	94.3	Flood Risk
240 min Summer	0.872	0.872	9.5	95.9	Flood Risk
360 min Summer	0.870	0.870	9.5	95.7	Flood Risk
480 min Summer	0.851	0.851	9.5	93.6	Flood Risk
600 min Summer	0.823	0.823	9.5	90.5	Flood Risk
720 min Summer	0.790	0.790	9.5	86.9	Flood Risk
960 min Summer	0.711	0.711	9.5	78.2	Flood Risk
1440 min Summer	0.513	0.513	9.5	56.5	O K
2160 min Summer	0.319	0.319	9.5	35.1	O K
2880 min Summer	0.213	0.213	9.3	23.4	O K
4320 min Summer	0.144	0.144	8.1	15.8	O K
5760 min Summer	0.123	0.123	6.8	13.5	O K
7200 min Summer	0.110	0.110	5.9	12.1	O K
8640 min Summer	0.102	0.102	5.3	11.2	O K
10080 min Summer	0.096	0.096	4.8	10.5	O K
15 min Winter	0.475	0.475	9.5	52.2	O K
30 min Winter	0.648	0.648	9.5	71.3	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	32.654	0.0	54.3	23	
30 min Summer	22.732	0.0	75.7	35	
60 min Summer	15.352	0.0	102.5	62	
120 min Summer	10.205	0.0	136.3	102	
180 min Summer	8.009	0.0	160.5	136	
240 min Summer	6.721	0.0	179.5	172	
360 min Summer	5.237	0.0	209.9	242	
480 min Summer	4.387	0.0	234.4	312	
600 min Summer	3.824	0.0	255.4	382	
720 min Summer	3.418	0.0	273.9	450	
960 min Summer	2.862	0.0	305.8	586	
1440 min Summer	2.228	0.0	357.1	826	
2160 min Summer	1.736	0.0	417.5	1168	
2880 min Summer	1.452	0.0	465.6	1504	
4320 min Summer	1.127	0.0	542.1	2204	
5760 min Summer	0.941	0.0	603.7	2936	
7200 min Summer	0.816	0.0	654.3	3672	
8640 min Summer	0.726	0.0	698.8	4384	
10080 min Summer	0.658	0.0	738.7	5064	
15 min Winter	32.654	0.0	60.9	23	
30 min Winter	22.732	0.0	84.8	36	
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5 Manchester Square London W1U 3PD					
Date 09/05/2025 15:03 File 2yr Attenuation - Turbin...		Designed by DWarren Checked by			
Innovyze		Source Control 2020.1.3			
Summary of Results for 2 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.817	0.817	9.5	89.9	Flood Risk
120 min Winter	0.936	0.936	9.5	102.9	Flood Risk
180 min Winter	0.978	0.978	9.5	107.6	Flood Risk
240 min Winter	0.987	0.987	9.5	108.6	Flood Risk
360 min Winter	0.963	0.963	9.5	105.9	Flood Risk
480 min Winter	0.915	0.915	9.5	100.6	Flood Risk
600 min Winter	0.857	0.857	9.5	94.3	Flood Risk
720 min Winter	0.792	0.792	9.5	87.2	Flood Risk
960 min Winter	0.620	0.620	9.5	68.2	O K
1440 min Winter	0.337	0.337	9.5	37.0	O K
2160 min Winter	0.163	0.163	8.9	17.9	O K
2880 min Winter	0.135	0.135	7.6	14.8	O K
4320 min Winter	0.110	0.110	5.9	12.1	O K
5760 min Winter	0.098	0.098	5.0	10.7	O K
7200 min Winter	0.089	0.089	4.3	9.8	O K
8640 min Winter	0.083	0.083	3.8	9.1	O K
10080 min Winter	0.079	0.079	3.5	8.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	15.352	0.0	114.8	62	
120 min Winter	10.205	0.0	152.7	112	
180 min Winter	8.009	0.0	179.7	144	
240 min Winter	6.721	0.0	201.1	184	
360 min Winter	5.237	0.0	235.1	262	
480 min Winter	4.387	0.0	262.5	336	
600 min Winter	3.824	0.0	286.0	412	
720 min Winter	3.418	0.0	306.8	484	
960 min Winter	2.862	0.0	342.5	620	
1440 min Winter	2.228	0.0	400.0	838	
2160 min Winter	1.736	0.0	467.6	1132	
2880 min Winter	1.452	0.0	521.5	1472	
4320 min Winter	1.127	0.0	607.2	2180	
5760 min Winter	0.941	0.0	676.1	2896	
7200 min Winter	0.816	0.0	732.9	3648	
8640 min Winter	0.726	0.0	782.7	4328	
10080 min Winter	0.658	0.0	827.4	5112	
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5 Manchester Square London W1U 3PD		
Date 09/05/2025 15:03	Designed by DWarren	
File 2yr Attenuation - Turbin...	Checked by	
Innovyze	Source Control 2020.1.3	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.252	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.891

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.297	4 8	0.297	8 12	0.297

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5 Manchester Square London W1U 3PD		
Date 09/05/2025 15:03	Designed by DWarren	
File 2yr Attenuation - Turbin...	Checked by	
Innovyze	Source Control 2020.1.3	

Model Details

Storage is Online Cover Level (m) 1.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	110.0	1.000	110.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0142-9500-1000-9500
Design Head (m)	1.000
Design Flow (l/s)	9.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	142
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	9.5
Flush-Flo™	0.305	9.5
Kick-Flo®	0.675	7.9
Mean Flow over Head Range	-	8.2

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.1	1.200	10.4	3.000	16.0	7.000	24.0
0.200	9.2	1.400	11.1	3.500	17.2	7.500	24.8
0.300	9.5	1.600	11.9	4.000	18.3	8.000	25.6
0.400	9.4	1.800	12.5	4.500	19.4	8.500	26.3
0.500	9.2	2.000	13.2	5.000	20.4	9.000	27.1
0.600	8.7	2.200	13.8	5.500	21.4	9.500	27.8
0.800	8.6	2.400	14.4	6.000	22.3		
1.000	9.5	2.600	14.9	6.500	23.1		

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5 Manchester Square London W1U 3PD					
Date 29/05/2026 13:10 File 30yr Attenuation - BTA....					
Designed by DWarren Checked by					
Innovyze			Source Control 2020.1.3		
Summary of Results for 30 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.427	0.427	14.7	74.7	0 K
30 min Summer	0.586	0.586	14.7	102.6	0 K
60 min Summer	0.744	0.744	14.7	130.2	Flood Risk
120 min Summer	0.840	0.840	14.7	147.1	Flood Risk
180 min Summer	0.863	0.863	14.7	151.1	Flood Risk
240 min Summer	0.863	0.863	14.7	151.1	Flood Risk
360 min Summer	0.839	0.839	14.7	146.9	Flood Risk
480 min Summer	0.800	0.800	14.7	139.9	Flood Risk
600 min Summer	0.752	0.752	14.7	131.7	Flood Risk
720 min Summer	0.696	0.696	14.7	121.7	0 K
960 min Summer	0.575	0.575	14.7	100.7	0 K
1440 min Summer	0.390	0.390	14.7	68.2	0 K
2160 min Summer	0.233	0.233	14.4	40.7	0 K
2880 min Summer	0.177	0.177	13.5	30.9	0 K
4320 min Summer	0.141	0.141	10.4	24.7	0 K
5760 min Summer	0.123	0.123	8.6	21.6	0 K
7200 min Summer	0.112	0.112	7.4	19.6	0 K
8640 min Summer	0.104	0.104	6.5	18.1	0 K
10080 min Summer	0.098	0.098	5.9	17.1	0 K
15 min Winter	0.485	0.485	14.7	84.8	0 K
30 min Winter	0.669	0.669	14.7	117.0	0 K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	61.601	0.0	87.3	23	
30 min Summer	43.270	0.0	122.8	36	
60 min Summer	29.238	0.0	166.4	62	
120 min Summer	19.142	0.0	218.0	104	
180 min Summer	14.710	0.0	251.3	136	
240 min Summer	12.161	0.0	277.0	172	
360 min Summer	9.287	0.0	317.3	242	
480 min Summer	7.656	0.0	348.9	312	
600 min Summer	6.585	0.0	375.1	380	
720 min Summer	5.819	0.0	397.7	448	
960 min Summer	4.782	0.0	435.8	570	
1440 min Summer	3.619	0.0	494.7	802	
2160 min Summer	2.733	0.0	560.6	1132	
2880 min Summer	2.239	0.0	612.3	1472	
4320 min Summer	1.692	0.0	693.9	2204	
5760 min Summer	1.388	0.0	759.4	2936	
7200 min Summer	1.191	0.0	814.7	3672	
8640 min Summer	1.052	0.0	863.5	4336	
10080 min Summer	0.948	0.0	907.6	5136	
15 min Winter	61.601	0.0	97.8	23	
30 min Winter	43.270	0.0	137.6	36	
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Innovyze			Source Control 2020.1.3		
Summary of Results for 30 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.848	0.848	14.7	148.4	Flood Risk
120 min Winter	0.961	0.961	14.7	168.2	Flood Risk
180 min Winter	0.982	0.982	14.7	171.8	Flood Risk
240 min Winter	0.974	0.974	14.7	170.5	Flood Risk
360 min Winter	0.924	0.924	14.7	161.7	Flood Risk
480 min Winter	0.853	0.853	14.7	149.3	Flood Risk
600 min Winter	0.771	0.771	14.7	135.0	Flood Risk
720 min Winter	0.669	0.669	14.7	117.0	0 K
960 min Winter	0.479	0.479	14.7	83.9	0 K
1440 min Winter	0.244	0.244	14.5	42.7	0 K
2160 min Winter	0.160	0.160	12.1	28.0	0 K
2880 min Winter	0.137	0.137	10.0	23.9	0 K
4320 min Winter	0.114	0.114	7.6	19.9	0 K
5760 min Winter	0.101	0.101	6.2	17.6	0 K
7200 min Winter	0.092	0.092	5.4	16.1	0 K
8640 min Winter	0.086	0.086	4.7	15.0	0 K
10080 min Winter	0.081	0.081	4.3	14.1	0 K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	29.238	0.0	186.4	62	
120 min Winter	19.142	0.0	244.2	114	
180 min Winter	14.710	0.0	281.5	144	
240 min Winter	12.161	0.0	310.3	184	
360 min Winter	9.287	0.0	355.5	262	
480 min Winter	7.656	0.0	390.7	336	
600 min Winter	6.585	0.0	420.1	412	
720 min Winter	5.819	0.0	445.5	480	
960 min Winter	4.782	0.0	488.2	596	
1440 min Winter	3.619	0.0	554.1	802	
2160 min Winter	2.733	0.0	627.8	1112	
2880 min Winter	2.239	0.0	685.8	1472	
4320 min Winter	1.692	0.0	777.3	2200	
5760 min Winter	1.388	0.0	850.5	2872	
7200 min Winter	1.191	0.0	912.5	3656	
8640 min Winter	1.052	0.0	967.2	4320	
10080 min Winter	0.948	0.0	1016.6	5136	
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5 Manchester Square London W1U 3PD		
Date 29/05/2026 13:10 File 30yr Attenuation - BTA....	Designed by DWarren Checked by	
Innovyze Source Control 2020.1.3		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.252	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.760

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.254	4 8	0.253	8 12	0.253

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5 Manchester Square London W1U 3PD		
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Model Details

Storage is Online Cover Level (m) 1.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	175.0	1.000	175.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0173-1470-1000-1470
Design Head (m)	1.000
Design Flow (l/s)	14.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	173
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	14.7
Flush-Flo™	0.322	14.7
Kick-Flo®	0.702	12.4
Mean Flow over Head Range	-	12.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.1	1.200	16.0	3.000	24.8	7.000	37.3
0.200	14.2	1.400	17.2	3.500	26.7	7.500	38.6
0.300	14.7	1.600	18.4	4.000	28.5	8.000	39.8
0.400	14.6	1.800	19.4	4.500	30.2	8.500	41.0
0.500	14.3	2.000	20.4	5.000	31.7	9.000	42.2
0.600	13.8	2.200	21.4	5.500	33.2	9.500	43.3
0.800	13.2	2.400	22.3	6.000	34.6		
1.000	14.7	2.600	23.2	6.500	36.0		

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5 Manchester Square London W1U 3PD					
Date 09/05/2025 15:05 File 30yr Attenuation - Const...		Designed by DWarren Checked by			
Innovyze		Source Control 2020.1.3			
Summary of Results for 30 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.429	0.429	19.3	98.7	O K
30 min Summer	0.589	0.589	19.3	135.4	O K
60 min Summer	0.748	0.748	19.3	172.1	Flood Risk
120 min Summer	0.849	0.849	19.3	195.2	Flood Risk
180 min Summer	0.874	0.874	19.3	200.9	Flood Risk
240 min Summer	0.875	0.875	19.3	201.3	Flood Risk
360 min Summer	0.852	0.852	19.3	196.0	Flood Risk
480 min Summer	0.813	0.813	19.3	187.0	Flood Risk
600 min Summer	0.766	0.766	19.3	176.2	Flood Risk
720 min Summer	0.710	0.710	19.3	163.4	Flood Risk
960 min Summer	0.591	0.591	19.3	136.0	O K
1440 min Summer	0.406	0.406	19.3	93.5	O K
2160 min Summer	0.249	0.249	19.0	57.2	O K
2880 min Summer	0.193	0.193	17.6	44.4	O K
4320 min Summer	0.156	0.156	13.7	35.8	O K
5760 min Summer	0.137	0.137	11.3	31.4	O K
7200 min Summer	0.124	0.124	9.7	28.5	O K
8640 min Summer	0.115	0.115	8.6	26.5	O K
10080 min Summer	0.108	0.108	7.8	24.8	O K
15 min Winter	0.487	0.487	19.3	112.0	O K
30 min Winter	0.671	0.671	19.3	154.3	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	61.601	0.0	114.7	23	
30 min Summer	43.270	0.0	161.5	36	
60 min Summer	29.238	0.0	218.9	62	
120 min Summer	19.142	0.0	286.7	104	
180 min Summer	14.710	0.0	330.6	136	
240 min Summer	12.161	0.0	364.4	172	
360 min Summer	9.287	0.0	417.5	242	
480 min Summer	7.656	0.0	458.9	312	
600 min Summer	6.585	0.0	493.4	380	
720 min Summer	5.819	0.0	523.2	448	
960 min Summer	4.782	0.0	573.3	570	
1440 min Summer	3.619	0.0	650.8	802	
2160 min Summer	2.733	0.0	737.5	1132	
2880 min Summer	2.239	0.0	805.6	1472	
4320 min Summer	1.692	0.0	912.9	2204	
5760 min Summer	1.388	0.0	999.2	2936	
7200 min Summer	1.191	0.0	1071.9	3664	
8640 min Summer	1.052	0.0	1136.2	4392	
10080 min Summer	0.948	0.0	1194.1	5088	
15 min Winter	61.601	0.0	128.6	23	
30 min Winter	43.270	0.0	180.9	36	
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5 Manchester Square London W1U 3PD					
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Innovyze		Source Control 2020.1.3			
Summary of Results for 30 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.852	0.852	19.3	196.0	Flood Risk
120 min Winter	0.969	0.969	19.3	222.8	Flood Risk
180 min Winter	0.991	0.991	19.3	228.0	Flood Risk
240 min Winter	0.986	0.986	19.3	226.7	Flood Risk
360 min Winter	0.937	0.937	19.3	215.5	Flood Risk
480 min Winter	0.866	0.866	19.3	199.3	Flood Risk
600 min Winter	0.786	0.786	19.3	180.7	Flood Risk
720 min Winter	0.685	0.685	19.3	157.5	O K
960 min Winter	0.497	0.497	19.3	114.2	O K
1440 min Winter	0.260	0.260	19.1	59.9	O K
2160 min Winter	0.176	0.176	15.9	40.4	O K
2880 min Winter	0.151	0.151	13.2	34.8	O K
4320 min Winter	0.126	0.126	10.0	29.0	O K
5760 min Winter	0.112	0.112	8.2	25.7	O K
7200 min Winter	0.102	0.102	7.0	23.5	O K
8640 min Winter	0.095	0.095	6.2	21.9	O K
10080 min Winter	0.090	0.090	5.6	20.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	29.238	0.0	245.2	62	
120 min Winter	19.142	0.0	321.2	114	
180 min Winter	14.710	0.0	370.3	144	
240 min Winter	12.161	0.0	408.2	184	
360 min Winter	9.287	0.0	467.6	260	
480 min Winter	7.656	0.0	514.1	336	
600 min Winter	6.585	0.0	552.7	410	
720 min Winter	5.819	0.0	586.1	480	
960 min Winter	4.782	0.0	642.2	596	
1440 min Winter	3.619	0.0	729.0	802	
2160 min Winter	2.733	0.0	826.0	1116	
2880 min Winter	2.239	0.0	902.3	1472	
4320 min Winter	1.692	0.0	1022.6	2196	
5760 min Winter	1.388	0.0	1119.1	2936	
7200 min Winter	1.191	0.0	1200.6	3616	
8640 min Winter	1.052	0.0	1272.6	4360	
10080 min Winter	0.948	0.0	1337.6	5056	
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5 Manchester Square London W1U 3PD		
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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.252	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 1.000

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.333	4 8	0.333	8 12	0.333

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5 Manchester Square London W1U 3PD		
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Model Details

Storage is Online Cover Level (m) 1.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	230.0	1.000	230.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0196-1930-1000-1930
Design Head (m)	1.000
Design Flow (l/s)	19.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	196
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	19.3
Flush-Flo™	0.337	19.3
Kick-Flo®	0.717	16.5
Mean Flow over Head Range	-	16.2

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.8	1.200	21.0	3.000	32.6	7.000	49.2
0.200	18.2	1.400	22.7	3.500	35.2	7.500	50.8
0.300	19.2	1.600	24.1	4.000	37.5	8.000	52.5
0.400	19.2	1.800	25.5	4.500	39.7	8.500	54.0
0.500	18.8	2.000	26.9	5.000	41.8	9.000	55.5
0.600	18.2	2.200	28.1	5.500	43.7	9.500	57.0
0.800	17.4	2.400	29.3	6.000	45.6		
1.000	19.3	2.600	30.5	6.500	47.4		

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5 Manchester Square London W1U 3PD					
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Innovyze			Source Control 2020.1.3		
Summary of Results for 30 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.438	0.438	8.0	40.3	O K
30 min Summer	0.603	0.603	8.0	55.4	O K
60 min Summer	0.760	0.760	8.0	69.9	Flood Risk
120 min Summer	0.851	0.851	8.0	78.3	Flood Risk
180 min Summer	0.870	0.870	8.0	80.0	Flood Risk
240 min Summer	0.868	0.868	8.0	79.8	Flood Risk
360 min Summer	0.841	0.841	8.0	77.4	Flood Risk
480 min Summer	0.801	0.801	8.0	73.7	Flood Risk
600 min Summer	0.753	0.753	8.0	69.3	Flood Risk
720 min Summer	0.700	0.700	8.0	64.4	Flood Risk
960 min Summer	0.569	0.569	8.0	52.3	O K
1440 min Summer	0.372	0.372	8.0	34.2	O K
2160 min Summer	0.210	0.210	7.8	19.3	O K
2880 min Summer	0.147	0.147	7.4	13.6	O K
4320 min Summer	0.115	0.115	5.7	10.6	O K
5760 min Summer	0.099	0.099	4.7	9.1	O K
7200 min Summer	0.090	0.090	4.0	8.2	O K
8640 min Summer	0.083	0.083	3.6	7.6	O K
10080 min Summer	0.078	0.078	3.2	7.1	O K
15 min Winter	0.498	0.498	8.0	45.8	O K
30 min Winter	0.689	0.689	8.0	63.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	61.601	0.0	47.5	23	
30 min Summer	43.270	0.0	66.9	36	
60 min Summer	29.238	0.0	90.5	62	
120 min Summer	19.142	0.0	118.5	104	
180 min Summer	14.710	0.0	136.6	136	
240 min Summer	12.161	0.0	150.6	172	
360 min Summer	9.287	0.0	172.5	242	
480 min Summer	7.656	0.0	189.6	312	
600 min Summer	6.585	0.0	203.9	380	
720 min Summer	5.819	0.0	216.2	450	
960 min Summer	4.782	0.0	236.9	572	
1440 min Summer	3.619	0.0	268.9	802	
2160 min Summer	2.733	0.0	304.7	1132	
2880 min Summer	2.239	0.0	332.8	1472	
4320 min Summer	1.692	0.0	377.2	2204	
5760 min Summer	1.388	0.0	412.7	2904	
7200 min Summer	1.191	0.0	442.8	3648	
8640 min Summer	1.052	0.0	469.3	4392	
10080 min Summer	0.948	0.0	493.3	5136	
15 min Winter	61.601	0.0	53.3	23	
30 min Winter	43.270	0.0	74.9	37	
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5 Manchester Square					
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Innovyze		Source Control 2020.1.3			
Summary of Results for 30 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.867	0.867	8.0	79.8	Flood Risk
120 min Winter	0.977	0.977	8.0	89.9	Flood Risk
180 min Winter	0.994	0.994	8.0	91.4	Flood Risk
240 min Winter	0.983	0.983	8.0	90.5	Flood Risk
360 min Winter	0.929	0.929	8.0	85.5	Flood Risk
480 min Winter	0.856	0.856	8.0	78.7	Flood Risk
600 min Winter	0.774	0.774	8.0	71.2	Flood Risk
720 min Winter	0.679	0.679	8.0	62.5	O K
960 min Winter	0.466	0.466	8.0	42.9	O K
1440 min Winter	0.223	0.223	7.9	20.5	O K
2160 min Winter	0.132	0.132	6.6	12.1	O K
2880 min Winter	0.111	0.111	5.4	10.2	O K
4320 min Winter	0.091	0.091	4.1	8.4	O K
5760 min Winter	0.081	0.081	3.4	7.4	O K
7200 min Winter	0.074	0.074	2.9	6.8	O K
8640 min Winter	0.068	0.068	2.6	6.3	O K
10080 min Winter	0.064	0.064	2.3	5.9	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	29.238	0.0	101.4	62	
120 min Winter	19.142	0.0	132.7	114	
180 min Winter	14.710	0.0	153.0	144	
240 min Winter	12.161	0.0	168.7	184	
360 min Winter	9.287	0.0	193.2	260	
480 min Winter	7.656	0.0	212.4	336	
600 min Winter	6.585	0.0	228.4	410	
720 min Winter	5.819	0.0	242.2	486	
960 min Winter	4.782	0.0	265.4	596	
1440 min Winter	3.619	0.0	301.2	802	
2160 min Winter	2.733	0.0	341.2	1108	
2880 min Winter	2.239	0.0	372.7	1472	
4320 min Winter	1.692	0.0	422.5	2168	
5760 min Winter	1.388	0.0	462.2	2904	
7200 min Winter	1.191	0.0	495.9	3624	
8640 min Winter	1.052	0.0	525.6	4400	
10080 min Winter	0.948	0.0	552.5	5136	
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Innovyze	Source Control 2020.1.3	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.252	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.413

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.138	4 8	0.138	8 12	0.138

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5 Manchester Square London W1U 3PD		
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Model Details

Storage is Online Cover Level (m) 1.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	92.0	1.000	92.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0132-8000-1000-8000
Design Head (m)	1.000
Design Flow (l/s)	8.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	132
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	8.0
Flush-Flo™	0.302	8.0
Kick-Flo®	0.664	6.6
Mean Flow over Head Range	-	6.9

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.7	1.200	8.7	3.000	13.4	7.000	20.1
0.200	7.8	1.400	9.4	3.500	14.5	7.500	20.8
0.300	8.0	1.600	10.0	4.000	15.4	8.000	21.5
0.400	7.9	1.800	10.5	4.500	16.3	8.500	22.1
0.500	7.7	2.000	11.1	5.000	17.1	9.000	22.7
0.600	7.2	2.200	11.6	5.500	17.9	9.500	23.3
0.800	7.2	2.400	12.1	6.000	18.7		
1.000	8.0	2.600	12.6	6.500	19.4		

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5 Manchester Square London W1U 3PD					
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Innovyze		Source Control 2020.1.3			
Summary of Results for 30 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.428	0.428	17.2	87.8	O K
30 min Summer	0.588	0.588	17.2	120.5	O K
60 min Summer	0.747	0.747	17.2	153.1	Flood Risk
120 min Summer	0.845	0.845	17.2	173.3	Flood Risk
180 min Summer	0.870	0.870	17.2	178.3	Flood Risk
240 min Summer	0.871	0.871	17.2	178.5	Flood Risk
360 min Summer	0.847	0.847	17.2	173.7	Flood Risk
480 min Summer	0.808	0.808	17.2	165.7	Flood Risk
600 min Summer	0.761	0.761	17.2	156.0	Flood Risk
720 min Summer	0.706	0.706	17.2	144.6	Flood Risk
960 min Summer	0.586	0.586	17.2	120.0	O K
1440 min Summer	0.400	0.400	17.2	82.0	O K
2160 min Summer	0.242	0.242	16.9	49.7	O K
2880 min Summer	0.186	0.186	15.7	38.1	O K
4320 min Summer	0.149	0.149	12.2	30.6	O K
5760 min Summer	0.131	0.131	10.1	26.8	O K
7200 min Summer	0.119	0.119	8.7	24.3	O K
8640 min Summer	0.110	0.110	7.7	22.6	O K
10080 min Summer	0.104	0.104	6.9	21.2	O K
15 min Winter	0.486	0.486	17.2	99.7	O K
30 min Winter	0.670	0.670	17.2	137.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	61.601	0.0	102.3	23	
30 min Summer	43.270	0.0	143.9	36	
60 min Summer	29.238	0.0	195.1	62	
120 min Summer	19.142	0.0	255.5	104	
180 min Summer	14.710	0.0	294.6	136	
240 min Summer	12.161	0.0	324.7	172	
360 min Summer	9.287	0.0	372.0	242	
480 min Summer	7.656	0.0	408.9	312	
600 min Summer	6.585	0.0	439.7	380	
720 min Summer	5.819	0.0	466.2	448	
960 min Summer	4.782	0.0	510.9	570	
1440 min Summer	3.619	0.0	579.9	802	
2160 min Summer	2.733	0.0	657.1	1132	
2880 min Summer	2.239	0.0	717.8	1472	
4320 min Summer	1.692	0.0	813.5	2204	
5760 min Summer	1.388	0.0	890.3	2936	
7200 min Summer	1.191	0.0	955.1	3672	
8640 min Summer	1.052	0.0	1012.4	4392	
10080 min Summer	0.948	0.0	1064.0	5080	
15 min Winter	61.601	0.0	114.6	23	
30 min Winter	43.270	0.0	161.3	36	
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Innovyze			Designed by DWarren Checked by		
Source Control 2020.1.3					
Summary of Results for 30 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.851	0.851	17.2	174.4	Flood Risk
120 min Winter	0.966	0.966	17.2	198.0	Flood Risk
180 min Winter	0.988	0.988	17.2	202.5	Flood Risk
240 min Winter	0.981	0.981	17.2	201.2	Flood Risk
360 min Winter	0.932	0.932	17.2	191.1	Flood Risk
480 min Winter	0.862	0.862	17.2	176.6	Flood Risk
600 min Winter	0.781	0.781	17.2	160.1	Flood Risk
720 min Winter	0.680	0.680	17.2	139.4	O K
960 min Winter	0.491	0.491	17.2	100.6	O K
1440 min Winter	0.254	0.254	17.0	52.0	O K
2160 min Winter	0.169	0.169	14.2	34.6	O K
2880 min Winter	0.145	0.145	11.7	29.7	O K
4320 min Winter	0.121	0.121	8.9	24.7	O K
5760 min Winter	0.107	0.107	7.3	21.9	O K
7200 min Winter	0.098	0.098	6.3	20.0	O K
8640 min Winter	0.091	0.091	5.6	18.7	O K
10080 min Winter	0.086	0.086	5.0	17.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	29.238	0.0	218.5	62	
120 min Winter	19.142	0.0	286.2	114	
180 min Winter	14.710	0.0	329.9	144	
240 min Winter	12.161	0.0	363.7	184	
360 min Winter	9.287	0.0	416.7	260	
480 min Winter	7.656	0.0	458.1	336	
600 min Winter	6.585	0.0	492.5	410	
720 min Winter	5.819	0.0	522.2	480	
960 min Winter	4.782	0.0	572.3	596	
1440 min Winter	3.619	0.0	649.5	802	
2160 min Winter	2.733	0.0	736.0	1116	
2880 min Winter	2.239	0.0	804.0	1476	
4320 min Winter	1.692	0.0	911.2	2200	
5760 min Winter	1.388	0.0	997.1	2904	
7200 min Winter	1.191	0.0	1069.8	3672	
8640 min Winter	1.052	0.0	1133.9	4368	
10080 min Winter	0.948	0.0	1191.8	5136	
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5 Manchester Square London W1U 3PD		
Date 09/05/2025 15:07	Designed by DWarren	
File 30yr Attenuation - Turbi...	Checked by	
Innovyze	Source Control 2020.1.3	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.252	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.891

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.297	4 8	0.297	8 12	0.297

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5 Manchester Square London W1U 3PD		
Date 09/05/2025 15:07 File 30yr Attenuation - Turbi...	Designed by DWarren Checked by	
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Model Details

Storage is Online Cover Level (m) 1.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	205.0	1.000	205.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0186-1720-1000-1720
Design Head (m)	1.000
Design Flow (l/s)	17.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	186
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	17.2
Flush-Flo™	0.328	17.2
Kick-Flo®	0.709	14.6
Mean Flow over Head Range	-	14.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.5	1.200	18.8	3.000	29.1	7.000	43.8
0.200	16.5	1.400	20.2	3.500	31.3	7.500	45.2
0.300	17.2	1.600	21.5	4.000	33.4	8.000	46.7
0.400	17.1	1.800	22.8	4.500	35.3	8.500	48.1
0.500	16.7	2.000	23.9	5.000	37.2	9.000	49.4
0.600	16.2	2.200	25.0	5.500	38.9	9.500	50.7
0.800	15.5	2.400	26.1	6.000	40.6		
1.000	17.2	2.600	27.1	6.500	42.2		

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5 Manchester Square London W1U 3PD					
Date 29/05/2026 13:10 File 100yr+CC Attenuation - ...		Designed by DWarren Checked by			
Innovyze		Source Control 2020.1.3			
Summary of Results for 100 year Return Period (+45%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.357	0.357	18.0	148.4	0 K
30 min Summer	0.500	0.500	18.0	207.5	0 K
60 min Summer	0.655	0.655	18.0	271.9	0 K
120 min Summer	0.792	0.792	18.0	328.6	Flood Risk
180 min Summer	0.830	0.830	18.0	344.5	Flood Risk
240 min Summer	0.845	0.845	18.0	350.7	Flood Risk
360 min Summer	0.851	0.851	18.0	353.4	Flood Risk
480 min Summer	0.840	0.840	18.0	348.6	Flood Risk
600 min Summer	0.819	0.819	18.0	340.1	Flood Risk
720 min Summer	0.794	0.794	18.0	329.6	Flood Risk
960 min Summer	0.735	0.735	18.0	305.0	Flood Risk
1440 min Summer	0.593	0.593	18.0	246.1	0 K
2160 min Summer	0.420	0.420	18.0	174.4	0 K
2880 min Summer	0.304	0.304	18.0	126.0	0 K
4320 min Summer	0.197	0.197	17.2	81.6	0 K
5760 min Summer	0.167	0.167	14.4	69.1	0 K
7200 min Summer	0.149	0.149	12.4	61.8	0 K
8640 min Summer	0.137	0.137	11.0	56.7	0 K
10080 min Summer	0.128	0.128	9.9	52.9	0 K
15 min Winter	0.404	0.404	18.0	167.5	0 K
30 min Winter	0.566	0.566	18.0	235.0	0 K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	115.056	0.0	161.3	24	
30 min Summer	81.787	0.0	230.3	37	
60 min Summer	55.699	0.0	316.1	66	
120 min Summer	36.450	0.0	414.1	122	
180 min Summer	27.815	0.0	474.2	166	
240 min Summer	22.852	0.0	519.5	198	
360 min Summer	17.298	0.0	590.0	264	
480 min Summer	14.163	0.0	644.2	334	
600 min Summer	12.112	0.0	688.7	404	
720 min Summer	10.650	0.0	726.7	474	
960 min Summer	8.680	0.0	789.7	614	
1440 min Summer	6.485	0.0	884.8	866	
2160 min Summer	4.827	0.0	989.6	1220	
2880 min Summer	3.915	0.0	1070.1	1560	
4320 min Summer	2.920	0.0	1196.1	2212	
5760 min Summer	2.374	0.0	1298.3	2944	
7200 min Summer	2.024	0.0	1383.9	3672	
8640 min Summer	1.780	0.0	1459.6	4400	
10080 min Summer	1.598	0.0	1528.1	5136	
15 min Winter	115.056	0.0	181.0	24	
30 min Winter	81.787	0.0	258.2	38	
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5 Manchester Square London W1U 3PD					
Date 29/05/2026 13:10 File 100yr+CC Attenuation - ...	Designed by DWarren Checked by				
Innovyze	Source Control 2020.1.3				
<u>Summary of Results for 100 year Return Period (+45%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.747	0.747	18.0	309.8	Flood Risk
120 min Winter	0.902	0.902	18.0	374.2	Flood Risk
180 min Winter	0.951	0.951	18.0	394.7	Flood Risk
240 min Winter	0.963	0.963	18.0	399.7	Flood Risk
360 min Winter	0.965	0.965	18.0	400.6	Flood Risk
480 min Winter	0.943	0.943	18.0	391.3	Flood Risk
600 min Winter	0.908	0.908	18.0	376.7	Flood Risk
720 min Winter	0.866	0.866	18.0	359.4	Flood Risk
960 min Winter	0.771	0.771	18.0	319.9	Flood Risk
1440 min Winter	0.540	0.540	18.0	224.2	0 K
2160 min Winter	0.300	0.300	18.0	124.4	0 K
2880 min Winter	0.196	0.196	17.1	81.4	0 K
4320 min Winter	0.154	0.154	13.0	63.8	0 K
5760 min Winter	0.134	0.134	10.6	55.4	0 K
7200 min Winter	0.121	0.121	9.1	50.1	0 K
8640 min Winter	0.112	0.112	8.0	46.3	0 K
10080 min Winter	0.105	0.105	7.2	43.4	0 K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	55.699	0.0	354.2	66	
120 min Winter	36.450	0.0	464.0	120	
180 min Winter	27.815	0.0	531.2	176	
240 min Winter	22.852	0.0	582.0	222	
360 min Winter	17.298	0.0	661.0	280	
480 min Winter	14.163	0.0	721.7	360	
600 min Winter	12.112	0.0	771.5	436	
720 min Winter	10.650	0.0	814.1	512	
960 min Winter	8.680	0.0	884.7	664	
1440 min Winter	6.485	0.0	991.3	916	
2160 min Winter	4.827	0.0	1108.4	1240	
2880 min Winter	3.915	0.0	1198.6	1504	
4320 min Winter	2.920	0.0	1339.9	2212	
5760 min Winter	2.374	0.0	1454.2	2936	
7200 min Winter	2.024	0.0	1550.0	3672	
8640 min Winter	1.780	0.0	1635.0	4400	
10080 min Winter	1.598	0.0	1711.9	5136	
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Innovyze	Source Control 2020.1.3	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.252	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.760

Time (mins) Area			Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)	From:	To:	(ha)
0	4	0.254	4	8	0.253	8	12	0.253

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Model Details

Storage is Online Cover Level (m) 1.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	415.0	1.000	415.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0190-1800-1000-1800
Design Head (m)	1.000
Design Flow (l/s)	18.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	190
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	18.0
Flush-Flo™	0.332	18.0
Kick-Flo®	0.714	15.3
Mean Flow over Head Range	-	15.2

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.6	1.200	19.6	3.000	30.4	7.000	45.8
0.200	17.2	1.400	21.1	3.500	32.8	7.500	47.4
0.300	18.0	1.600	22.5	4.000	34.9	8.000	48.9
0.400	17.9	1.800	23.8	4.500	37.0	8.500	50.3
0.500	17.5	2.000	25.0	5.000	38.9	9.000	51.7
0.600	17.0	2.200	26.2	5.500	40.8	9.500	53.1
0.800	16.2	2.400	27.3	6.000	42.5		
1.000	18.0	2.600	28.4	6.500	44.2		

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Date 09/05/2025 15:07 File 100yr+CC Attenuation - C...		Designed by DWarren Checked by			
Innovyze		Source Control 2020.1.3			
Summary of Results for 100 year Return Period (+45%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.369	0.369	23.6	195.7	O K
30 min Summer	0.516	0.516	23.6	273.5	O K
60 min Summer	0.677	0.677	23.6	358.8	O K
120 min Summer	0.818	0.818	23.6	433.4	Flood Risk
180 min Summer	0.858	0.858	23.6	454.8	Flood Risk
240 min Summer	0.875	0.875	23.6	463.6	Flood Risk
360 min Summer	0.883	0.883	23.6	468.0	Flood Risk
480 min Summer	0.872	0.872	23.6	462.3	Flood Risk
600 min Summer	0.852	0.852	23.6	451.5	Flood Risk
720 min Summer	0.827	0.827	23.6	438.1	Flood Risk
960 min Summer	0.768	0.768	23.6	406.8	Flood Risk
1440 min Summer	0.624	0.624	23.6	330.8	O K
2160 min Summer	0.446	0.446	23.6	236.6	O K
2880 min Summer	0.326	0.326	23.6	172.9	O K
4320 min Summer	0.215	0.215	22.5	114.0	O K
5760 min Summer	0.183	0.183	18.8	97.2	O K
7200 min Summer	0.164	0.164	16.3	87.1	O K
8640 min Summer	0.151	0.151	14.4	80.2	O K
10080 min Summer	0.141	0.141	13.0	74.9	O K
15 min Winter	0.417	0.417	23.6	220.8	O K
30 min Winter	0.584	0.584	23.6	309.7	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	115.056	0.0	211.7	24	
30 min Summer	81.787	0.0	302.5	37	
60 min Summer	55.699	0.0	415.7	66	
120 min Summer	36.450	0.0	544.6	122	
180 min Summer	27.815	0.0	623.6	164	
240 min Summer	22.852	0.0	683.3	196	
360 min Summer	17.298	0.0	776.0	262	
480 min Summer	14.163	0.0	847.3	332	
600 min Summer	12.112	0.0	905.8	402	
720 min Summer	10.650	0.0	955.8	472	
960 min Summer	8.680	0.0	1038.7	612	
1440 min Summer	6.485	0.0	1163.7	868	
2160 min Summer	4.827	0.0	1301.9	1220	
2880 min Summer	3.915	0.0	1407.7	1560	
4320 min Summer	2.920	0.0	1573.3	2212	
5760 min Summer	2.374	0.0	1708.2	2944	
7200 min Summer	2.024	0.0	1820.7	3672	
8640 min Summer	1.780	0.0	1920.3	4408	
10080 min Summer	1.598	0.0	2010.3	5136	
15 min Winter	115.056	0.0	237.5	24	
30 min Winter	81.787	0.0	339.2	38	
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Date 09/05/2025 15:07 File 100yr+CC Attenuation - C...		Designed by DWarren Checked by			
Innovyze		Source Control 2020.1.3			
Summary of Results for 100 year Return Period (+45%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.770	0.770	23.6	408.4	Flood Risk
120 min Winter	0.931	0.931	23.6	493.2	Flood Risk
180 min Winter	0.982	0.982	23.6	520.3	Flood Risk
240 min Winter	0.995	0.995	23.6	527.1	Flood Risk
360 min Winter	0.999	0.999	23.7	529.4	Flood Risk
480 min Winter	0.977	0.977	23.6	517.7	Flood Risk
600 min Winter	0.941	0.941	23.6	499.0	Flood Risk
720 min Winter	0.899	0.899	23.6	476.6	Flood Risk
960 min Winter	0.804	0.804	23.6	426.0	Flood Risk
1440 min Winter	0.571	0.571	23.6	302.6	O K
2160 min Winter	0.323	0.323	23.6	171.1	O K
2880 min Winter	0.215	0.215	22.5	114.0	O K
4320 min Winter	0.170	0.170	17.1	89.9	O K
5760 min Winter	0.148	0.148	13.9	78.4	O K
7200 min Winter	0.134	0.134	11.9	71.0	O K
8640 min Winter	0.124	0.124	10.5	65.7	O K
10080 min Winter	0.116	0.116	9.4	61.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	55.699	0.0	465.8	66	
120 min Winter	36.450	0.0	610.2	120	
180 min Winter	27.815	0.0	698.7	176	
240 min Winter	22.852	0.0	765.5	218	
360 min Winter	17.298	0.0	869.4	280	
480 min Winter	14.163	0.0	949.2	358	
600 min Winter	12.112	0.0	1014.8	436	
720 min Winter	10.650	0.0	1070.8	512	
960 min Winter	8.680	0.0	1163.6	662	
1440 min Winter	6.485	0.0	1303.8	916	
2160 min Winter	4.827	0.0	1458.3	1240	
2880 min Winter	3.915	0.0	1576.9	1504	
4320 min Winter	2.920	0.0	1762.7	2212	
5760 min Winter	2.374	0.0	1913.3	2944	
7200 min Winter	2.024	0.0	2039.3	3672	
8640 min Winter	1.780	0.0	2151.0	4408	
10080 min Winter	1.598	0.0	2252.1	5136	
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Innovyze	Source Control 2020.1.3	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.252	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 1.000

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.333	4 8	0.333	8 12	0.333

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Date 09/05/2025 15:07 File 100yr+CC Attenuation - C...	Designed by DWarren Checked by	
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Model Details

Storage is Online Cover Level (m) 1.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	530.0	1.000	530.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0214-2370-1000-2370
Design Head (m)	1.000
Design Flow (l/s)	23.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	214
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	23.7
Flush-Flo™	0.355	23.6
Kick-Flo®	0.729	20.4
Mean Flow over Head Range	-	19.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.2	1.200	25.8	3.000	40.1	7.000	60.5
0.200	20.8	1.400	27.8	3.500	43.2	7.500	62.6
0.300	23.5	1.600	29.7	4.000	46.1	8.000	64.6
0.400	23.5	1.800	31.4	4.500	48.8	8.500	66.5
0.500	23.2	2.000	33.0	5.000	51.4	9.000	68.4
0.600	22.5	2.200	34.6	5.500	53.8	9.500	70.2
0.800	21.3	2.400	36.0	6.000	56.1		
1.000	23.7	2.600	37.5	6.500	58.4		

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5 Manchester Square London W1U 3PD					
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Innovyze			Source Control 2020.1.3		
Summary of Results for 100 year Return Period (+45%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.372	0.372	9.8	80.1	O K
30 min Summer	0.522	0.522	9.8	112.2	O K
60 min Summer	0.685	0.685	9.8	147.4	O K
120 min Summer	0.818	0.818	9.8	175.9	Flood Risk
180 min Summer	0.853	0.853	9.8	183.4	Flood Risk
240 min Summer	0.865	0.865	9.8	186.0	Flood Risk
360 min Summer	0.867	0.867	9.8	186.3	Flood Risk
480 min Summer	0.852	0.852	9.8	183.1	Flood Risk
600 min Summer	0.829	0.829	9.8	178.3	Flood Risk
720 min Summer	0.803	0.803	9.8	172.6	Flood Risk
960 min Summer	0.743	0.743	9.8	159.7	Flood Risk
1440 min Summer	0.592	0.592	9.8	127.3	O K
2160 min Summer	0.404	0.404	9.8	86.9	O K
2880 min Summer	0.280	0.280	9.8	60.2	O K
4320 min Summer	0.166	0.166	9.2	35.6	O K
5760 min Summer	0.137	0.137	7.9	29.4	O K
7200 min Summer	0.120	0.120	6.8	25.9	O K
8640 min Summer	0.110	0.110	6.0	23.6	O K
10080 min Summer	0.102	0.102	5.4	22.0	O K
15 min Winter	0.421	0.421	9.8	90.5	O K
30 min Winter	0.592	0.592	9.8	127.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	115.056	0.0	88.3	24	
30 min Summer	81.787	0.0	125.8	38	
60 min Summer	55.699	0.0	172.1	66	
120 min Summer	36.450	0.0	225.4	122	
180 min Summer	27.815	0.0	258.0	164	
240 min Summer	22.852	0.0	282.7	196	
360 min Summer	17.298	0.0	321.0	262	
480 min Summer	14.163	0.0	350.5	332	
600 min Summer	12.112	0.0	374.7	404	
720 min Summer	10.650	0.0	395.3	472	
960 min Summer	8.680	0.0	429.6	612	
1440 min Summer	6.485	0.0	481.4	870	
2160 min Summer	4.827	0.0	538.0	1220	
2880 min Summer	3.915	0.0	581.8	1560	
4320 min Summer	2.920	0.0	650.5	2212	
5760 min Summer	2.374	0.0	705.7	2936	
7200 min Summer	2.024	0.0	752.2	3672	
8640 min Summer	1.780	0.0	793.5	4400	
10080 min Summer	1.598	0.0	830.9	5136	
15 min Winter	115.056	0.0	99.0	24	
30 min Winter	81.787	0.0	141.0	38	
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Pell Frischmann				Page 2	
5 Manchester Square London W1U 3PD					
Date 09/05/2025 15:07 File 100yr+CC Attenuation - S...		Designed by DWarren Checked by			
Innovyze		Source Control 2020.1.3			
Summary of Results for 100 year Return Period (+45%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.778	0.778	9.8	167.3	Flood Risk
120 min Winter	0.934	0.934	9.8	200.9	Flood Risk
180 min Winter	0.981	0.981	9.8	211.0	Flood Risk
240 min Winter	0.990	0.990	9.8	212.8	Flood Risk
360 min Winter	0.987	0.987	9.8	212.3	Flood Risk
480 min Winter	0.961	0.961	9.8	206.5	Flood Risk
600 min Winter	0.922	0.922	9.8	198.2	Flood Risk
720 min Winter	0.878	0.878	9.8	188.7	Flood Risk
960 min Winter	0.780	0.780	9.8	167.6	Flood Risk
1440 min Winter	0.533	0.533	9.8	114.7	O K
2160 min Winter	0.276	0.276	9.8	59.3	O K
2880 min Winter	0.165	0.165	9.2	35.4	O K
4320 min Winter	0.125	0.125	7.1	26.8	O K
5760 min Winter	0.107	0.107	5.8	23.0	O K
7200 min Winter	0.097	0.097	4.9	20.8	O K
8640 min Winter	0.089	0.089	4.3	19.1	O K
10080 min Winter	0.084	0.084	3.9	18.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	55.699	0.0	192.8	66	
120 min Winter	36.450	0.0	252.5	120	
180 min Winter	27.815	0.0	289.0	176	
240 min Winter	22.852	0.0	316.6	218	
360 min Winter	17.298	0.0	359.6	280	
480 min Winter	14.163	0.0	392.6	358	
600 min Winter	12.112	0.0	419.7	436	
720 min Winter	10.650	0.0	442.8	512	
960 min Winter	8.680	0.0	481.2	662	
1440 min Winter	6.485	0.0	539.2	918	
2160 min Winter	4.827	0.0	602.6	1240	
2880 min Winter	3.915	0.0	651.6	1524	
4320 min Winter	2.920	0.0	728.6	2208	
5760 min Winter	2.374	0.0	790.4	2936	
7200 min Winter	2.024	0.0	842.5	3664	
8640 min Winter	1.780	0.0	888.7	4368	
10080 min Winter	1.598	0.0	930.7	5136	
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Pell Frischmann		Page 3
5 Manchester Square London W1U 3PD		
Date 09/05/2025 15:07	Designed by DWarren	
File 100yr+CC Attenuation - S...	Checked by	
Innovyze	Source Control 2020.1.3	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.252	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.413

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.138	4 8	0.138	8 12	0.138

Pell Frischmann		Page 4
5 Manchester Square London W1U 3PD		
Date 09/05/2025 15:07 File 100yr+CC Attenuation - S...	Designed by DWarren Checked by	
Innovyze	Source Control 2020.1.3	

Model Details

Storage is Online Cover Level (m) 1.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	215.0	1.000	215.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0144-9800-1000-9800
Design Head (m)	1.000
Design Flow (l/s)	9.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	144
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	9.8
Flush-Flo™	0.302	9.8
Kick-Flo®	0.672	8.1
Mean Flow over Head Range	-	8.4

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.2	1.200	10.7	3.000	16.5	7.000	24.7
0.200	9.5	1.400	11.5	3.500	17.7	7.500	25.6
0.300	9.8	1.600	12.2	4.000	18.9	8.000	26.4
0.400	9.7	1.800	12.9	4.500	20.0	8.500	27.2
0.500	9.4	2.000	13.6	5.000	21.1	9.000	27.9
0.600	8.9	2.200	14.2	5.500	22.0	9.500	28.7
0.800	8.8	2.400	14.8	6.000	23.0		
1.000	9.8	2.600	15.4	6.500	23.9		

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Pell Frischmann				Page 1	
5 Manchester Square London W1U 3PD					
Date 09/05/2025 15:08 File 100yr+CC Attenuation - T...		Designed by DWarren Checked by			
Innovyze		Source Control 2020.1.3			
Summary of Results for 100 year Return Period (+45%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.370	0.370	21.1	174.1	O K
30 min Summer	0.518	0.518	21.1	243.4	O K
60 min Summer	0.679	0.679	21.1	319.2	O K
120 min Summer	0.819	0.819	21.1	385.1	Flood Risk
180 min Summer	0.859	0.859	21.1	403.7	Flood Risk
240 min Summer	0.875	0.875	21.1	411.2	Flood Risk
360 min Summer	0.882	0.882	21.1	414.5	Flood Risk
480 min Summer	0.870	0.870	21.1	409.1	Flood Risk
600 min Summer	0.849	0.849	21.1	399.2	Flood Risk
720 min Summer	0.824	0.824	21.1	387.1	Flood Risk
960 min Summer	0.764	0.764	21.1	359.0	Flood Risk
1440 min Summer	0.618	0.618	21.1	290.6	O K
2160 min Summer	0.439	0.439	21.1	206.3	O K
2880 min Summer	0.318	0.318	21.1	149.5	O K
4320 min Summer	0.207	0.207	20.1	97.3	O K
5760 min Summer	0.176	0.176	16.8	82.7	O K
7200 min Summer	0.158	0.158	14.6	74.1	O K
8640 min Summer	0.145	0.145	12.8	68.1	O K
10080 min Summer	0.135	0.135	11.6	63.6	O K
15 min Winter	0.418	0.418	21.1	196.5	O K
30 min Winter	0.586	0.586	21.1	275.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	115.056	0.0	189.0	24	
30 min Summer	81.787	0.0	269.8	37	
60 min Summer	55.699	0.0	370.5	66	
120 min Summer	36.450	0.0	485.4	122	
180 min Summer	27.815	0.0	555.8	164	
240 min Summer	22.852	0.0	609.0	196	
360 min Summer	17.298	0.0	691.6	262	
480 min Summer	14.163	0.0	755.2	332	
600 min Summer	12.112	0.0	807.3	402	
720 min Summer	10.650	0.0	851.9	472	
960 min Summer	8.680	0.0	925.7	612	
1440 min Summer	6.485	0.0	1037.2	868	
2160 min Summer	4.827	0.0	1160.1	1220	
2880 min Summer	3.915	0.0	1254.4	1560	
4320 min Summer	2.920	0.0	1402.1	2212	
5760 min Summer	2.374	0.0	1522.1	2944	
7200 min Summer	2.024	0.0	1622.3	3672	
8640 min Summer	1.780	0.0	1711.1	4408	
10080 min Summer	1.598	0.0	1791.4	5136	
15 min Winter	115.056	0.0	212.0	24	
30 min Winter	81.787	0.0	302.6	38	
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Pell Frischmann				Page 2	
5 Manchester Square London W1U 3PD					
Date 09/05/2025 15:08 File 100yr+CC Attenuation - T...		Designed by DWarren Checked by			
Innovyze		Source Control 2020.1.3			
Summary of Results for 100 year Return Period (+45%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.773	0.773	21.1	363.4	Flood Risk
120 min Winter	0.933	0.933	21.1	438.5	Flood Risk
180 min Winter	0.983	0.983	21.1	462.2	Flood Risk
240 min Winter	0.996	0.996	21.1	467.9	Flood Risk
360 min Winter	0.999	0.999	21.1	469.4	Flood Risk
480 min Winter	0.976	0.976	21.1	458.6	Flood Risk
600 min Winter	0.939	0.939	21.1	441.6	Flood Risk
720 min Winter	0.897	0.897	21.1	421.4	Flood Risk
960 min Winter	0.800	0.800	21.1	375.9	Flood Risk
1440 min Winter	0.564	0.564	21.1	265.0	O K
2160 min Winter	0.314	0.314	21.0	147.6	O K
2880 min Winter	0.207	0.207	20.1	97.2	O K
4320 min Winter	0.163	0.163	15.2	76.5	O K
5760 min Winter	0.142	0.142	12.4	66.6	O K
7200 min Winter	0.128	0.128	10.6	60.2	O K
8640 min Winter	0.119	0.119	9.4	55.7	O K
10080 min Winter	0.111	0.111	8.4	52.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	55.699	0.0	415.2	66	
120 min Winter	36.450	0.0	543.8	120	
180 min Winter	27.815	0.0	622.7	176	
240 min Winter	22.852	0.0	682.2	218	
360 min Winter	17.298	0.0	774.8	280	
480 min Winter	14.163	0.0	846.0	358	
600 min Winter	12.112	0.0	904.4	436	
720 min Winter	10.650	0.0	954.3	512	
960 min Winter	8.680	0.0	1037.0	662	
1440 min Winter	6.485	0.0	1162.0	916	
2160 min Winter	4.827	0.0	1299.4	1240	
2880 min Winter	3.915	0.0	1405.2	1504	
4320 min Winter	2.920	0.0	1570.8	2212	
5760 min Winter	2.374	0.0	1704.9	2936	
7200 min Winter	2.024	0.0	1817.2	3672	
8640 min Winter	1.780	0.0	1916.7	4392	
10080 min Winter	1.598	0.0	2006.9	5136	
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5 Manchester Square London W1U 3PD		
Date 09/05/2025 15:08	Designed by DWarren	
File 100yr+CC Attenuation - T...	Checked by	
Innovyze	Source Control 2020.1.3	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.252	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.891

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.297	4 8	0.297	8 12	0.297

Pell Frischmann		Page 4
5 Manchester Square London W1U 3PD		
Date 09/05/2025 15:08 File 100yr+CC Attenuation - T...	Designed by DWarren Checked by	
Innovyze	Source Control 2020.1.3	

Model Details

Storage is Online Cover Level (m) 1.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	470.0	1.000	470.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0203-2110-1000-2110
Design Head (m)	1.000
Design Flow (l/s)	21.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	203
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	21.1
Flush-Flo™	0.345	21.1
Kick-Flo®	0.724	18.1
Mean Flow over Head Range	-	17.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.0	1.200	23.0	3.000	35.7	7.000	53.8
0.200	19.4	1.400	24.8	3.500	38.5	7.500	55.6
0.300	21.0	1.600	26.4	4.000	41.0	8.000	57.4
0.400	21.0	1.800	27.9	4.500	43.4	8.500	59.1
0.500	20.6	2.000	29.4	5.000	45.7	9.000	60.8
0.600	20.0	2.200	30.8	5.500	47.9	9.500	62.4
0.800	19.0	2.400	32.1	6.000	49.9		
1.000	21.1	2.600	33.3	6.500	51.9		

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5 Manchester Square London W1U 3PD		
Date 09/05/2025 15:06	Designed by DWarren	
File 30yr Attenuation - Const...	Checked by	
Innovyze	Source Control 2020.1.3	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	2	Soil	0.500
Area (ha)	1.000	Urban	0.000
SAAR (mm)	1301	Region Number	Region 10

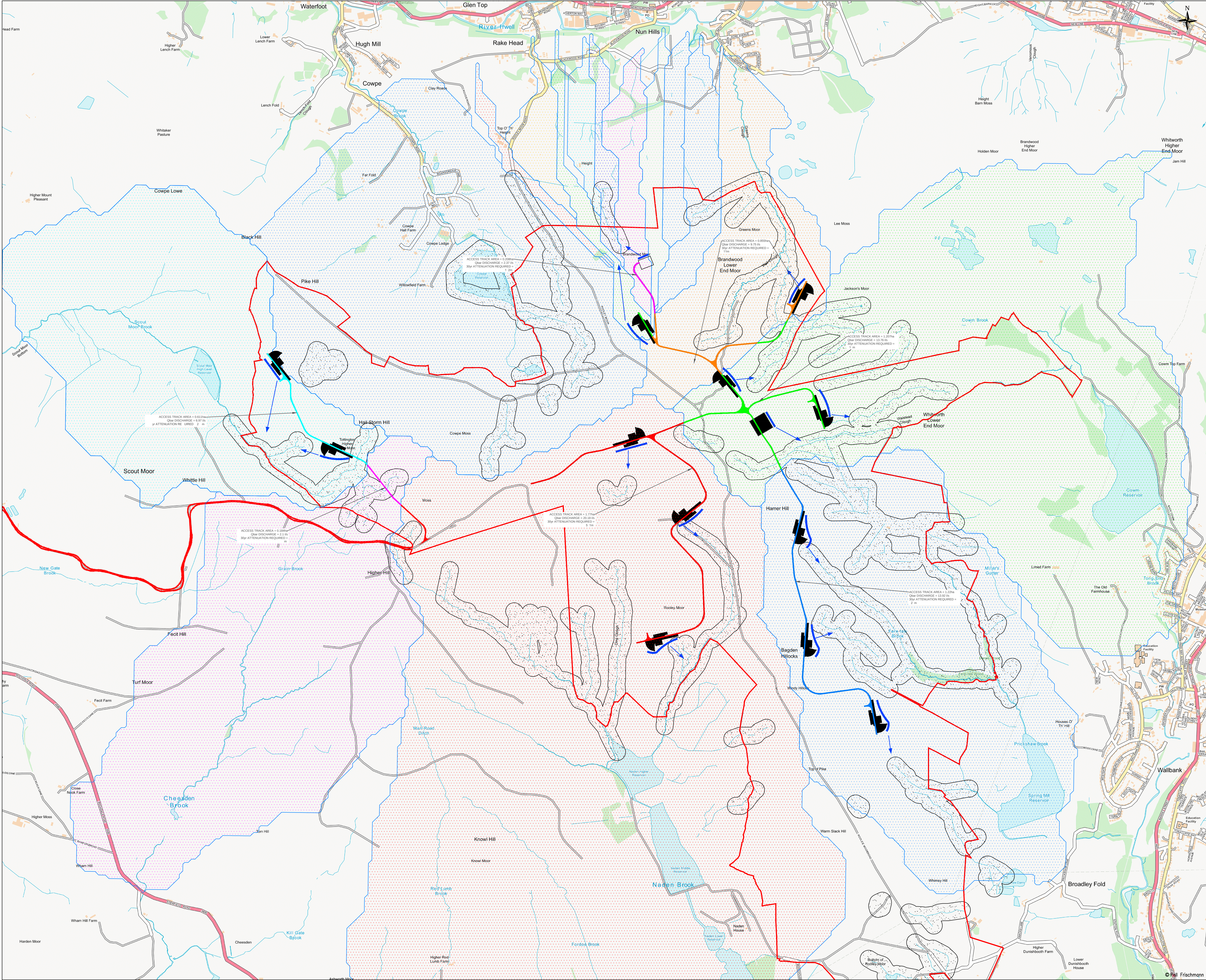
Results l/s

QBAR Rural 11.4
QBAR Urban 11.4

Q2 years 10.6

Q1 year 9.9
Q30 years 19.3
Q100 years 23.7

Appendix B Conceptual Drainage Layout Plan



- NOTE:
1. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE SPECIFICATION FOR HIGHWAY WORKS AND THE TURBINE MANUFACTURERS STANDARDS AND ALL RELEVANT DRAWINGS WITHIN THE PROJECT DESIGN PACKAGE.
 2. ALL WORKS TO BE EXECUTED IN ACCORDANCE WITH THE DMRB, THE MANUAL OF CONTRACT DOCUMENTS FOR HIGHWAY WORKS, DESIGN MANUAL FOR ROADS AND BRIDGES, AND TRAFFIC SIGNS MANUAL.
 3. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE. ALL LEVELS ARE IN METRES AND RELATE TO ORDNANCE DATUM.
 4. DO NOT SCALE FROM ANY DRAWING. WORK TO FIGURED DIMENSIONS ONLY. ANY DISCREPANCIES IN DIMENSIONS ARE TO BE REFERRED TO THE DESIGNER BEFORE WORK IS PUT TO HAND.
 5. ALL DIMENSIONS AND LEVELS ARE TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO PREPARING ANY WORKING DRAWINGS OR COMMENCING ON SITE.
 6. ALL WORKS BY THE CONTRACTOR MUST BE CARRIED OUT IN SUCH A WAY THAT ALL REQUIREMENTS UNDER THE HEALTH AND SAFETY AT WORK ACT ARE SATISFIED.
 7. ALL WORKS ARE TO BE CARRIED OUT IN COMPLIANCE WITH THE REQUIREMENT OF THE STATUTORY AUTHORITIES AND CONSTRUCTION DESIGN MANAGEMENT REGULATIONS.

KEY:

- ATTENUATION BASIN/SWALE
- FLOW DIRECTION



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CUBICO UK DEVELOPMENT
(WIND) LIMITED

SCOUT MOOR II WIND FARM

CONCEPTUAL DRAINAGE
LAYOUT PLAN

	Name	Date	Scale	1:10000 @ A1
Designed	DW	14.05.2026	File	Scout Moor Drainage Conceptual Layout
Checked	NmK	18.05.2026	Drawing Status	DRAFT
Drawing No.	SK24			Revision
				P3

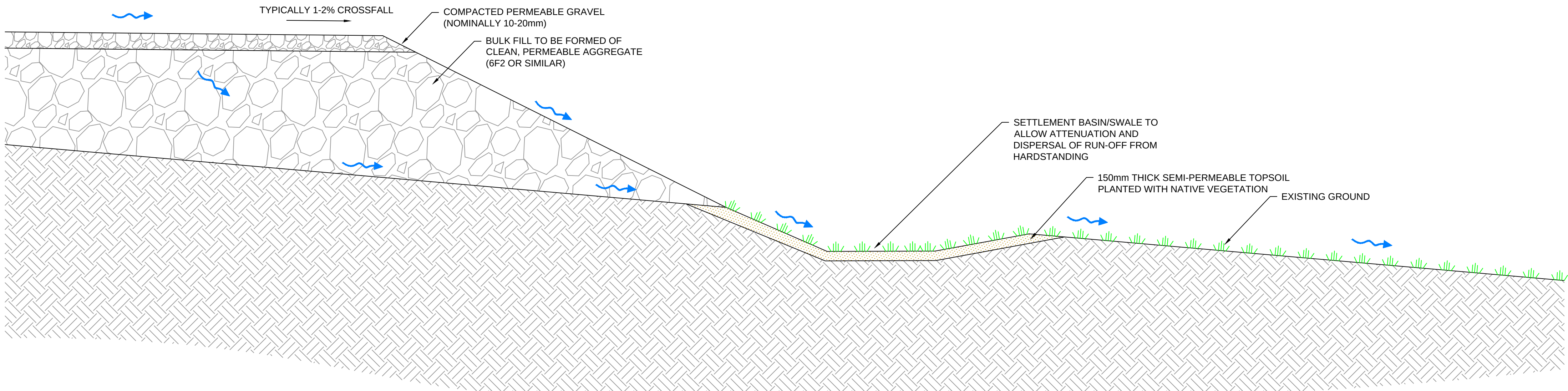
Appendix C Typical Construction Drawings

LOCATION	RETURN PERIOD	LIMITING DISCHARGE (L/S)	ATTENUATION REQUIREMENTS (m)
TURBINE HARDSTANDING (0.891ha)	2	9.500	110
	30	17.200	205
	100+CC	21.100	470

- NOTE:
1. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE SPECIFICATION FOR HIGHWAY WORKS AND THE TURBINE MANUFACTURERS STANDARDS AND ALL RELEVANT DRAWINGS WITHIN THE PROJECT DESIGN PACKAGE.
 2. ALL WORKS TO BE EXECUTED IN ACCORDANCE WITH THE DMRB, THE MANUAL OF CONTRACT DOCUMENTS FOR HIGHWAY WORKS, DESIGN MANUAL FOR ROADS AND BRIDGES, AND TRAFFIC SIGNS MANUAL.
 3. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE. ALL LEVELS ARE IN METRES AND RELATE TO ORDNANCE DATUM.
 4. DO NOT SCALE FROM ANY DRAWING. WORK TO FIGURED DIMENSIONS ONLY. ANY DISCREPANCIES IN DIMENSIONS ARE TO BE REFERRED TO THE DESIGNER BEFORE WORK IS PUT TO HAND.
 5. ALL DIMENSIONS AND LEVELS ARE TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO PREPARING ANY WORKING DRAWINGS OR COMMENCING ON SITE.
 6. ALL WORKS BY THE CONTRACTOR MUST BE CARRIED OUT IN SUCH A WAY THAT ALL REQUIREMENTS UNDER THE HEALTH AND SAFETY AT WORK ACT ARE SATISFIED.
 7. ALL WORKS ARE TO BE CARRIED OUT IN COMPLIANCE WITH THE REQUIREMENT OF THE STATUTORY AUTHORITIES AND CONSTRUCTION DESIGN MANAGEMENT REGULATIONS.

KEY:

INDICATIVE SETTLEMENT/ DISPERSAL BASIN



SECTION A-A'
1:50



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Client

CUBICO UK DEVELOPMENT
(WIND) LIMITED

Project

SCOUT MOOR II WIND FARM

Drawing Title

INDICATIVE HARDSTANDING
DRAINAGE ARRANGEMENT

	Name	Date	Scale
Designed	DW	14.05.2026	1" = 1' @ A1
Checked	NMcK	18.05.2026	File Scout Moor Drainage Conceptual Layout
			Drawing Status DRAFT

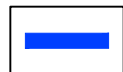
Drawing No.	Revision
SK25	P3

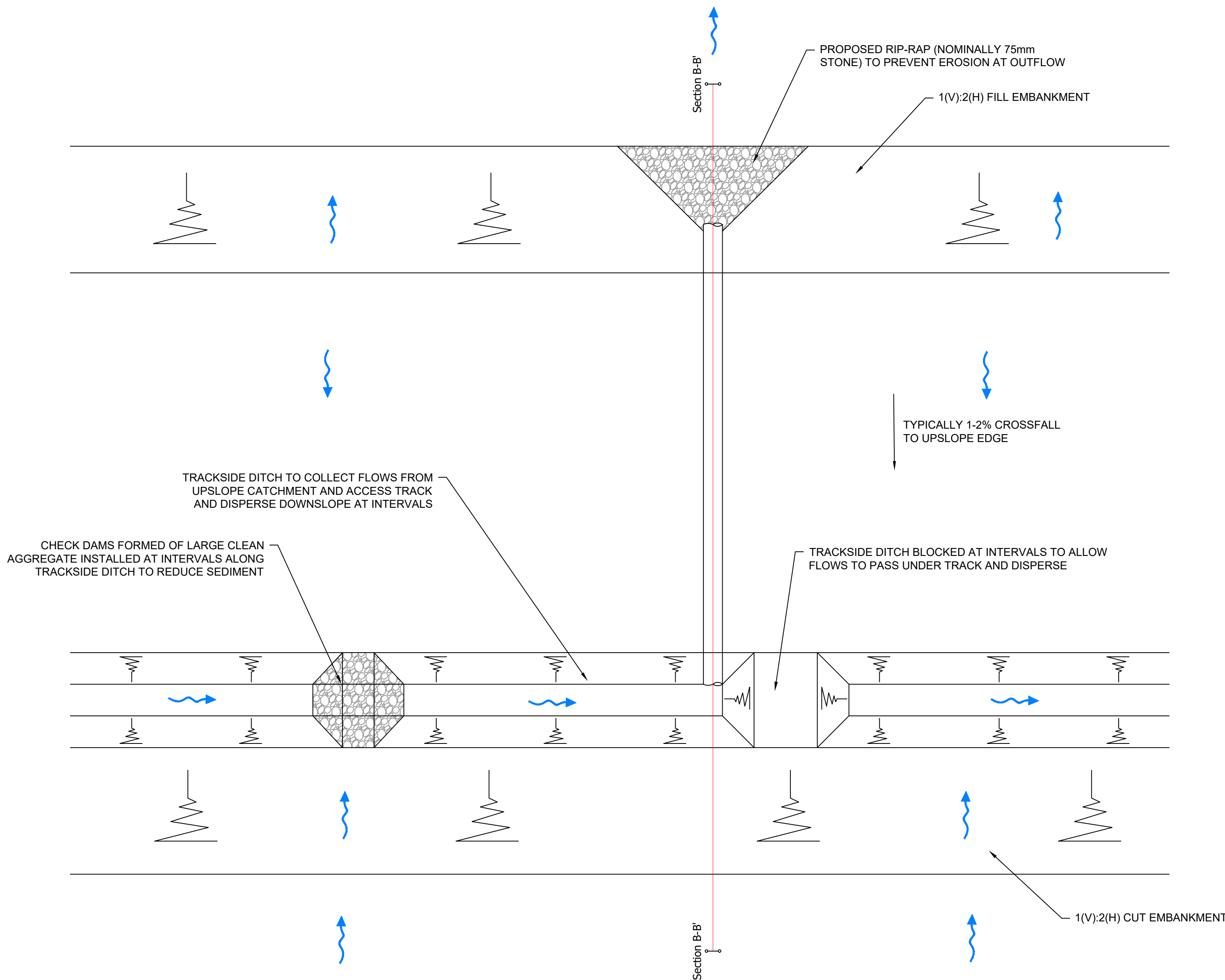


NOTE:

1. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE SPECIFICATION FOR HIGHWAY WORKS AND THE TURBINE MANUFACTURERS STANDARDS AND ALL RELEVANT DRAWINGS WITHIN THE PROJECT DESIGN PACKAGE.
2. ALL WORKS TO BE EXECUTED IN ACCORDANCE WITH THE DMRB, THE MANUAL OF CONTRACT DOCUMENTS FOR HIGHWAY WORKS, DESIGN MANUAL FOR ROADS AND BRIDGES, AND TRAFFIC SIGNS MANUAL.
3. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE. ALL LEVELS ARE IN METRES AND RELATE TO ORDNANCE DATUM.
4. DO NOT SCALE FROM ANY DRAWING. WORK TO FIGURED DIMENSIONS ONLY. ANY DISCREPANCIES IN DIMENSIONS ARE TO BE REFERRED TO THE DESIGNER BEFORE WORK IS PUT TO HAND.
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6. ALL WORKS BY THE CONTRACTOR MUST BE CARRIED OUT IN SUCH A WAY THAT ALL REQUIREMENTS UNDER THE HEALTH AND SAFETY AT WORK ACT ARE SATISFIED.
7. ALL WORKS ARE TO BE CARRIED OUT IN COMPLIANCE WITH THE REQUIREMENT OF THE STATUTORY AUTHORITIES AND CONSTRUCTION DESIGN MANAGEMENT REGULATIONS.

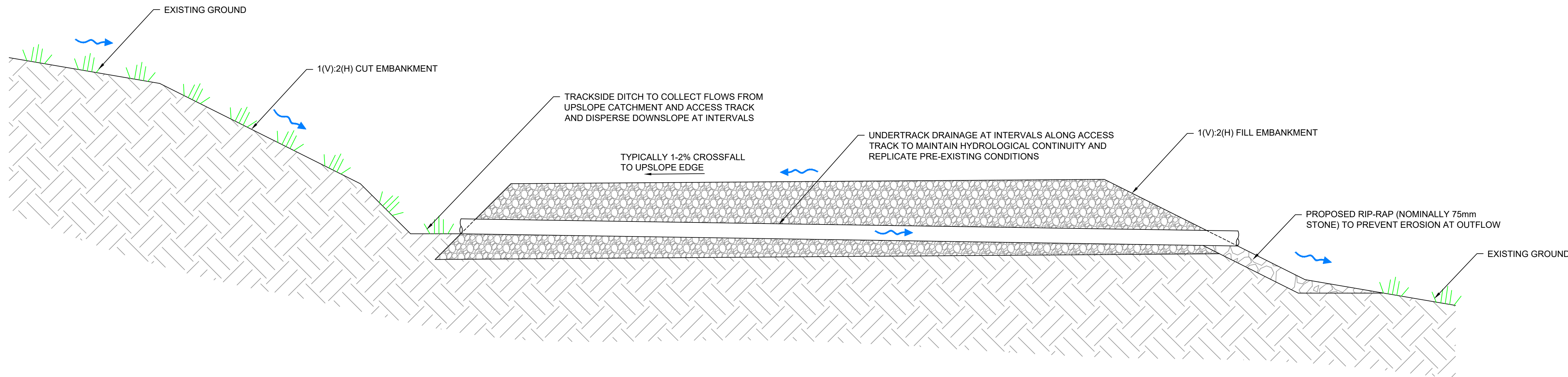
KEY:

 INDICATIVE SETTLEMENT/ DISPERSAL BASIN



INDICATIVE TRACKSIDE DRAINAGE ARRANGEMENT - PLAN VIEW

1:50



SECTION B-B'

1:25



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Client

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(WIND) LIMITED

Project

SCOUT MOOR II WIND FARM

Drawing Title

INDICATIVE TRACKSIDE
DRAINAGE ARRANGEMENT

	Name	Date	Scale	Custom	A1
Designed	DW	12.05.2025	File	Scout Moor Drainage Conceptual	Layout
Checked	NMcK	12.05.2025	Drawing Status	DRAFT	

Drawing No.

SK26

Revision

P1



- NOTE:
1. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE SPECIFICATION FOR HIGHWAY WORKS AND THE TURBINE MANUFACTURERS STANDARDS AND ALL RELEVANT DRAWINGS WITHIN THE PROJECT DESIGN PACKAGE.
 2. ALL WORKS TO BE EXECUTED IN ACCORDANCE WITH THE DMRB, THE MANUAL OF CONTRACT DOCUMENTS FOR HIGHWAY WORKS, DESIGN MANUAL FOR ROADS AND BRIDGES, AND TRAFFIC SIGNS MANUAL.
 3. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE. ALL LEVELS ARE IN METRES AND RELATE TO ORDNANCE DATUM.
 4. DO NOT SCALE FROM ANY DRAWING. WORK TO FIGURED DIMENSIONS ONLY. ANY DISCREPANCIES IN DIMENSIONS ARE TO BE REFERRED TO THE DESIGNER BEFORE WORK IS PUT TO HAND.
 5. ALL DIMENSIONS AND LEVELS ARE TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO PREPARING ANY WORKING DRAWINGS OR COMMENCING ON SITE.
 6. ALL WORKS BY THE CONTRACTOR MUST BE CARRIED OUT IN SUCH A WAY THAT ALL REQUIREMENTS UNDER THE HEALTH AND SAFETY AT WORK ACT ARE SATISFIED.
 7. ALL WORKS ARE TO BE CARRIED OUT IN COMPLIANCE WITH THE REQUIREMENT OF THE STATUTORY AUTHORITIES AND CONSTRUCTION DESIGN MANAGEMENT REGULATIONS.

KEY:

 INDICATIVE SETTLEMENT/ DISPERSAL BASIN



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Client

CUBICO UK DEVELOPMENT (WIND) LIMITED

Project

SCOUT MOOR II WIND FARM

Drawing Title

INDICATIVE LAYDOWN AREA DRAINAGE ARRANGEMENT

	Name	Date	Scale	Custom	Revision
Designed	DW	29.05.2026	File	Scout Moor Drainage Conceptual Layout	
Checked	NMcK	09.06.2026	Drawing Status	DRAFT	
Drawing No.		SK27			P1