AMBIENTAL

ENVIRONMENTAL ASSESSMENT

Surface Water Drainage Strategy

Nil Desperandum

Alsager Avenue

Queenborough

Swale

ME11 5LA

Document Issue Record

Project: Surface Drainage Strategy (SWDS)

Prepared for: Oast Architecture

Reference: 5874 SWDS

Site Location: Nil Desperandum, Alsager Avenue, Queenborough, Swale, ME11 5LA

Proposed Development: It is understood that the development is for the construction of 22 dwellings on an existing greenfield parcel of land.

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Contents

1. Introduction

1.1 Ambiental Environmental Assessment has been appointed by Oast Architecture to undertake a National Planning Policy Framework (NPPF) compliant Flood Risk Assessment (FRA) and Surface Water Drainage Strategy (SWDS) for the proposed development at Nil Desperandum, Alsager Avenue, Queenborough, Swale, ME11 5LA. The purpose of this assessment is to support an outline planning application.

1.1 This report comprises the Surface Water Drainage Strategy. Ambiental have produced a separate Flood Risk Assessment report (Ref 5874 FRA).

1.1 This strategy has been prepared in accordance with the National Planning Policy Framework (NPPF), the national Planning Practice Guidance (PPG), Defra's National Standards for Sustainable Drainage and the SuDS Design Guidance for Kent County Council.

2. Site Overview

Location and Site Area and Proposed Development

2.1 The site is shown outlined within Figure 1 (below); the address is Nil Desperandum, Alsager Avenue, Queenborough, Swale, ME11 5LA.

Figure 1: Site Location (development site boundary shown in red)

2.1 It is understood that the development is for the construction of 22 dwellings. The existing and proposed plans are shown in Appendix 1. The proposed plans are shown in Figure 2 below.

Figure 2: Proposed site plan (Source: Oast Architecture)

2.1 A review of 2m LiDAR data for the area indicates that the proposed development site is sloping, with topographic elevations of approximately 12.21mAOD in the southwest of the site, and topographic elevations of 4.19mAOD in the northeast. It is unknown at the time of writing whether the site levels will be altered post-development.

2.1 Plans provided by the client indicate that the redline boundary is approximately 10,734m^2. The site is 100% greenfield as existing. The proposed development will increase hardstanding areas on site post-development.

2.1 Measurements of the plans provided by the client indicate that post-development, roof areas will total approximately 1,581m^2 and, road and path areas will total approximately 2,676m^2. Detailed landscaping plans at a plot level have not been provided at the time of writing and therefore the extent of hardstanding within each plot is unknown. However, plans provided by the client indicate that each plot will have two parking bays, with an area of approximately 11.5m^2 per bay. Therefore, the total area of parking bays could be 529m^2 (11.5x2x23). As a result, the total hardstanding areas on site would be approximately 4,786m^2. An allowance of 10% would typically be added for urban creep allowance however it is assumed that all future increase in hardstanding would be formed of permeable paving construction.

2.1 However, it is noted that residential parking bays/ driveways could be formed as permeable paving to self-attenuate.

2.1 All proposed on-site drainage should be designed to accommodate rainfall events up to, and including, the 1 in 100yr rainfall event including the appropriate allowance for climate change at 40% as per the Environment Agency (EA) guidance.

Geology and Infiltration Potential

2.1 The British Geological Survey (BGS) online mapping indicates that the bedrock geology at the site is the London Clay Formation, comprised of clay and silt. No superficial deposits are mapped at the site according to the BGS.

2.1 The nearest BGS borehole record is TQ97SW87, approximately 135m southwest of the proposed development site. This borehole was undertaken at a topographic elevation of approximately 18.29mAOD, approximately 6m above the highest elevation on site. However, the BGS records indicate that this borehole was taken to a depth of 137.16m. The records indicate that water was struck at a depth of 85m below ground level. This record also indicates layers of clay to a depth of approximately 290 ft (88m).

2.10 The Cranfield Soil and Agrifood Institute Soilscapes mapping indicates that soils at the site are clayey with impeded drainage, draining to nearby stream networks.

2.11 No infiltration tests have been conducted on site at the time of writing. However, given the above analysis of only soil and geology mapping, infiltration is unlikely to be feasible as the main technique for managing surface water runoff from the proposed development. As such, for the purposes of this outline strategy, infiltration has been discounted.

Existing Drainage Infrastructure

2.11 The site is currently 100% greenfield and as a result, it is presumed that there is no existing formal surface water drainage on site.

2.11 To understand surface water drainage mechanisms in the wider area, an Asset Location Plan has been acquired from Southern Water. The full Asset Location Plan is provided in Appendix 1 of this report. An extract is provided in Figure 3 below.

2.10 This does indicate an existing Southern Water 100mm foul water sewer flowing from west to east across the site. Based on the asset plan and the proposed site plan provided by the client, the existing foul sewer appears to flow below two properties and could be within close proximity of others. The developer should consult Southern Water as easements may be required to provide an undeveloped buffer along the route of this sewer for access/ maintenance purposes.

2.11 The asset plan provided by Southern Water indicates that the nearest public surface water sewer is located approximately 30m east of the site on Well Road. The nearest surface water manhole is ref 6451, which has a cover level of 7.49mAOD and an invert level of 5.97mAOD. Given the lowest point on the proposed development site is 4.19mAOD, it may not be viable to connect into the nearby Southern Water surface water sewer through a gravity connection.

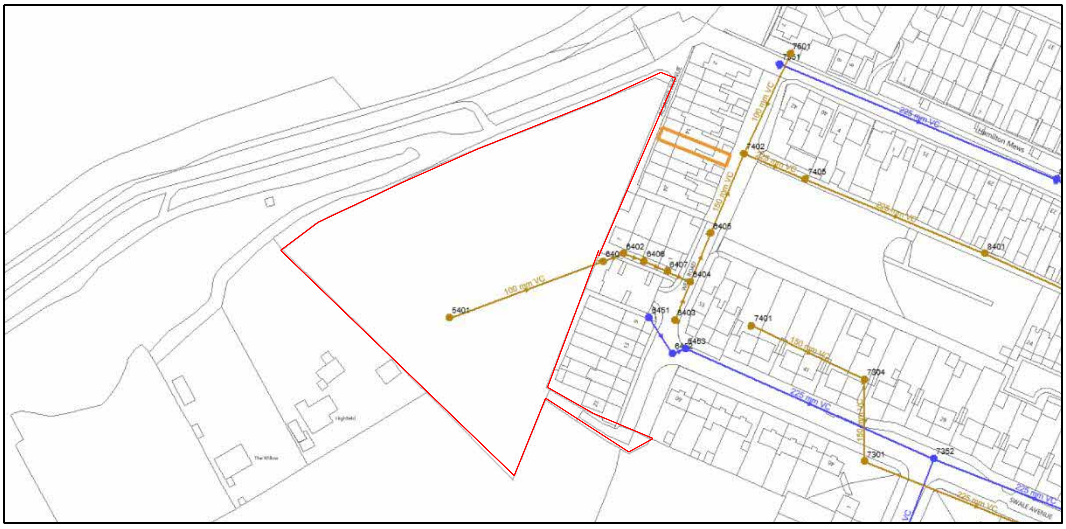

Figure 3: Asset Location Plan (Source: Southern Water)

3. SUDS Assessment

2.1 In accordance with the SuDS management train approach, the use of various SuDS measures to reduce and control surface water flows have been considered for the development.

2.1 The management of surface water has been considered in respect to the SuDS hierarchy (below) (as detailed in the CIRIA 753 'The SUDS Manual', Section 3.2.3):

SuDS Drainage Hierarchy			
		Suitability	Comment
1.	Infiltration	x	Underlying geology with poor infiltration rates
2.	Discharge to Surface Water		Discharge to tidal waters of River Swale
3.	Discharge to Surface Water Sewer, Highway Drain or another Drainage System	-	
4.	Discharge to Combined Sewer	-	
5.	Discharge to a foul sewer (should not be considered as a possible option)	-	

Table 1: SuDS Hierarchy

2.1 Following the SuDS drainage hierarchy, infiltration has been considered. However, as per section "Geology and Infiltration Potential", infiltration has been discounted as the main surface water discharge option due to potentially poor infiltration rates on site.

2.1 As such, given the close proximity of the site to the River Swale (tidal), discharging runoff to the adjacent water body should be considered next, in line with the SuDS drainage hierarchy.

2.1 Discharging runoff to a tidal water body can be done at an unrestricted rate. As detailed in DEFRAs "Non-statutory technical standards for SUDS" under S1:

"Where the drainage system discharges to a surface water body that can accommodate uncontrolled surface water discharges without any impact on flood risk from that surface water body (e.g. the sea or a large estuary) the peak flow control standards (S2 and S3) and volume control technical standards (S4 and S6) need not apply".

2.1 Surface water connection into a tidal river/water body are generally permitted to be/remain unrestricted.

2.1 However, given that the Swale is predominantly tidal, outfalls within tidal ranges can be subject to tidelocking and runoff rates restricted in these events. Therefore, if the outfall cannot be positioned above the design tide level, consideration of storage is required in the event of a tidelocked outfall.

2.1 The suitability of SuDS components has been assessed in order to provide a sustainable means of providing the required attenuation volumes. The following components have been assessed as set out in the below table:

Suitability of SuDS Components		
SuDS Component	Description	Suitability
Infiltrating SuDS	Infiltration can contribute to reducing runoff rates and volumes while supporting baseflow and groundwater recharge processes. The suitability and infiltration rate depends on the permeability of the surrounding soils.	x
Permeable Pavement	Pervious surfaces can be used in combination with aggregate sub-base and/or geocellular/modular storage to attenuate and/or infiltrate runoff from surrounding surfaces and roofs. Liners can be used where ground conditions are not suitable for infiltration.	
Green / Blue Roofs	Green Roofs provide areas of visual benefit, ecological value, enhanced building performance and the reduction of surface water runoff. They are generally more costly to install and maintain than conventional roofs but can provide many long-term benefits and reduce the on-site storage volumes. Blue roofs provide additional attenuation by storing the rainwater in crates located in the roof structure. Runoff from these structures can be reduced significantly using small orifice devices due to the low risk of blockage.	x
Rainwater Harvesting	Rainwater Harvesting is the collection of rainwater runoff for use. It can be collected from roofs or other impermeable areas, stored, treated (where required) and then used as a supply of water for domestic, commercial and industrial properties.	
Swales	Swales are designed to convey, treat and attenuate surface water runoff and provide aesthetic and biodiversity benefits. They can replace conventional pipework as a means of conveying runoff, however space constraints of some sites can make it difficult incorporating them into the design.	x
Rills and Channels	Rills and Channels keep runoff on the surface and convey runoff along the surface to downstream SuDS components. They can be incorporated into the design to provide a visually appealing method of conveyance, they also provide effectiveness in pre-treatment removal of silts.	x
Bioretention Systems	Bioretention systems can reduce runoff rates and volumes and treat pollution through the use of engineered soils and vegetation. They are particularly effective in delivering interception, but can also be an attractive landscape feature whilst providing habitat and biodiversity.	x
Retention Ponds and Wetlands	Ponds and Wetlands are features with a permanent pool of water that provide both attenuation and treatment of surface water runoff. They enhance treatment processes and have great amenity and biodiversity benefits. Often a flow control system at the outfall (outflow?) controls the rates of discharge for a range of water levels during storm events.	x
Detention Basins	Detention Basins are landscaped depressions that are usually dry except during and immediately following storm events, and can be used as a recreational or other amenity facility. They generally appropriate to manage high volumes of surface water from larger sites such as neighbourhoods.	
Geocellular Systems	Attenuation storage tanks are used to create a below-ground void space for the temporary storage of surface water before infiltration, controlled release or use. The inherent flexibility in size and shape means they can be tailored to suit the specific characteristics and requirements of any site.	
Proprietary Treatment Systems	Proprietary treatment systems are manufactured products that remove specific pollutants from surface water runoff. They are especially useful where site constraints preclude the use of other methods and can be useful in reducing the maintenance requirements of downstream SuDS.	
Filter Drains and Filter Strips	Filter drains are shallow trenches filled with stone, gravel that create temporary subsurface storage for the attenuation, conveyance and filtration of surface water runoff. Filter strips are uniformly graded and gently sloping strips of grass or dense vegetation, designed to treat runoff from adjacent impermeable areas by promoting sedimentation, filtration and infiltration.	x

Table 2: Suitability of SuDS Components

2.1 Given the underlying geology and soils at the site, infiltration as a primary technique of managing runoff may not be viable. However, the private residential hard-standing could be Type A Permeable Paving to drain itself.

2.10 Calculations have been undertaken to provide the required attenuation within a below ground geocellular tank for the purposes of this report. However, it is important to note that above ground techniques may be feasible if located outside the 1:200 year (2115) event. Based on analysis within the accompanying FRA (Ambiental Ref 5874 FRA), the proposed green area which could accommodate a detention basin could be affected for the 1:200 year (2115) event. If the entire site can be raised to at least 5.27mAOD (the 1:200 year (2115) flood level) then it may be possible to provide the required attenuation storage in a detention basin. This approach would need to be agreed with the Environment Agency and the Lead Local Flood Authority, and it is generally not accepted to locate open SuDS systems within the floodplain.

2.11 For the purposes of this report, assuming a worst case scenario, where site levels cannot be raised, a geocellular tank will be used to provide the required storage.

2.11 Rainwater harvesting can be considered as a means of increasing sustainability by decreasing demand on water supply subject to specialist design.

Geocellular Tank

2.11 Attenuation storage tanks are used to create a below-ground void space for the temporary storage of surface water before infiltration, controlled release or use. The inherent flexibility in size and shape means they can be tailored to suit the specific characteristics and requirements of any site.

Rainwater Harvesting

2.10 Rainwater harvesting (RWH) systems should be considered for rainwater re-use. Rainwater harvesting can take various forms including simple water butts to utilise runoff for watering and irrigation, to more complex pumped RWH systems to be used in grey water uses.

2.11 Water Butts are considered suitable for this site to reduce peak discharges to the proposed soakaway and downstream flood risk. Water butts often have limited storage capacity, depending on the demand for harvested rainwater and the previous rainfall conditions. However, it is considered that they still have an important role to play in the sustainable use of surface water.

2.10 As such, downpipes could be routed through a water butt prior to overflow discharge to the underground system.

4. Surface Water Drainage Strategy

2.1 In order to mitigate flood risk posed by the proposed development, adequate control measures are required to be considered. This should ensure that surface water runoff is dealt with at source and that the flood risk on/off site is not increased over the lifetime of the development.

Runoff rates

2.1 As detailed in DEFRAs "Non-statutory technical standards for SUDS" under S1:

"Where the drainage system discharges to a surface water body that can accommodate uncontrolled surface water discharges without any impact on flood risk from that surface water body (e.g. the sea or a large estuary) the peak flow control standards (S2 and S3) and volume control technical standards (S4 and S6) need not apply".

2.1 Surface water connection into a tidal river/water body are generally permitted to be/remain unrestricted.

4.4 As such, it is proposed to discharge surface water runoff from the site to the adjacent tidal water body at an unrestricted rate.

Attenuation Storage

2.1 Attenuation storage is needed to temporarily store water during periods when the runoff rates from the development site exceed the restricted flow rates of the site.

4.4 As the proposed development will discharge surface water at an unrestricted rate to a tidal system, such considerations are not required. However, as the site is currently partially below the 1:200 year (2115) flood level, consideration should be shown to potential tidelocking scenarios whereby the proposed outfall becomes submerged by tidal flood waters.

4.4 To simulate this in MicroDrainage, the Quick Storage Estimate tool was used to calculate the required storage volumes for the 1:100 year +CC (40%) event, assuming a 0 l/s outfall from the site (representative of a tidelocked outfall) adopting a worst case approach.

4.4 Based on the total proposed hardstanding area of 0.479 hectares, and assuming that the required volume will be provided in a geocellular tank with a void ratio of 0.95, there would be a required storage volume of 655m^3.

2.1 This could be provided in a geocellular tank of 575m^2 and 1.2m deep with 0.95 void ratio (575 x 1.2 x 0.95 = 655.5m^3). The tank size should be confirmed at detailed design stage with further consideration to tidal cycles and levels in the area. If a shallowed tank is required the storage may need to be provided in several smaller structures or in a permeable paving sub-base given the size of the green area in the north of the site.

2.10 Alternatively, during detailed design it may be determined that an attenuation basin could be provided, which, due to side slope requirements, could require a larger footprint.

2.10 It is worth noting that the above storage volumes do not include a 10% allowance for urban creep. It is assumed that all future hardstanding would be of permeable paving construction.

Long Term Storage

2.10 As it is proposed to discharge runoff from the development into the adjacent tidal waters unrestricted, consideration of Long-Term Storage should not be required.

Drainage Strategy

2.10 It is proposed to collect runoff from roof areas utilising rainwater pipes connecting into a number of main drain runs, before being attenuated in a below ground geocellular system prior to being discharged to the adjacent tidal water system at an unrestricted rate.

2.10 Hardstanding areas such as the access road could be drained via gullies connecting into the main drain runs.

2.10 It is proposed to utilise Type A permeable paving in place of the driveways and non-trafficked pedestrian footpaths to drain itself.

2.10 For the purposes of this outline drainage strategy, the proposed attenuation tank has been sized based on an outfall restriction of 0 l/s to simulate a tide-lock scenario whereby the outfall becomes submerged.

2.10 The tank size should be confirmed at detailed design stage which further consideration to tidal cycles and levels in the area. A new outfall and supporting infrastructure may require a Flood Risk Activity Permit, and if required this should be obtained before any works start.

2.10 Silt traps should be fitted to downpipes to decrease the risk of blockage. Smart Sponge or similar proprietary treatment products should be fitted to drain runs from the road/ parking areas to offer sufficient treatment of runoff from trafficked areas

2.10 A proposed surface water drainage strategy drainage layout has been included in Appendix 2.

Design Exceedance

2.10 In the event of drainage system failure under extreme rainfall events, or blockage, flooding may occur within the site. In the event of the development's drainage system failure, the runoff flow will be dictated by topography on site. Indicative flow paths are shown in the outline strategy drawing in Appendix 2 of this report. Design of external levels should be considered at the detailed design stage, particularly if it is proposed to level/ landscape the site.

Water Quality

2.10 The proposal is to discharge runoff from the development to the adjacent tidal waters. As such, it is important to provide suitable water quality treatment at source.

2.10 Adequate treatment must be delivered to the surface water runoff to remove pollutants through SuDS devices, which are able to provide pollution mitigation. Pollution Hazards and the SuDS Mitigation have been indexed in the specialized literature CIRIA 753 'The SUDS Manual'.

POLLUTION HAZARD INDICES FOR DIFFERENT LAND USE CLASSIFICATIONS				
LAND USE	Pollution Hazard Level	Total suspended Solids (TSS)	Metals	Hydro-carbons
Residential Roofs	Very Low	0.2	0.2	0. 05
Individual property driveways, residential car parks, low traffic roads i.e. < 300 traffic movements/day	Low	0.5	0.4	0.4

Table 3: Summary of Pollution hazard Indices for different Land Use

2.10 Runoff from the proposed new roof areas is considered to generally be uncontaminated. However, to prevent any potential sediment from impacting on the storage structure, sediment traps should be provided on the underground surface water drainage system at suitable locations to prevent sedimentation.

2.10 Runoff from the proposed access road/ parking bays could be treated through the Smart Sponge or similar proprietary treatment products prior to entering the main drain runs/ attenuation tank. The private residential hard-standing could be Type A Permeable Paving to drain itself and also offer additional treatment.

Adoption and Maintenance

2.10 All onsite SuDS and drainage systems will be privately maintained. A long-term maintenance regime should be arranged by the site owners with a managing agent for all common areas before implementation.

2.10 In addition to a long-term maintenance regime, it is recommended that all drainage elements implemented on site should be inspected following the first rainfall event post-construction and monthly for the first quarter following construction.

2.10 An Outline maintenance regime for below ground drainage on site is included in Table 4.

Item	Visual Inspection	Cleanse / De-sludge	CCTV Survey	Comments
Surface Water Drainage System (pipework, chambers etc.)	5 years	10 years	10 years	Cleansing to be carried as necessary
Gullies/Channels	1 year	1 year	N/A	Cleansing to be carried as necessary
Permeable Paving	1 year	'Swept' clean of debris every 2 years.	N/A	For paving -Lift blocks and remove sand bedding and replace and re-bed paving – refer to individual manufacturer's recommendations. For tarmac - vacuum clean paving as necessary to maintain infiltration.

Flow Control Devices Orifice Plate or Similar flow control	Six Monthly	As required	N/A	Inspect and remove blockage, hose down as required, check flow

Table 4: Schedule of maintenance for drainage

5. Conclusion

2.1 Ambiental Environmental Assessment has been appointed by Oast Architecture to undertake a National Planning Policy Framework (NPPF) compliant Flood Risk Assessment (FRA) and Surface Water Drainage Strategy (SWDS) for the proposed development at Nil Desperandum, Alsager Avenue, Queenborough, Swale, ME11 5LA. The purpose of this assessment is to support an outline planning application.

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2.1 Based on the total proposed hardstanding area of 0.479 hectares, and assuming that the required volume will be provided in a geocellular tank with a void ratio of 0.95, there would be a required storage volume of 655m^3. This could be provided in a geocellular tank of 575m^2 and 1.2m deep with 0.95 void ratio (575 x 1.2 x 0.95 = 655.5m^3). The tank size should be confirmed at detailed design stage with further consideration to tidal cycles and levels in the area.

2.1 Hardstanding areas such as the access road and parking areas could be drained via gullies connecting into the main drain runs. Silt traps should be fitted to downpipes to decrease the risk of blockage. Smart Sponge or similar proprietary treatment products should be fitted to drain runs from the road/ parking areas to offer sufficient treatment of runoff from trafficked areas

2.1 The proposed drainage strategy should be progressed at the detailed design stage taking into account wider side constraints.

2.1 The findings and recommendations of this report are for the use of the client who commissioned the assessment, and no responsibility or liability can be accepted for the use of the report or its findings by any other person or for any other purpose.

Appendix 1 – Supporting Information

A3 SHEET

NOTE:
THIS DRAWING HAS BEEN PRODUCED BY ELECTRONIC MEANS. SHOULD THE SCALE MEASUREMENTS BE TAKEN BY MEANS OTHER THAN ELECTRONIC (e.g. FROM A PRINTED COPY), THE FOLLOWING MUST BE TAKEN INTO CONSIDERATION BEFORE SCALING IS UNDERTAKEN:
ENSURE THAT THE COPY HAS BEEN PRINTED/PLOTTED ON THE STATED SHEET SIZE WITH THE PLOTTING/PRINTING SCALE SET TO A CORRECT RATIO.

Primary Access Routes

0m 20m 40m 60m 80m 100m

VISUAL SCALE 1:1000 @ A3

Client
Mr Alan Hill
Project
Nil Desperandum
Title
Site Layout Plan
Scale
As Indicated
Date

OAST ARCHITECTURE

Drawn By	Checked By	Drawing No:	Revision
Oast	DS	A101	

A1 SHEET

NO TE:
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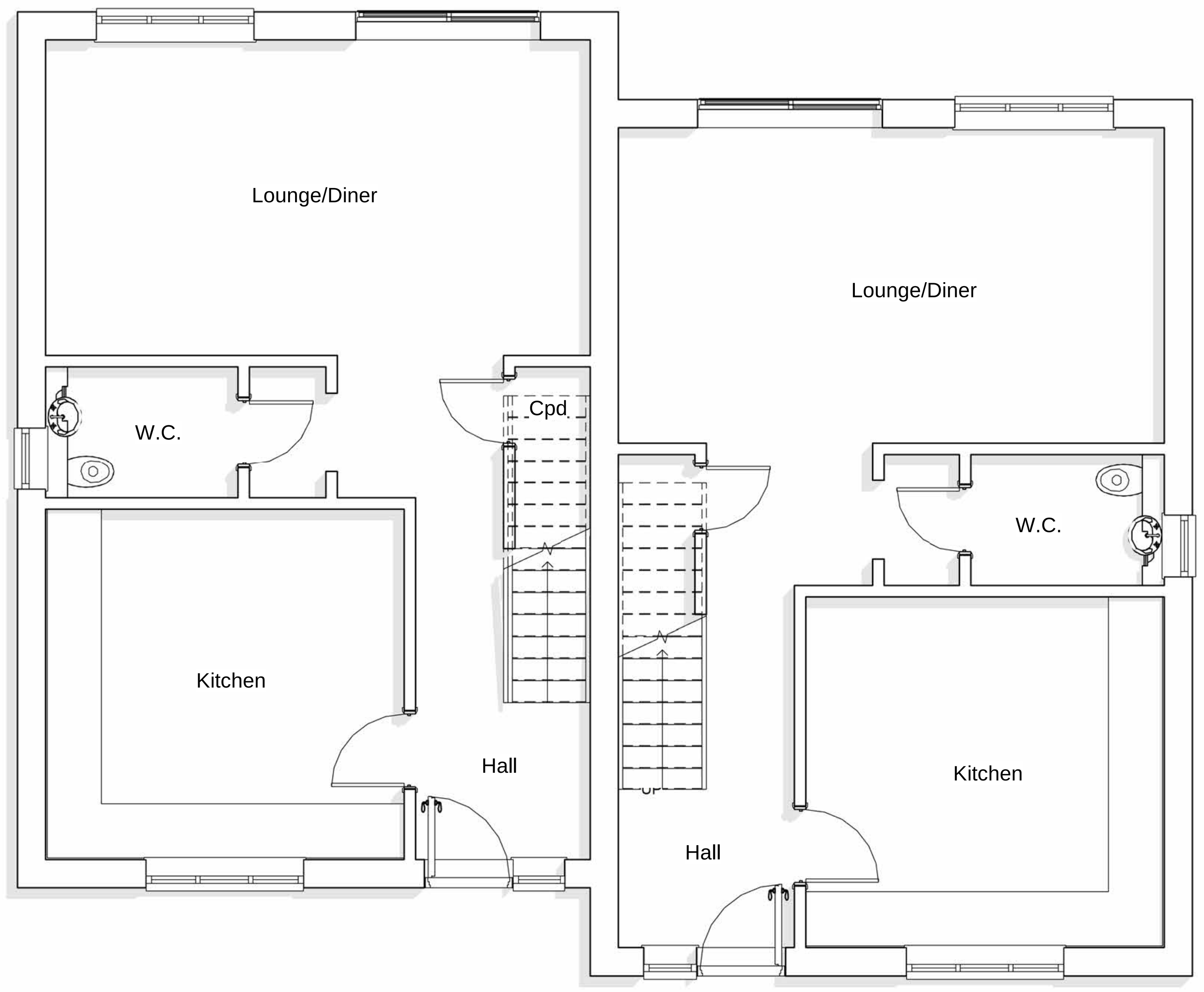
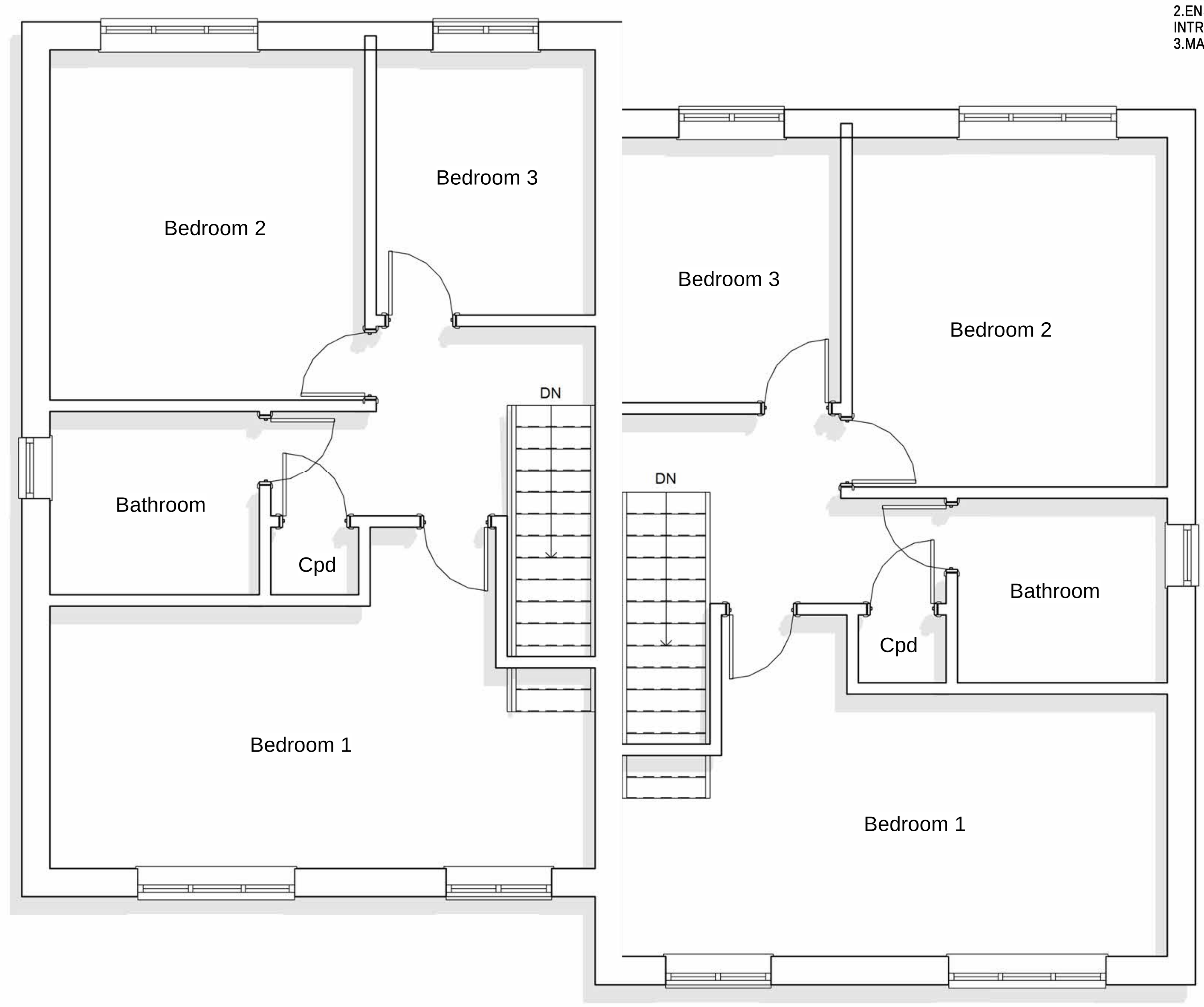
2.ENSURE THAT AN ADEQUATE ALLOWANCE (DEPENDANT ON THE STATED SCALE) IS MADE FOR THE INEVITABLE DISTORTIONS INTRODUCED BY PLOTTING/PRINTING AND COPYING PROCESSES.
3.MARKED CRITICAL DIMENSIONS ARE TO BE REGARDED AS HAVING PRECEDENCE OVER THE SCALED VALUES.



1 **Proposed Ground Floor**
1 : 50



2 **Proposed First Floor**
1 : 50

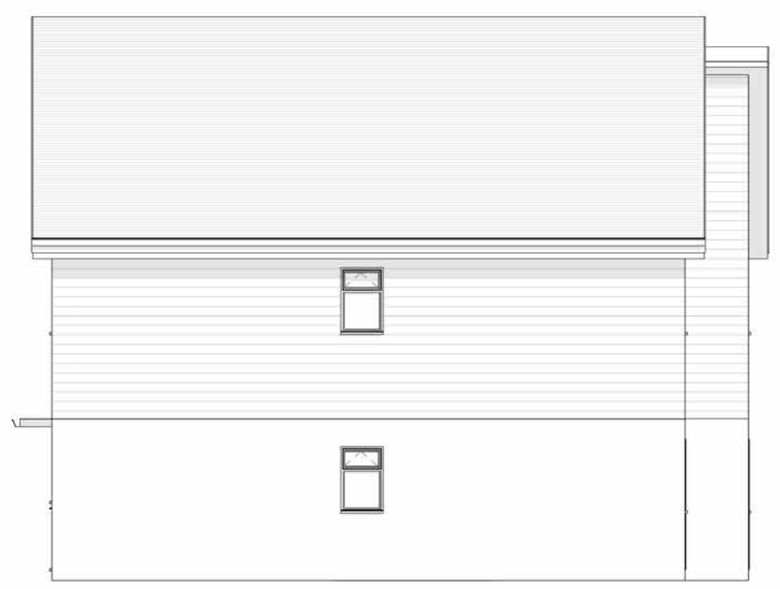
Marley Smooth grey interlocking roof tile

Marley Cedral grey Cladding

Off White Render

Anthracite Grey Windows

3 **Proposed Front**
1 : 100



4 **Proposed R/H Side**
1 : 100

5 **Proposed Back**
1 : 100

6 **Proposed L/H Side**
1 : 100

0m 1m 2m 3m 4m 5m
VISUAL SCALE 1:50 @ A1

0m 2m 4m 6m 8m 10m
VISUAL SCALE 1:100 @ A1

REV	DESCRIPTION	DATE	INIT	CHKD

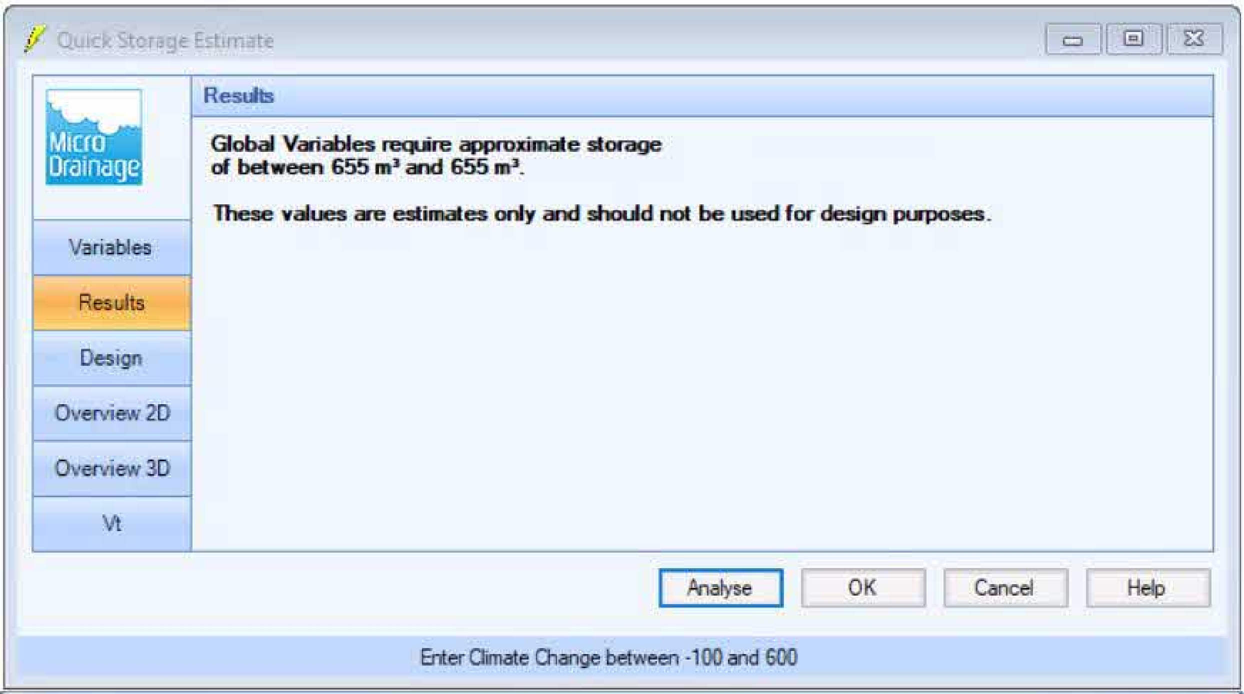
Client
Owner

Project
Nil Desperandum

Title
Dwelling House Type GA 2

Scale	Date	Drawn By	Checked By	Drawing No:	Revision
As indicated		Oast	DS	A103	

OAST ARCHITECTURE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Micro Drainage
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of between 655 m³ and 655 m³.
These values are estimates only and should not be used for design purposes.
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Results
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Overview 3D
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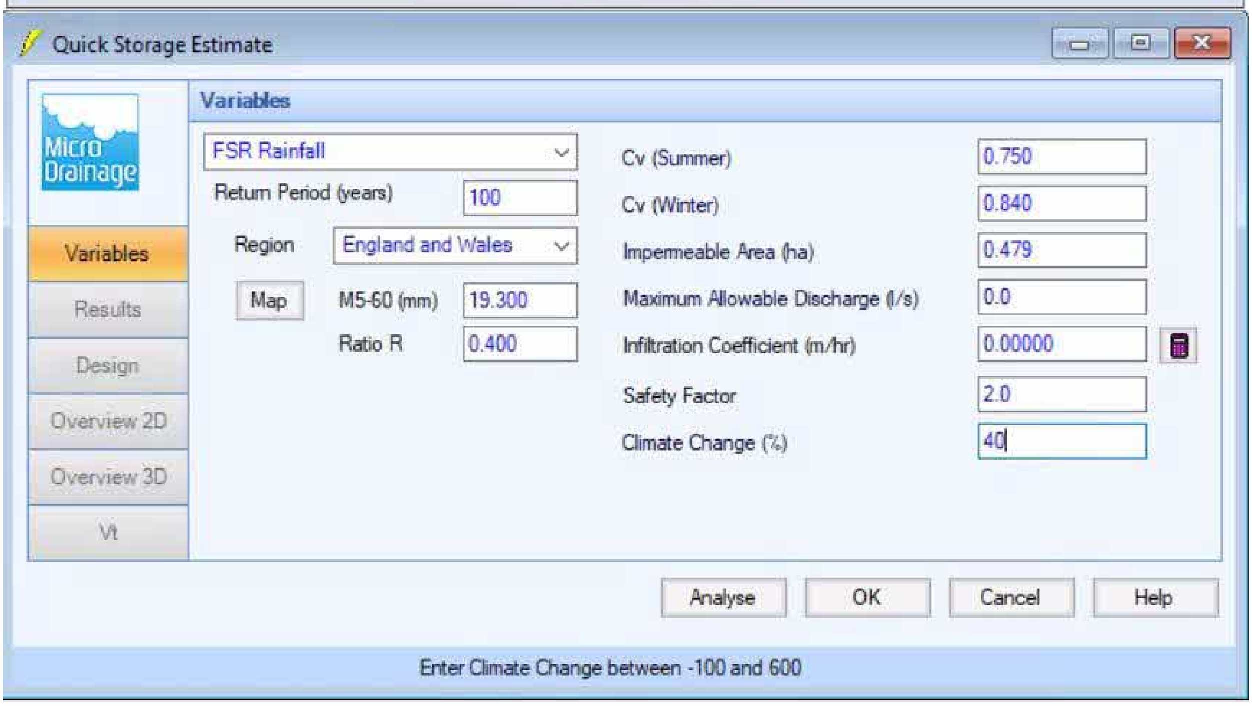
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Climate Change (%)
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Results
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Overview 2D
Overview 3D
Vt
Analyse
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Cancel
Help
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