BURO HAPPOLD

Eden Project North

Drainage Strategy Report

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Glossary

Term	Definition
Attenuation	A method to reduce a flood peak to prevent flooding, often utilising temporary storage, but increasing the duration of the flow.
Brownfield	Land previously developed that has potential to be regenerated.
Catchment	A surface water catchment is the area which water drains into a watercourse. A groundwater catchment is the area that consists of the groundwater river flow.
Design Flood Level	This is the level of flooding that flood defences or mitigation measures are designed against. This is typically the 1% (1 in 100) flood level.
Discharge	The rate of flow of water measured in terms of volume per unit time.
EA	Environment Agency.
Flood Defence	A natural or man-made infrastructure used to prevent certain areas from inundation from flooding, and / or the provision of flood warning systems.
Floodplain	Area of land adjacent to a water course which water flows or is stored during a flood event, or would otherwise be flooded in the absence of flood defences.
Flood Resilience	Improving flood resistance, e.g. reducing the risk of properties against flooding events.
Flood Risk	The level of risk to personal safety and damage to property resulting from flooding due to the frequency or likelihood of flood events.
Flood Risk Assessment (FRA)	An assessment of the flood risks to the proposed development over its expected lifetime and the possible flood risks to the surrounding areas, assessing flood flows, flood storage capacity and runoff.
Flood Risk Management (FRM)	Managing and/or reducing flood risk to people, property and the environment.
Flood Zones	The statistical chance of a flood event occurring in any one year, stated as a percentage. PPS25 identifies three flood zones.
Fluvial Flooding	Related or connected to a watercourse (river or stream).
Greenfield	Land which has not been previously developed.
Groundwater	Water present within underground strata known as aquifers.
Inundation	Flooding of land with water.
m AOD	Metres Above Ordnance Datum.
Mitigation	Actions taken to reduce either the probability of flooding or the consequences of flooding or a combination of the two.
Previously Developed Land	Land which is or was occupied by a permanent structure (excluding agricultural or forestry buildings) and associated fixed surface infrastructure.
Red line boundary	Boundary drawn to indicate the site area on which the planning application is based.
Residual Risk	The risk that remains after risk management and mitigation measures have been implemented
Risk	Risk is the probability that an event will occur and the impact (or consequences) associated with that event.
Runoff	Water flow over surfaces to the drainage system. Runoff occurs if the ground is impermeable or if permeable ground is saturated.
Strategic Flood Risk Assessment (SFRA)	An SFRA is the assessment and 'categorisation' of flood risk on an area-wide basis in accordance with PPS25.
Surface Water Flooding	Surface water flooding occurs when the volume of water is unable to filtrate through the ground to enter drainage systems, and therefore runs quickly off land and results in localised flooding. This type of flooding is usually associated with intense rainfall.
Sustainable Drainage Systems (SuDS)	SuDS are used as a strategy to manage surface water in a sustainable manner or least damaging solution through management practices and physical structures.
Sustainable Development	Development which meets the needs of the present without compromising the ability of future generations to meet their own needs.
Water Table	The top surface of the saturated zone within the aquifer.

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1 Introduction

1.1 Appointment and Brief

Buro Happold have been appointed by Eden Project International Ltd. to undertake the infrastructure design for the Eden North Project.

This report will review and discuss the following:

- Site constraints;
- Review of existing external sewer network;
- Proposed surface water drainage strategy; and
- Proposed foul water drainage strategy.

The Drainage Strategy Report has been prepared as supplementary documentation to support the planning application for the Eden North site located in Morecambe.

1.2 Review of Available Information

A topographical survey has been provided by Survey Ops, along with an incomplete CCTV survey route of the underground culvert located within the site. The survey is incomplete due to high water level in the culvert. An underground utility survey that covers all the area was not available at the time this report was issued and Buro Happold have recommended to undertake and complete one prior to Stage 3 commencing along with completion of the required CCTV survey works.

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2 Site Description

2.1 Existing Site

The Eden Project North site is a brownfield site located in Morecambe, UK. The site boundary is approximately 4.6 hectares. The site is limited by Morecambe beach to the north and west, The Stone Jetty Pier to the northwest, and Marine Road Central and Morecambe War Memorial to the south of the development. There is a watercourse called Morecambe Bay approximately 1.6 km to the northwest of the site. The post code and grid reference of the site are LA4 4BU and SD 43035 64364.



Figure 2.1 Site Location

2.2 Existing Topography

The existing site levels are shown in Figure 2.2. Levels across the site vary from approximately 10.4 m AOD, in the northern boundary, to 4 m AOD at the central area of the site. The mean elevation across the site is approximately 6.7 m AOD. Refer to Appendix A for topographical survey.

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Figure 2.2 Existing Topography

2.3 Existing Waterbodies

There is an existing unnamed culverted watercourse that crosses through the site. Morecambe Bay is also approximately 1.6 km to the northwest of the site. The existing culvert location and detail is included in the following sections of this report.

2.4 Existing Drainage

2.4.1 Surface Water

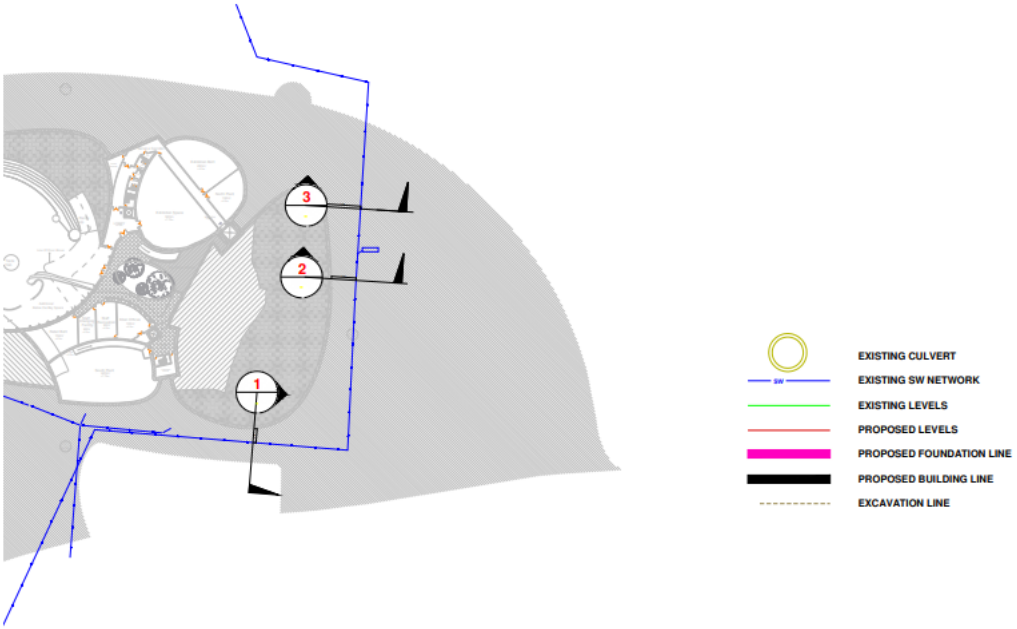
Existing Culvert

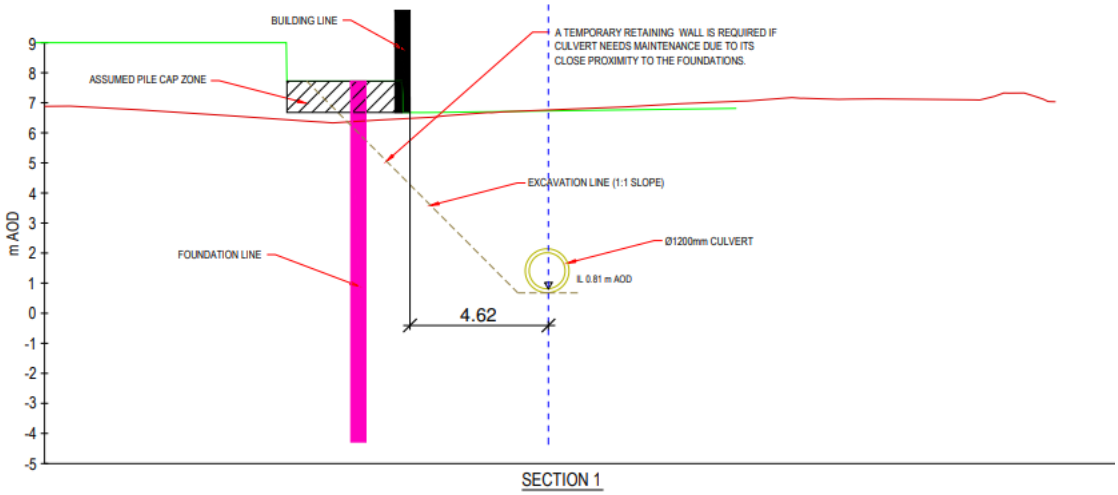
Asset records from United Utilities, proven by CCTV survey, show that there is an existing 1,200mm diameter culvert to the south and west of the proposed development, crossing within the site boundary, that discharges to Morecambe Bay. The culvert is an Ordinary Watercourse and the landowner of the site is the Riparian owner, with responsibility to ensure the watercourse is not impeded. The location of the watercourse is shown in Figure 2.4 below.

The record drawings indicate that the culvert reduces to a 900mm pipe at some point adjacent to the existing rock armour. A CCTV survey of the pipe indicates that it is in good condition, however, the survey was abandoned near the sea defences due to standing water within the pipe. The CCTV survey results are included in Appendix A.

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The design proposals look to avoid building permanent structures over the culvert, and where possible an 8m easement will be provided. However, in two locations the proposed building will encroach into this 8m. In these areas we propose that any long-term maintenance that requires the culvert to be exposed would be done with a temporary retaining structure being installed between the proposed building and the culvert. Due to the good condition of the culvert, this is not seen as a short- or medium-term requirement, but the building position has been developed to allow this access in the long term if required. The culvert position with associated sections is included in the following figures.





SECTION 1

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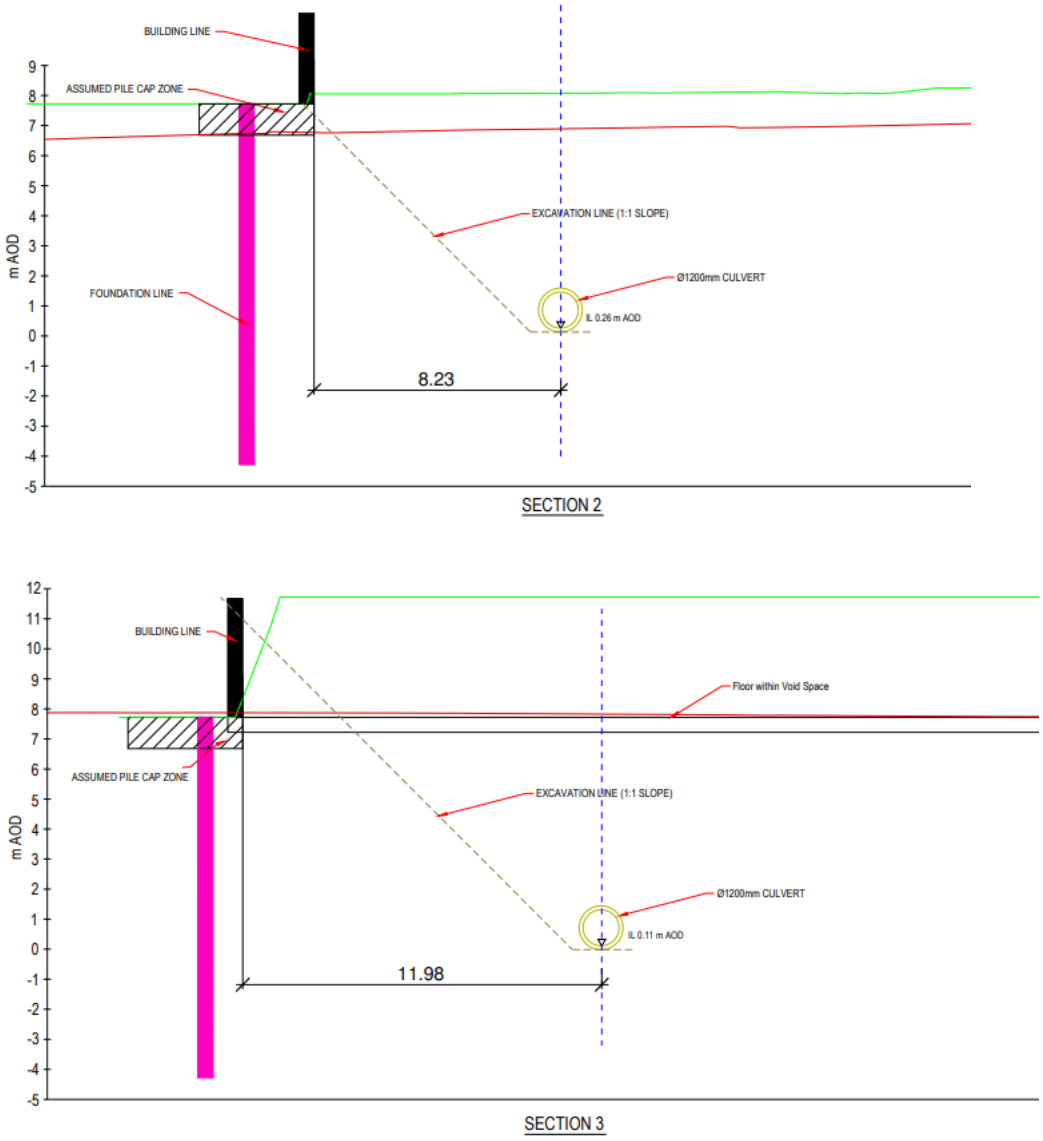


Figure 2.3 Culvert Position and Sections

Soakaways

Historic information from the council shows two soakaway manholes located in the rock armour, shown in Figure 2.4 Existing Surface Water Figure 2.4. Current information of these soakaway manholes is limited to a historic drawing proposal, and visual confirmation of the manhole covers. The council have confirmed that these existing soakaways serve the current site and were installed at a similar time to the rock armour and sea wall upgrades. A survey is being undertaken by the council to confirm the size and capacity of these soakaways.

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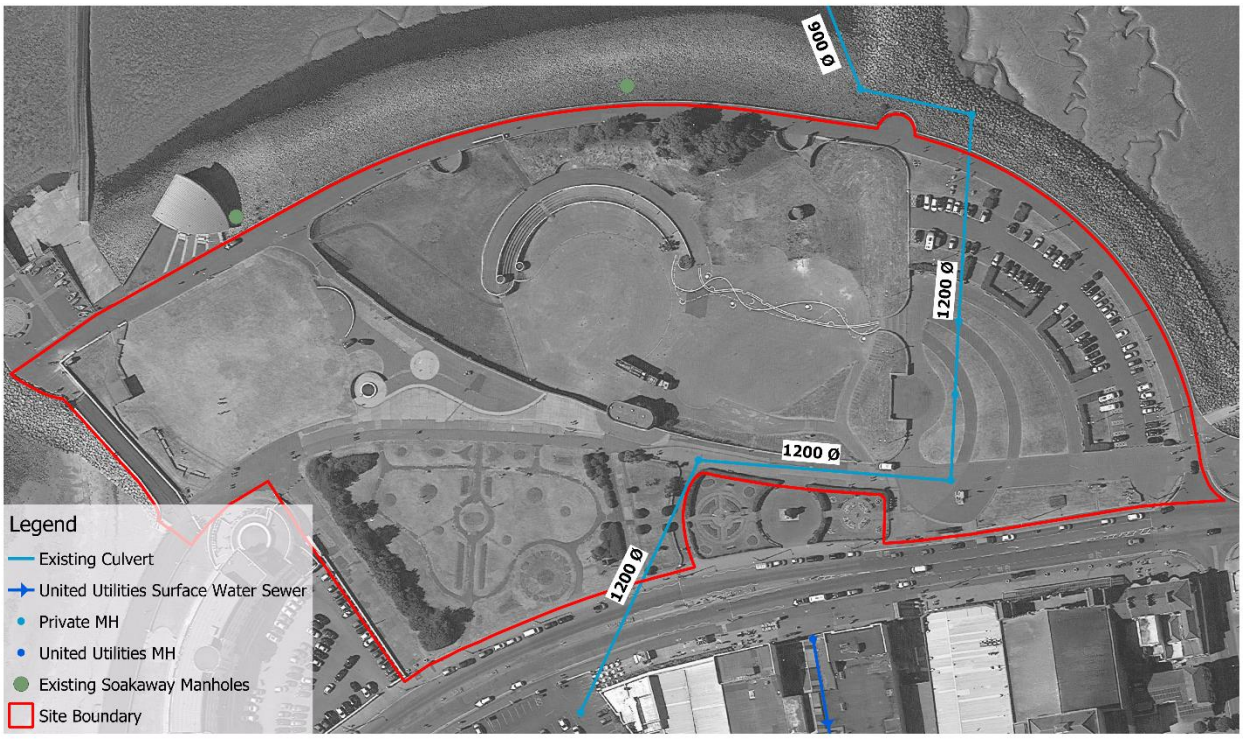


Figure 2.4 Existing Surface Water

Impermeable Areas

The existing site is made up of hardstanding areas, where the Bubbles complex was located, and then soft landscape areas which are located around the site. An Existing catchment plan has been created and is shown in Figure 2.5 below. From the existing areas, an impermeable area of the existing site has been calculated as 2.57 hectares.

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Figure 2.5 Existing Catchment Plan

2.4.2 Foul Water

United Utilities records show that there is no foul or combined network present within the proposed development site. However, a combined network is present under Marine Road Central, with the head of the run starting South West of the site, see below Figure 2.6.

As the site was previously a Lido between the years of 1936 to 1975 and the Bubbles complex from 1989 to 1999 it is assumed that there was previously foul discharge from the site. Any private sewers serving the existing site are to be grubbed up and removed.

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Figure 2.6 Existing Combined Network

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3 Proposed development

The proposed development comprises a number of connected biomes located centrally in the site. Appendix B includes the detailed plans indicated in Figure 3.1.

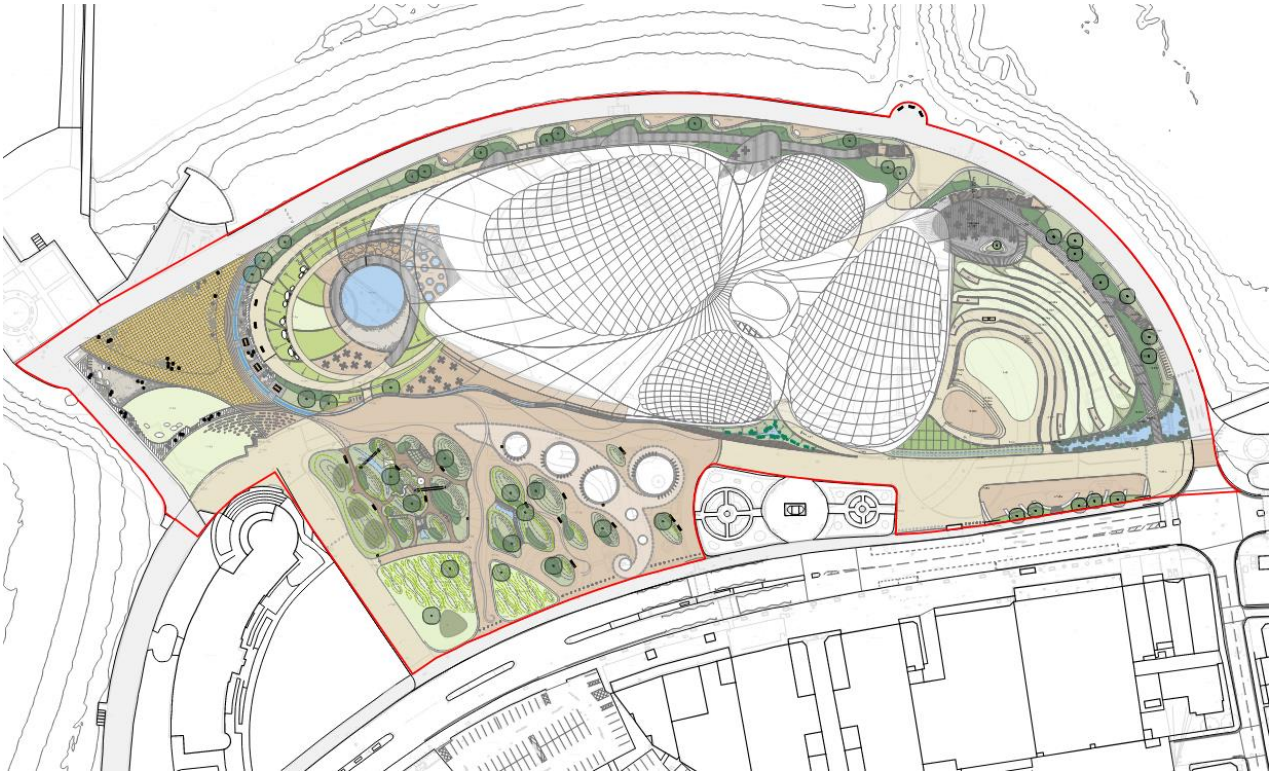


Figure 3.1 Proposed Eden North (TEP/Grimshaw)

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4 Proposed surface water drainage strategy

4.1 General

The surface water drainage system will collect surface water runoff from the site. This will include runoff from roof and surrounding hardstanding areas. Primary runoff will be from hard impermeable surfaces such as roof and any exposed area of hard standing.

Roof water runoff will be collected and transferred to rainwater storage for reuse as irrigation. The storage will be provided in the form of blue roof storage and a rainwater tank.

Collection of external surface water runoff will be captured by the sites SuDS systems, avoiding the use of conventional drainage such as gullies and linear/ channel drains.

4.2 Consultation

Consultation has been undertaken with both the EA and the LLFA. A summary of these conversations along with relevant emails is included in Appendix C.

4.2.1 Lead Local Flood Authority (LLFA)

The LLFA have be consulted regarding the proposed surface water strategy of discharging at a greenfield run off rate to the existing culvert. Their comments regarding discharge are indicated below.

"With regard to your drainage options, a new 'greenfield' connection to the on-site culvert would be acceptable in principle, though you'd need to check there's sufficient capacity within the culvert to accept the additional runoff volumes without any backing up or flooding – this is to comply with the requirements of the NPPF, i.e. no increased risk of flooding on or off site. If an existing connection to the on-site culvert is found, then we'd have no objection to you discharging to the culvert at the existing brownfield runoff rates and volumes, provided you follow one of the methodologies set out in section 24.5 of the CIRIA SuDS Manual 2015"

4.2.2 Environment Agency

The Environment Agency have been contacted regarding the proposed surface water strategy of discharging to the existing soakaway manholes however, a response is yet to be received.

4.3 Drainage Hierarchy

The proposed surface water drainage strategy for the site is required to follow the design guidelines set out by CIRIA SuDS manual, particularly the hierarchy for surface water drainage discharge. The hierarchy is as follows:

1. Discharge to the ground via infiltration
2. Discharge to a watercourse or the sea
3. Discharge to existing drainage infrastructure

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Discharge Via Infiltration

Historic information provided by Lancashire council shows two soakaway manholes located on the rock armour, it is believed that the site currently drains to these. Current information of these soakaway manholes is limited to a historic drawing proposal, and visual confirmation of the manhole covers. Further investigation will be required to understand the rate of infiltration and the condition of these manholes, to determine if they can be reused. This proposed strategy is continued below as "Option 1". The historic information on the manholes can be found in Appendix D.

Infiltration testing will also be carried out within the site boundary to determine if infiltration potential is available on site. This will be undertaken during the site investigation and the results will form the detailed strategy.

Discharge to a Watercourse or Sea

There is a culverted watercourse crossing the site which ultimately discharges to the sea. CCTV survey information of the culvert shows no existing connection, however, due to standing water in the culvert at the time of the survey only approximately 75% of the culvert was actually surveyed. It may be that there are existing site connections in the section of culvert not surveyed. The proposed strategy of discharging to the culvert is continued below as "Option 2". Existing CCTV survey information can be found in Appendix A.

Discharge to existing drainage infrastructure

The current existing information provided from United Utilities asset plans indicates that there are no existing public surface water sewers within the site. There is a combined sewer in Marine Road Central that previously served a portion of the site, however, to reduce the impact on the existing drainage infrastructure this discharge options is being discounted in favour of the two options included below. United Utility asset plans can be found in Appendix E.

4.4 Proposed Surface Water Strategy – Options 1 (discharge to soakaways)

Surface water strategy option 1 proposes to reuse the existing soakaways as shown in the historic information provided.

A blue roof system is envisaged to capture rainfall from the roof and this will be retained for reuse. Surface water captured in the public realm area will be conveyed where possible to the proposed SuDS features. As information at this stage is limited, a number of assumptions have been made to calculate the proposed discharge rate. Due to the nature of the soakaways being placed within the rock armour, it is assumed that the infiltration rate is very high (~x10-1m/s) and the restriction will come instead from the size of the pipework entering the soakaways.

It is assumed that the pipe entering the soakaway manholes is a 300mm diameter pipe, this is based upon the size of the soakaway manholes (1200mm diameter). An assumed gradient of 1:100 for the 300mm diameter pipe gives a maximum capacity flow of 111.1l/s for each soakaway. This value will be refined once more information is available for the soakaway manholes and existing network. Once this information is available, a hydraulic model will be progressed to replicate the existing soakaway in order to calculate a more accurate discharge rate for the site.

The Option 1 strategy drawing can be found in Appendix F.

4.4.1 Option 1 Attenuation Requirements

Based on the proposed discharge rate for Option 1, a quick storage estimate calculation has been carried out for the 1 in 100 year storm event plus 40% climate change. The estimated attenuation storage required for the site is 1,375m3. The scheme will incorporate the following SuDS features for the attenuation requirements:

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- Blue Roof Storage
- Water Feature (Pond) Storage
- Swale / Raingarden
- Gravel Attenuation
- Attenuation Tank

4.5 Proposed Surface Water Strategy – Options 2 (discharge to culvert)

Surface water strategy option 2 proposes to create a new connection to the existing culvert which crosses the site and discharges runoff to Morecambe Bay. The invert level of the existing culvert at the connection point is 1.14 m AOD, therefore, runoff will be conveyed by gravity.

A blue roof system is envisaged to capture rainfall from the roof and this will be retained for reuse. Surface water captured in the public realm area of the site will be conveyed where possible to the proposed SuDS features, reducing the need for a conventional drainage system such as channel drains and gullies. A greenfield runoff discharge rate of 12.6l/s is proposed due to lack of existing information and confirmation of any existing connection from the site. The greenfield runoff calculation can be found in Appendix G. A CCTV survey carried out at a later design stage may determine if any existing connections are present on site, if this is the case there may be scope to increase the discharge rate based on the capacity of the identified connections in line with guidance from the LLFA.

The Option 2 strategy drawing can be found in Appendix F.

4.5.1 Option 2 Attenuation Requirements

Based on the proposed discharge rate for Option 2, a quick storage estimate calculation has been carried out for the 1 in 100 year storm event plus 40% Climate change. The estimated attenuation storage required is 3,540m3. The scheme will incorporate the following SuDS features for the attenuation requirements:

- Blue Roof Storage
- Water Feature (Pond) Storage
- Swale / Raingarden
- Gravel Attenuation
- Attenuation Tank

4.5.2 Sustainable Drainage Systems (SuDS)

Sustainable Urban Drainage Systems are used to reduce the impact of surface water from storm events on the existing environment mimicking the natural run-off characteristics of the site and removing pollutants from the urban run-off at source. There are various solutions which are described in the SuDS Manual (CIRIA C753) and include ground level features including swales and ponds, below ground systems (such as tanks, and infiltration techniques like soakaways). In addition, there are above ground solutions such as green roofs.

The Proposed Development considers the use of sustainable drainage techniques in accordance with local policy. The CIRIA SuDS Manual contains a hierarchy of sustainable methods of capturing and storing rainwater in a descending order: from drainage into the ground to recharging water resources.

Non-infiltration SuDS features will not reduce the amount of surface water discharged; however, it will significantly delay and mitigate the peak flood flows from the Site. The hierarchy of SuDS techniques is shown below:

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Table 4-1 SuDS Techniques

	SUDS Technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit	Suitability for the Proposed Development	Comments
Most Sustainable ↑	**Living roofs**	√	√	√	**Yes**	Yes considered for the lower roof areas. The feasibility of this working alongside the dunescape style is to be confirmed at the next design stage.
	Basins & ponds	√	√	√	**Yes**	Permanent water features have been considered by the landscape architect and storage will be available in these. Swales are to be utilised in the landscape features.
	-Constructed Wetlands				**No**	
	-Balancing ponds				**No**	
	-Detention basins				**No**	
	-Retention ponds				**Yes**	
↓	**Filter strips & swales**	√	√	√	**Yes**	
	Rain Gardens	√	√	√	**Yes**	Rain gardens to form parts of the proposed swales.
	Infiltration devices	√	√	√	**TBC**	Existing soakaways to be retained as per option one. This is subject to further investigation and information.
	-soakaways	√	√		**TBC**	
	-infiltration trenches & basins					
	Permeable surfaces	√	√		**Yes**	Permeable surfaces are being prioritised over hard standing
	-gravelled areas				**Yes**	Subject to landscape design, currently included in shceme
Least Sustainable	-solid paving blocks				**Yes**	Subject to landscape design
	-porous pavers				**Yes**	Subject to landscape design
	Tanked systems	√			**Yes**	Considered to store additional required volumes that isn't available in the current proposed SuDS features.
	-over-sized pipes/tanks				**Yes**	
	-attenuation cells				**Yes**	

The SuDS features included in the design for this site are listed below, with the location shown on the proceeding Figure 4.3.

Blue/Green Roofs

The blue/ green roofs are proposed for the scheme. These will be present on the low roof areas known as the dunescapes, at current it is assumed that blue roofs are feasible, however this is to be confirmed at a later stage where more design information is available on the dunescapes. The green roof aspect will include topsoil/planting medium to allow for local plants to cover the roof areas, providing ecological benefits. Below the green roof will be a blue roof system which will capture the rainwater and act as storage for the rainwater to be reused as part of the sites irrigation demand. An example of this a blue/green roof is shown in Figure 4.1 below.

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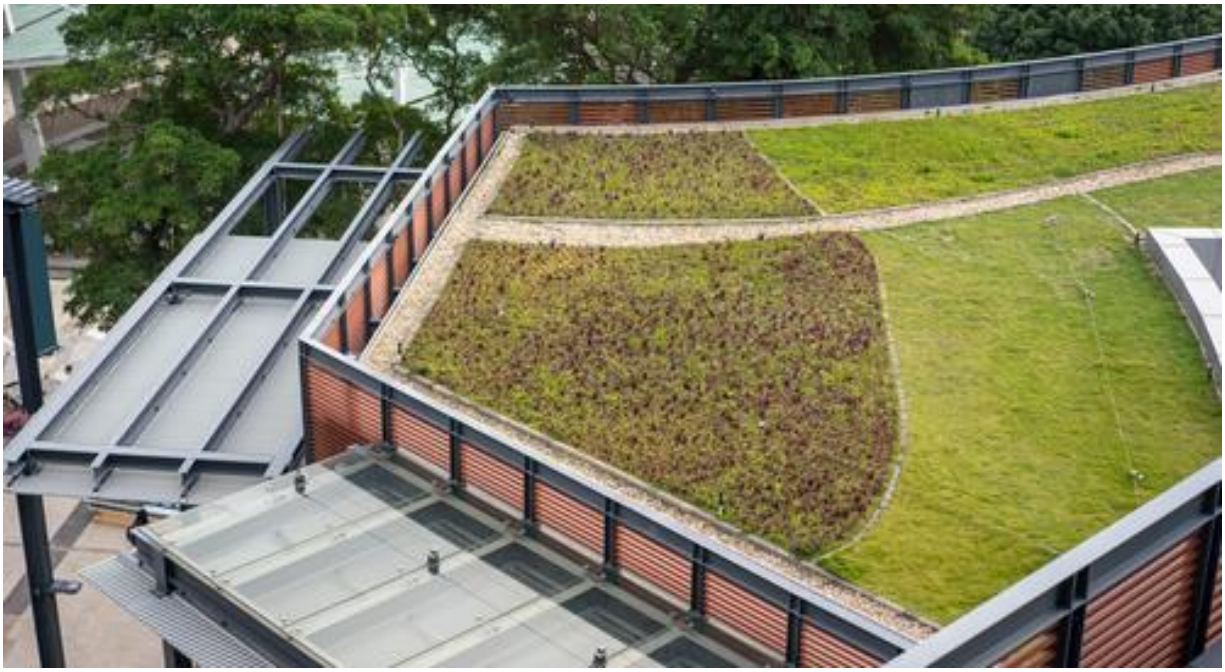


Figure 4.1 Example Blue/ Green Roof

Swales/Raingardens

Two swales / raingardens will be located on site, as shown in Figure 4.3. The swales will capture run off from the neighbouring walkways. The swales across the site are proposed to have a filter trench below to provide additional attenuation and water treatment capacity. An example of this is shown in Figure 4.2.



Figure 4.2 Example Swale

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Figure 4.3 Proposed SuDS Features

4.5.3 Climate Change

The climate change allowance is 40%, this has been used for the 1 in 100 year + CC event to calculate the estimated storage required.

4.5.4 Percentage Impermeable

The following impermeable percentages have been used across the site. The proposed catchment areas for the site are shown in Figure 4.4 below.

Table 4-2 Percentage Impermeable

Site Areas	Percentage Impermeable
Soft Landscaping	**0.15**
Water Features	**0.80**
Roof Areas	**0.90**
Paved Areas	**0.75**
Permeable Paving	**0.50**

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Figure 4.4 Catchment Plan

4.5.5 Pollution Control

The appropriateness of proposed SuDS for the proposed development has been evaluated based on the CIRIA Report C753 Simple Index Approach. This is based on a simple index system, in which SuDS components and types of sites are assigned an index value for pollutant mitigation/hazard levels. To deliver adequate treatment, the SuDS component should have a total pollution mitigation index equal to or larger than the pollution hazard index. The following table summarises the mitigation indices of the proposed SuDS.

Table 4-3 Mitigation indices of proposed SuDS components

Mitigation indices			
Type of SuDS	TSS	Metals	Hydrocarbons
Swale	0.5	0.6	0.6
Pond	0.7	0.7	0.5
Permeable Paving	0.4	0.4	0.5

These values are then compared to the pollution hazard levels of each type of area within the site to evaluate the adequacy of proposed SuDS.

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Table 4-4 Pollution hazard indices of areas within the proposed development

Pollution hazard level	Total suspended solids	Metals	Hydrocarbons	Proposed mitigation measure	Adequacy
Low	0.5	0.4	0.4	Swales/ Rain Gardens, Permeable Paving and Ponds	√

Due to the multiple levels of treatment the proposed the SuDS are deemed sufficient for treating the pollution hazard level.

4.5.6 Designing for Exceedance

The proposed site levels are mimicking the existing site levels, which means that any exceedance events will follow the existing flow paths to the existing points of discharge. Figure 4-6 below indicates the proposed routes. The main point of discharge in an exceedance event will be into the sea, via the existing RLNI ramp and over the existing sea walls; and towards Marine Road Central as per the current condition. A pump system will be installed in the basement areas to deal with tidal flooding and this system will also deal with any surface water exceedance events that reach the lower site areas.

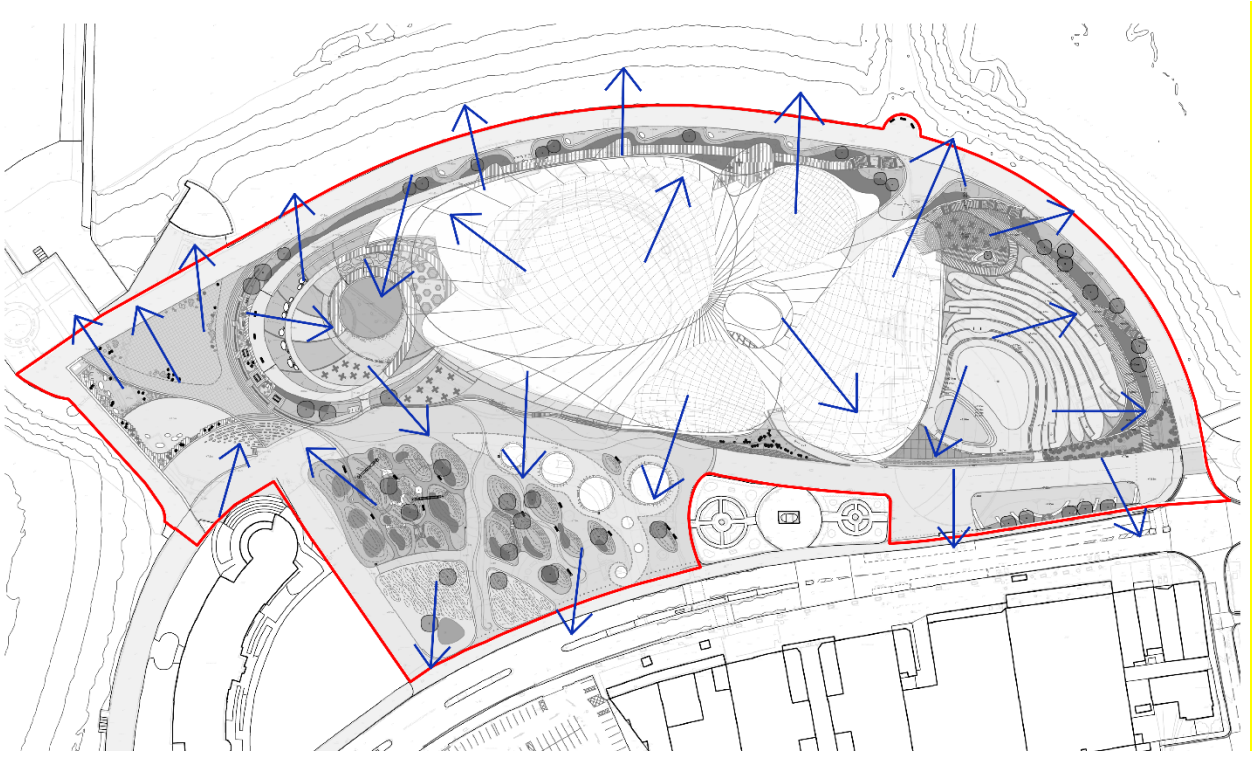


Figure 4.5 Exceedance Flow Routes

4.5.7 SuDS Operation and Maintenance Plan

Regular maintenance of the sustainable drainage system is essential to maintain its performance and avoid failure of the mechanical/electrical components. It is anticipated that the maintenance of the tanks will be undertaken by an experienced contractor, in cases where geo-cellular units are installed the suppliers will normally offer a maintenance contract for periodic inspections and flushing the system to remove any silt and debris that have been collected. A

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similar maintenance agreement is normal with the pumping equipment, with the respective suppliers. An agreed maintenance programme will be prepared in accordance with the SuDS Manual maintenance guidelines and manufacturers recommendations and supervised by either the development's facilities manager or an appointed property management company. This will be included within the Building Manual for the development on completion. An initial maintenance plan is included in Appendix H.

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5 Proposed Foul Water Drainage Strategy

5.1 General

The foul water strategy has been developed in accordance with the United Utilities requirements and Building regulations.

5.2 United Utilities Consultation

A Pre-development enquiry was submitted to United Utilities. United Utilities advised that:

"Foul flow from this site will be allowed to drain into the public foul water/combined sewer system. The proposed foul connection with a maximum pass forward flow of 5 l/s is acceptable to us in principle."

Full correspondence can be found in appendix C.

5.3 Proposed Strategy

The estimated peak discharge rate for foul water has been calculated as 5l/s. This is based on 90% of the potable water discharging to the foul water network with a peak factor of 6. As the existing combined sewer located in Marine Road Central are relatively large (300 and 450 dia. pipes), it is assumed there is sufficient capacity in the pipes for foul water to discharge to the combined network.

The current proposal for the foul water strategy will include internal foul water from the proposed building only. The connection point, located in Marine Road West, and the flow rate has previously been agreed with United Utilities. The foul network will follow the external line of the building before discharging to the agreed connection. The existing manhole has an approximate invert level of 4.00 m AOD, therefore, any foul water from ground floor level (7.72 m AOD) will be conveyed via a gravity system. As the lower ground level is at 4.5 m AOD, a pumped system will be required. The pumping station will be designed to adoptable standards and is proposed to be located on the lower ground floor in the South Plant room.

Once the design progresses, a more accurate foul flow will be calculated based on the proposed MEP requirements. The proposed connection point is shown in Figure 5.1 below, and the proposed foul water schematic drawing can be found in Appendix F.

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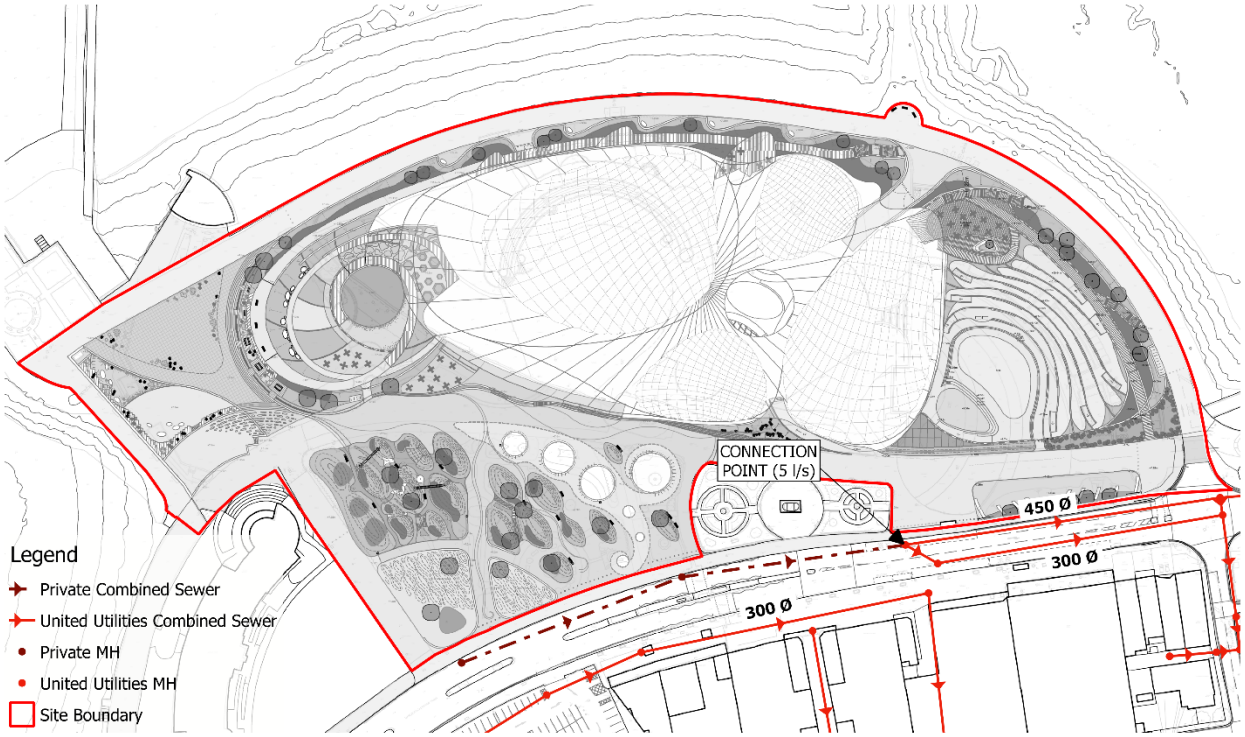


Figure 5.1 Agreed Foul Connection Point

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Appendix A Topographic Survey

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N

Note:

The survey is plotted on a plane local Grid. Orientation to National Grid.

All levels relate to Ordnance Datum, achieved using the OS National GPS Network.

Survey Control Markers established for Mapping purposes only and should not be used for Construction without the written approval of Survey Operations Ltd.

All drainage information must be verified with local authority records before use.

All drainage information added from CCTV survey.

SurveY OPERATIONS
Smith Street, Skelmersdale, Lancs. WN8 8LN
Tel: 01695 725662 Fax: 01695 51816
Email: mail@survops.co.uk — www.survops.co.uk

Client: Buro Happold Limited

Drawing Title: CCTV Drainage Survey of Land at:
Marine Road Central
Morecambe

Scale(s)	1:200	Surveyor	SO
Date	JUL 21	Drawn	IT
Job Number	21D107	Checked	SO

Sheet Size & Drg Number & Revision: A0 21D107/001



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N

Note:
The survey is plotted on a plane local Grid. Orientation to National Grid.
All levels relate to Ordnance Datum, achieved using the OS National GPS Network.
Survey Control Markers established for Mapping purposes only and should not be used for Construction without the written approval of Survey Operations Ltd.

All drainage information must be verified with local authority records before use.

All drainage information added from CCTV survey.

SurveY OPERATIONS
Smith Street, Skelmersdale, Lancs. WN8 8LN
Tel: 01695 725662 Fax: 01695 51816
Email: mail@survops.co.uk – www.survops.co.uk

Client
Buro Happold Limited

Drawing Title
CCTV Drainage Survey of Land at:
Marine Road Central
Morecambe

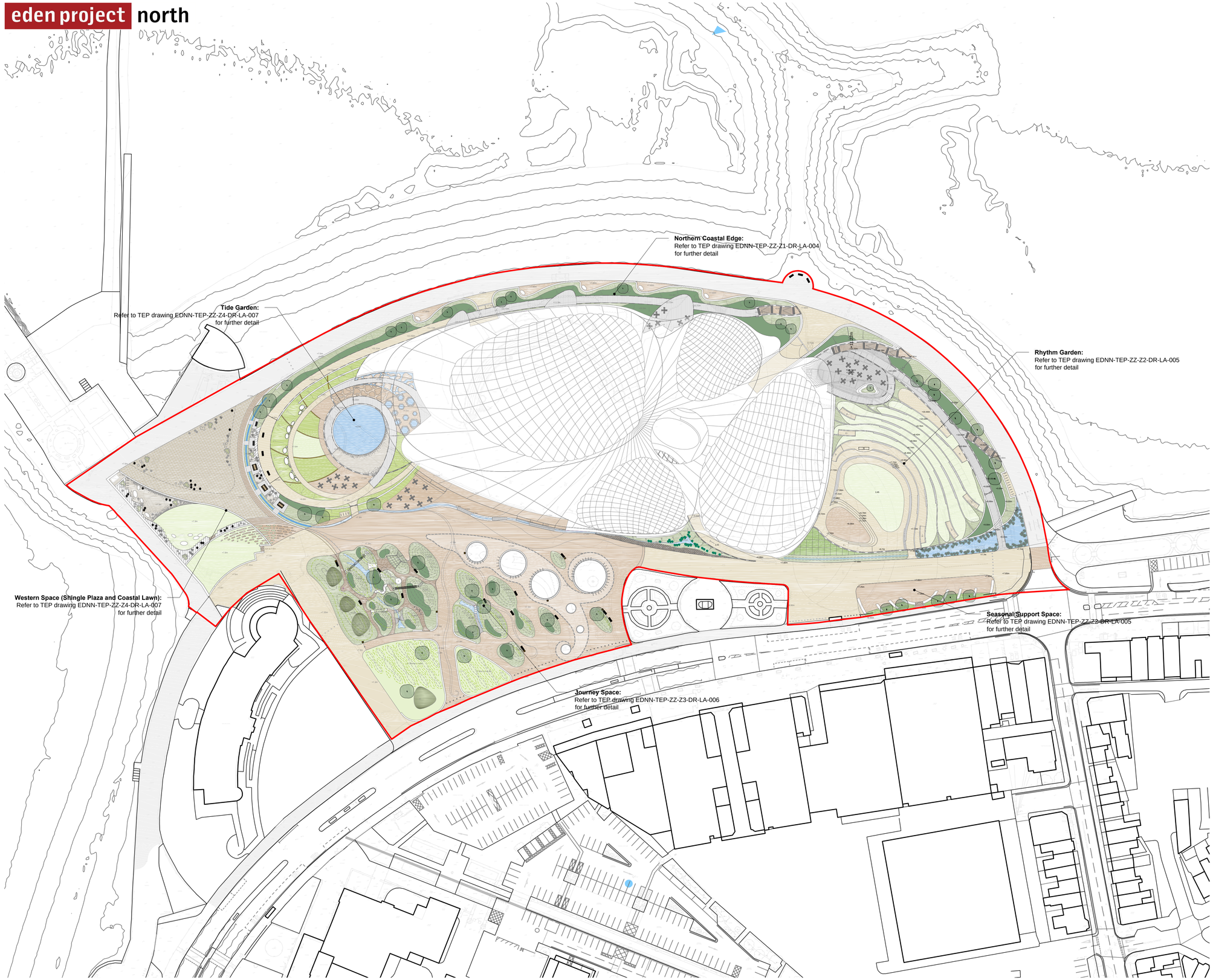
Scale(s)	1:200	Surveyor	SO
Date	JUL 21	Drawn	IT
Job Number	21D107	Checked	SO

Sheet Size & Drg Number & Revision
A0 21D107/002

Appendix B Proposed Scheme

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eden project north



Key

Existing

- Trees to be retained
- Existing surfacing to be retained
- Old sea wall

Proposed

- Mown / low growing grassland
- Tall grassland
- Mixed coastal planting (native and ornamental)
- Shrubs
- Shingle gravel planting
- Rain garden planting
- Tree planting
- Water
- Water with marginal planting
- Natural stone paving
- Buff coloured asphalt
- Buff self-binding gravel
- Hardwood timber decking with bauxite resin strips
- Shingle gravel (10-35mm aggregate size) to match shingle colour mix on the beach
- Shingle gravel within a recycled plastic mesh reinforcement system
- Stacked recycled concrete slab and/or natural stone to create low cliff edge: 0.5-2.0m in height
- Steps
- Indicative landform contours
- Indicative slopes
- Hardwood timber picnic table
- Hardwood timber seat
- Pebble seat in timber or polished stone
- Moveable furniture to terraces
- Cycle stands
- Hardwood timber clad litter bin
- Stainless steel fixed bollards (anti-ram specification)
- Stainless steel automated retractable bollards (anti-ram specification)
- Flood protection gates
- Decorative metal gates (2.0m high)
- Balustrade/railings (for further detail refer to TEP Drawing: EDNN-TEP-ZZ-ZZ-DR-LA-009)
- 3.0m high sea foam canopy shelter
- 5.0m high energy pods with cycle stands integrated into the edge

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Rev	Description	Drawn	App	Date

TEP | THE ENVIRONMENT PARTNERSHIP

Genesis Centre, Birchwood Science Park, Warrington WA3 7BH
Tel 01925 844004 e-mail tep@tep.uk.com www.tep.uk.com

Project no.	Project name
8723	Eden Project North

Status
INFORMATION Draft 24/08/21

Title
Landscape General Arrangement

Drawing no.
EDNN-TEP-ZZ-ZZ-DR-L-001

Scale	Date	Rev
1:750@A1	25/06/2021	P01

Drawn	Checked	Approved
CAH/AJG	GDA	GDA

Appendix C Correspondence

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From: Dunderdale, Chris <Chris.Dunderdale@lancashire.gov.uk>
Sent: 18 August 2021 08:54
To: Paige Bryce
Cc: Colin Byrne; Paul Thomson; Stefan Gandler; Les Johnson (Engineer); P047775 P-Eden North - Pre Feasibility
Subject: RE: Eden Project North - Pre App Meeting

Follow Up Flag: Follow up
Flag Status: Flagged

****External Email. This email originated from outside Buro Happold.****

Good morning Paige,

Please accept my apologies for the delayed response, I've just returned leave.

Our deadline for returning the pre-application response is 24 August 2021, though I'll try and get our comments back to you sooner if I can.

With regard to your drainage options, a new 'greenfield' connection to the on-site culvert would be acceptable in principle, though you'd need to check there's sufficient capacity within the culvert to accept the additional runoff volumes without any backing up or flooding – this is to comply with the requirements of the NPPF, i.e. no increased risk of flooding on or off site. If an existing connection to the on-site culvert is found, then we'd have no objection to you discharging to the culvert at the existing brownfield runoff rates and volumes, provided you follow one of the methodologies set out in section 24.5 of the CIRIA SuDS Manual 2015 – I'll add more on this in my pre-application response. If it's possible to dispose of surface water via infiltration (i.e. soakaways), then that would be our preferred option in line with the drainage hierarchy established under the PPG. For this, you'd need to work through an appropriate assessment carried out under Building Research Establishment (BRE) Digest 365 to confirm the relevant infiltration rates.

With regard to your planning application, I've no problem with you including two drainage options within your outline drainage strategy, subject to the final details being confirmed prior to the commencement of the development – I'm satisfied these details can be secured through a suitably worded pre-commencement planning condition if required. It might be worth checking with Lancaster City Council though just to make sure it meets their expectations and validation checklist.

Many thanks,

Chris

Chris Dunderdale
Senior Flood Risk Officer
Highways and Transport
Lancashire County Council
T: 01772 534593
W: www.lancashire.gov.uk

From: Paige Bryce <Paige.Bryce@BuroHappold.com>
Sent: 16 August 2021 12:39

To: Dunderdale, Chris <Chris.Dunderdale@lancashire.gov.uk>
Cc: Colin Byrne <Colin.Byrne@BuroHappold.com>; Paul Thomson <Paul.Thomson@BuroHappold.com>; Stefan Gandler <Stefan.Gandler@BuroHappold.com>; Les Johnson (Engineer) <Les.Johnson@BuroHappold.com>; P047775 P-Eden North - Pre Feasibility <047775@burohappold.onmicrosoft.com>
Subject: RE: Eden Project North - Pre App Meeting

Hi Chris,

Are you able to provide a response to the below please.

Thanks.

Kind regards,
Paige

Paige Bryce
Graduate Engineer
Buro Happold | Cities Infrastructure Leeds
T: +44 (0)113 2042200
www.burohappold.com | Twitter | Instagram

BURO HAPPOLD

From: Paige Bryce
Sent: 02 August 2021 15:39
To: chris.dunderdale@lancashire.gov.uk
Cc: Colin Byrne <Colin.Byrne@BuroHappold.com>; Paul Thomson <Paul.Thomson@BuroHappold.com>; Stefan Gandler <Stefan.Gandler@BuroHappold.com>; Les Johnson (Engineer) <Les.Johnson@BuroHappold.com>; P047775 P-Eden North - Pre Feasibility <047775@burohappold.onmicrosoft.com>
Subject: Eden Project North - Pre App Meeting

Hi Chris,

Hope you are well.

Following on from last week pre app meeting, I had noted that you would circulate a note of what we discussed in the meeting, do you know when this will likely be circulated?

For the proposed drainage strategy we have been progressing with our investigation to understand what discharges to the existing culvert as discussed in the meeting. We had a CCTV survey of the culvert undertaken however the northern section of the culvert just before the sea wall was submerged and the surveyors were unable to pass this point. From the CCTV survey information we have it shows no existing connections from the site. We hope to get the surveyors out again asap to try and survey the remaining part to understand if there are any connections at all or if we are looking at proposing a new connection using greenfield discharge rate to the culvert. As it is not clear what the existing drainage strategy on site is, we have also been in contact with the council to understand if they have any archive information on the sites current drainage strategy. We have received some historic information from the council that indicates the site could be drained to two soakaway manholes located in the rock armour. We are currently trying to organise a survey on these soakaway manholes to understand more about them as well.

As such, we now have two potential options for the surface water strategy, both with unknowns at this stage:

- Option 1 – discharge to the culvert (at a greenfield run off rate unless a connection is found in the area not yet surveyed, if a connection is found will the brownfield rate be acceptable?)
- Option 2 – discharge to the existing soakaways (at an existing discharge rate)

For the planning application, our drainage strategy report will include the two strategies as we don't have all the information currently to discard one, when we have more clarity we will discard one and continue with the most appropriate strategy.

If you have any issues or comments on this, please let me know.

Thanks.

Kind regards,
Paige

Paige Bryce
Graduate Engineer
Buro Happold | Cities Infrastructure Leeds
T: +44 (0)113 2042200
www.burohappold.com | Twitter | Instagram

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From:	Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Sent:	14 September 2020 09:54
To:	Paige Bryce
Cc:	Wastewater Developer Services
Subject:	FW: MORECAMBE LEISURE PARK MARINE ROAD CENTRAL, MORECAMBE (GRID REF: 342953, 464484) - UU Ref: 4200033086

**** External Email ****

Good morning Paige

MORECAMBE LEISURE PARK MARINE ROAD CENTRAL, MORECAMBE (GRID REF: 342953, 464484)
UU Ref: 4200033086

We have carried out an assessment of your application which is based on the information provided. This pre-development advice on your drainage strategy will be valid for 12 months. Your drainage strategy will need to be reviewed by other competent authorities as part of the planning process, and we advise that you carry out the necessary site investigations to confirm the viability of your proposals.

If your investigations require access to our public sewer network, we ask that you contact our network engineers with a request for an access certificate via our main contact telephone number 0345 3723223 or refer to the link below:
https://www.unitedutilities.com/builders-developers/working-near-our-assets/

Foul Water
Foul flow from this site will be allowed to drain into the public foul water/combined sewer system. The proposed foul connecton with a maximum pass forward flow of 5 l/s is acceptable to us in principle.
If you are able to identify an alternative, more suitable point of discharge in the future, we request that you contact us at your earliest convenience so that we can assess suitability.

Surface Water
All surface water flow from the proposed development should drain in-line with the drainage hierarchy, as outlined in Paragraph 80, (Reference ID: 7-080-20150323), of the National Planning Practice Guidance. We also recommend you prioritise the use of multi-functional sustainable drainage systems for the management of surface water in accordance with national planning policy.

Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable.
This is outlined as follows, in order of priority:

1. **into the ground (infiltration);**
2. **to a surface waterbody;**
3. **to a surface water sewer or highway drain;**
4. **to a combined sewer.**

For guidance, The North West SuDS Pro-Forma provides information on the appropriate evidence required at each stage of the hierarchy, to demonstrate how each level has been discounted.

The Lead Local Flood Authority has responsibility for all surface water drainage concerns and their input to your proposal is critical. You should also consider whether it is necessary to discuss your proposal with the Environment Agency, or Internal Drainage Board (if operating in your area).

The Local Planning Authority are the determining authority for any application for planning permission and the appropriate authority for determining cost viability of a proposed drainage scheme, such assessments are outside of the jurisdiction of United Utilities.

- **Waterbody**

The culverted watercourse that crosses the site is not a United Utilities Asset and contact should be made with the riparian owner who is responsible for the watercourse.
If an evidence based assessment has been carried out and confirms that infiltration is not feasible, we recommend that you contact the Lead Local Flood Authority and/or Environment Agency to discuss a point of discharge to the culverted watercrossing crossing the site for approval.
We would encourage you to identify and engage with any third party landowner and riparian owner to agree access and discharge rights to the water body if this is not in your ownership.

Levels
For low-lying sites, (where the ground level of the site or the level of a basement is below the ground level at the point where the drainage connects to the public sewer), care should be taken to ensure that the property is not at increased risk of flooding. If these circumstances exist, we recommend that you contact us to discuss further. It could affect the detailed design of your site and result in the need to incorporate appropriate mitigating measures in your drainage scheme.

Connection Application
Although we may discuss and agree discharge points and rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below:
https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-connections/
We recommend that the detailed design should confirm the locations of all utilities in the area and ensure that any proposed drainage solution considers routing and clash checks where required.

Sewer Map
United Utilities offer a fully supported mapping service at a modest cost for our water mains and sewerage assets. This is a service, which is constantly updated by our Property Searches Team (Tel No: 0870 7510101) and I recommend that the applicant give early consideration in project design as it is better value than traditional methods of data gathering. It is, however, the applicant's responsibility to demonstrate the exact relationship on site between any assets that may cross the site and any proposed development.

If we can be of any further assistance please don't hesitate to contact us further.

Many thanks.

Kind regards,

United Utilities
Water for the North West

Josephine Wong
Wastewater Developer Engineer
Developer Services & Metering
Customer Services
M: 07880308880 (from 7am to 1pm)
unitedutilities.com

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From: Paige Bryce [mailto:Paige.Bryce@BuroHappold.com]
Sent: 03 September 2020 17:11
To: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: RE: MORECAMBE LEISURE PARK MARINE ROAD CENTRAL, MORECAMBE (GRID REF: 342953, 464484) - UU Ref: 4200033086

I got a bounce back on the below due to file size. I have created a We Transfer link : https://we.tl/t-hXcNzQD5W1

Let me know if you have any issues.

Kind regards,
Paige

Paige Bryce
Graduate Engineer
Buro Happold | Cities Infrastructure Leeds
T: +44 (0)113 2042200
www.burohappold.com | Twitter | Instagram

BURO HAPPOLD

From: Paige Bryce
Sent: 03 September 2020 16:59
To: Wastewater Developer Services
Subject: RE: MORECAMBE LEISURE PARK MARINE ROAD CENTRAL, MORECAMBE (GRID REF: 342953, 464484) - UU Ref: 4200033086

Hi Josephine,

With regards to the below:

1. Architects plan attached.
2. I have attached a current utility plans. The information is based on asset record plans from the utility providers.
3. Architects plan attached.
4. Peak daily visitors, 3750. Expected annual visitors, 950000.
5. I have attached the proposed connection point for SW which we would look to have a discharge rate of 530l/s (50% reduction on current existing run off rate). For FW I have also attached a proposed connection point. The 5l/s discharge rate has been calculated as 90% of potable water demand, I've included the quick calc below.
6. Modified Rational Method calc attached. Foul calc below.

*(Peak no. of vistors * benchmark l/person/day) = total l/day*
*(l/day / 24*3600) = total l/s*
(Total l/s 0 .9) = foul l/s*
*(Foul l/s *peak factor)=peak foul l/s*

*(3750*20) =75000 l/day*
*(75000 / 24*3600) = 0.868 l/s*
*(0.868 *0.9) = 0.781 l/s*
*(0.781 * 6) = 4.688 l/s*

If you require any further information please let me know.

Kind regards,
Paige

Paige Bryce
Graduate Engineer
Buro Happold | Cities Infrastructure Leeds
T: +44 (0)113 2042200
www.burohappold.com | Twitter | Instagram

BURO HAPPOLD

From: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Sent: 20 August 2020 12:54
To: Paige Bryce <Paige.Bryce@BuroHappold.com>
Cc: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: MORECAMBE LEISURE PARK MARINE ROAD CENTRAL, MORECAMBE (GRID REF: 342953, 464484) - UU Ref: 4200033086

**** External Email ****

Good afternoon, Paige

MORECAMBE LEISURE PARK MARINE ROAD CENTRAL, MORECAMBE (GRID REF: 342953, 464484)
UU Ref: 4200033086

Thanks for your email.

Due to the scale and complexity of the development, it is not clear whether the existing drainage can accommodate this development.
Therefore, please submit the following for our assessment:

1. The master plan and the phasing plan
2. The existing utilities survey plan showing the site boundary
3. The proposed site layout plan
4. The expected growth of population and numbers of visitors
5. The high level of proposal surface water and foul water drainage Strategy showing the proposed connection points
6. The full calculation

Should you have any query, please feel free to contact me.

Many thanks.

Kind regards,

United Utilities
Water for the North West

Josephine Wong
Wastewater Developer Engineer
Developer Services & Metering
Customer Services
M: 07880308880 (from 7am to 1pm)
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From: Paige Bryce [mailto:Paige.Bryce@BuroHappold.com]
Sent: 14 August 2020 17:04
To: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: Pre-Development Enquiry, Morecambe

Good afternoon,

Please find attached the Pre Development Enquiry form for the site based at Morecambe leisure park, Morecambe. I have attached the site boundary and a location map for reference.

Please let me know if you require any further information.

Kind regards,
Paige

Paige Bryce
Graduate Engineer
Buro Happold | Cities Infrastructure Leeds
T: +44 (0)113 2042200
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Appendix D Historic Soakaway Manhole Information

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CLASS B ENGINEERING BRICKWORK
4 COURSES MAX.
2 COURSES MIN.

600x600 MANHOLE COVER AND FRAME
BEDDED ON CLASS M1 OR M2 MORTAR

150mm. THICK HEAVY DUTY REINFORCED
CONCRETE COVER SLAB (B.S.5911)
BEDDED WITH CLASS M1 OR M2 MORTAR
OR MASTIC SEALANT

600

C20 CONCRETE SURROUND
150mm. THICK

900 DIA PRECAST CONCRETE
SHAFT SECTIONS

HEAVY DUTY REINFORCED CONCRETE
REDUCING SLAB.

1200 DIA PRECAST CONCRETE
CHAMBER SECTIONS ABOVE SOAKAWAYS.
WITH C20 CONCRETE SURROUND.

3No 1200 DIA PRECAST
CONCRETE SOAKAWAY SECTIONS
TOTAL HEIGHT FROM BASE 2700.

INSERT NEW PLASTIC PIPE AND
CAULKING TO FORM NEW CONNECTION

PIPEWORK TO SUIT EXISTING.
150 CONCRETE SURROUND.

SIMON-HARTLEY 'COPLASTIX'
CIRCULAR FLAP VALVE
OR SIMILAR APPROVED

LADDER (BS 4211) DIST
FROM WALL 200mm.
MAX. 675mm FROM COVER
LEVEL TO FIRST LADDER RUNG
MATERIALS TO BE GRADE 316 S16
STAINLESS STEEL TO BS 970 PART 4.
REFER TO DRG No 7444-40.

C20 CONCRETE SURROUND
TO SOAKAWAYS, WITH VOIDS
THRO AT PERFORATIONS

300 THICK BASE SLAB
C20 CONCRETE

300 SUB-BASE WRAPPED IN
TERRAM 2000 OR SIMILAR

ORIGINAL BEACH LEVEL

MANHOLES B1 AND B2
1:20

CONSTRUCTION DETAILS:
1m WELL COMPACTED 'CORE A' STONE ON
'TERRAM 1500' GEOTEXTILE ON
EXISTING BEACH.

RAMP DOWN TO -2.00

WIDTH 7m. LENGTH 100m

-3
-2
-1
0
1
2

N

TIE-IN WITH EXISTING FEATURE
TO BE AGREED ON SITE.

COBBLE/BOULDER BEACH

A

A

MANHOLE B2
SEE DETAIL.
POSITION TO BE ESTABLISHED
ON SITE.

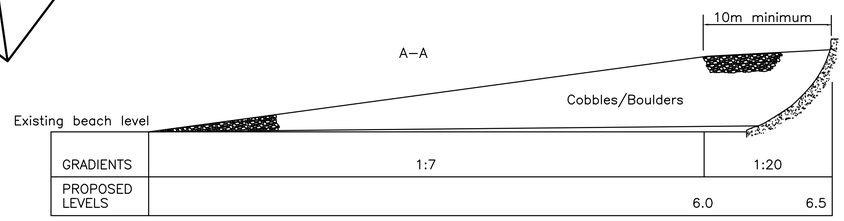
COBBLE BEACH TO RUN
INTO BREAKWATER

BUBBLES COMPLEX

MANHOLE B1
SEE DETAIL.
POSITION TO BE ESTABLISHED
ON SITE.

STONE JETTY

A-A



DRAWING No. 7444-26B

NOTES

1. ALL CONCRETE (INC PRECAST) TO BE SULPHATE RESISTANT.

REVISIONS

A. OCT 94. RAMP ADDED.
B. DEC 94. MANHOLE DETAILS ADDED.

PROJECT

COASTAL WORKS PHASE IV

DRAWING

BUBBLES COBBLE BEACH PLAN AND SECTIONS

LANCASTER CITY COUNCIL

ENGINEERING SERVICES

A.WRIGLEY B.Eng.,C.Eng.,M.I.C.E.
CHIEF ENGINEER
TOWN HALL
MORECAMBE
LA4 5AF
TEL. (0524) 582000

DISTRICT PROJECT GROUP

SCALE	PLAN 1:500 SECTION 1:250
DRAWN	CHECKED
DATE	DATE

IN ASSOCIATION WITH
SHORELINE MANAGEMENT PARTNERSHIP

DRAWING No. 7444-26B

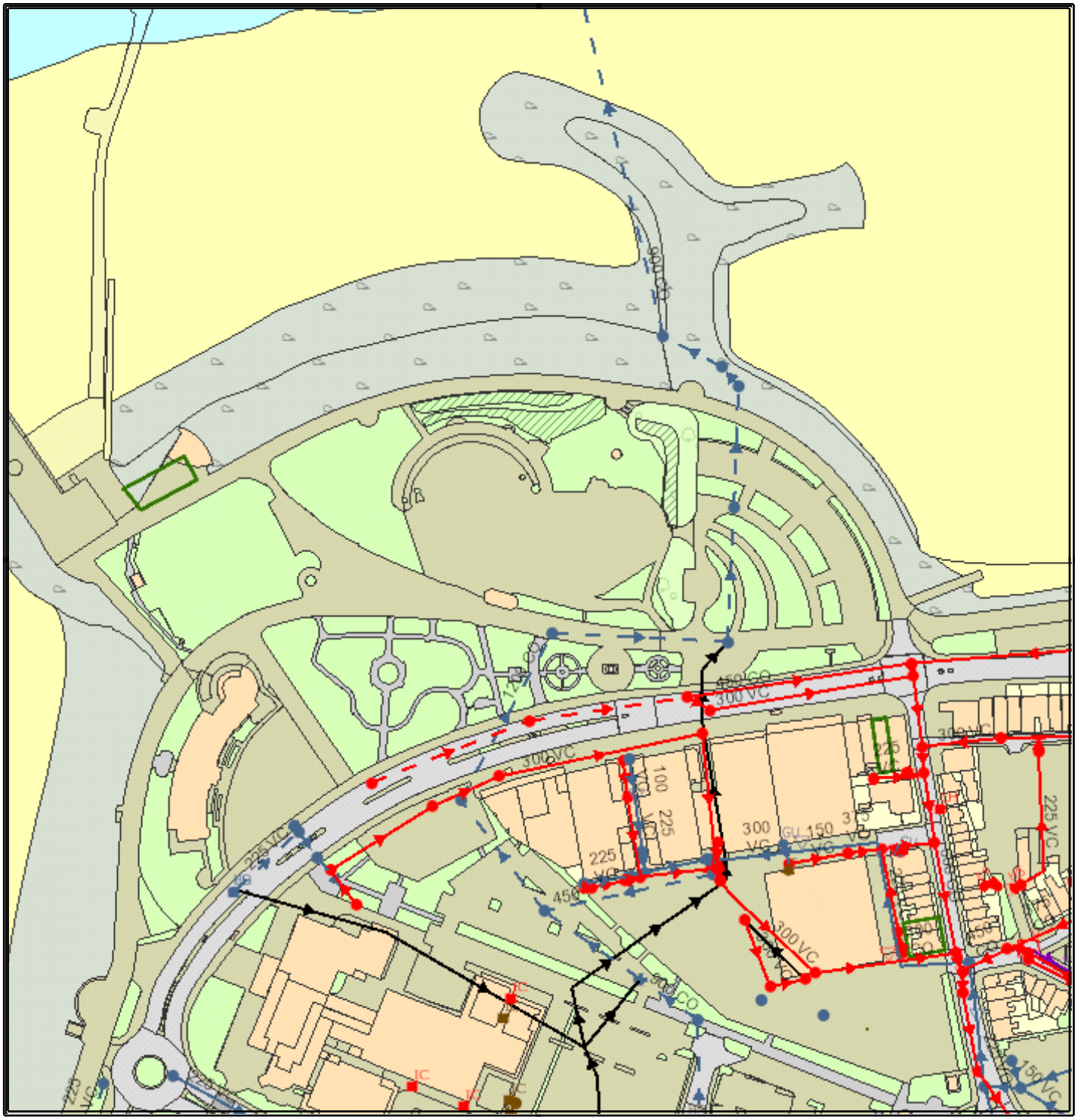
Appendix E United Utilities Asset Plan

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United Utilities

COMMERCIALDW
DRAINAGE AND WATER ENQUIRY

SEWER RECORD AREA EDGED RED LAND AT MORECAMBE LEISURE PARK MARINE ROAD CENTRAL MORECAMBE

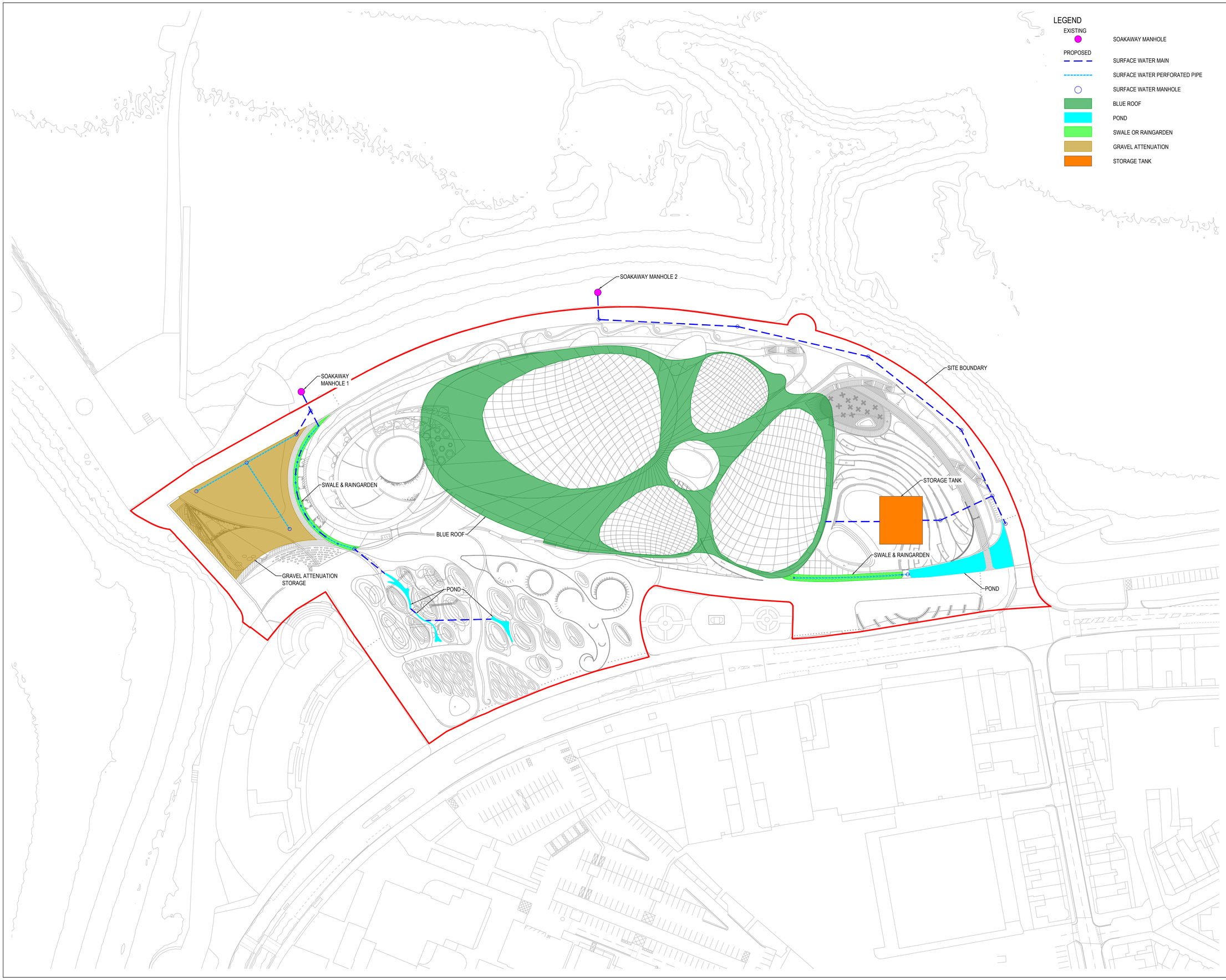


The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. The actual positions may be different from those shown on the plan and private pipes, sewers or drains may not be recorded. United Utilities Water Limited will not accept any liability for any damage caused by the actual positions being different from those shown.

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Appendix F Proposed Drainage Layout

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LEGEND

EXISTING

- SOAKAWAY MANHOLE

PROPOSED

- SURFACE WATER MAIN
- SURFACE WATER PERFORATED PIPE
- SURFACE WATER MANHOLE
- BLUE ROOF
- POND
- SWALE OR RAINGARDEN
- GRAVEL ATTENUATION
- STORAGE TANK

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MAINTENANCE/CLEANING/OPERATION.

DECOMMISSIONING/DEMOLITION.

Rev.	Description	Date	Iss'd	Rev'd	App'd
B	FOR PLANNING	25/08/2021	SG	CB	CB
A	FOR PLANNING	20/08/2021	SG	CB	CB

PLANNING

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FOR INFORMATION

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Architect *GRIMSHAW*

Project **EDEN PROJECT NORTH**

Drg Title SURFACE WATER DRAINAGE - OPTION 1

Job No. 0047775

Scale@A1 1:750

Drawn/Designed By. SG

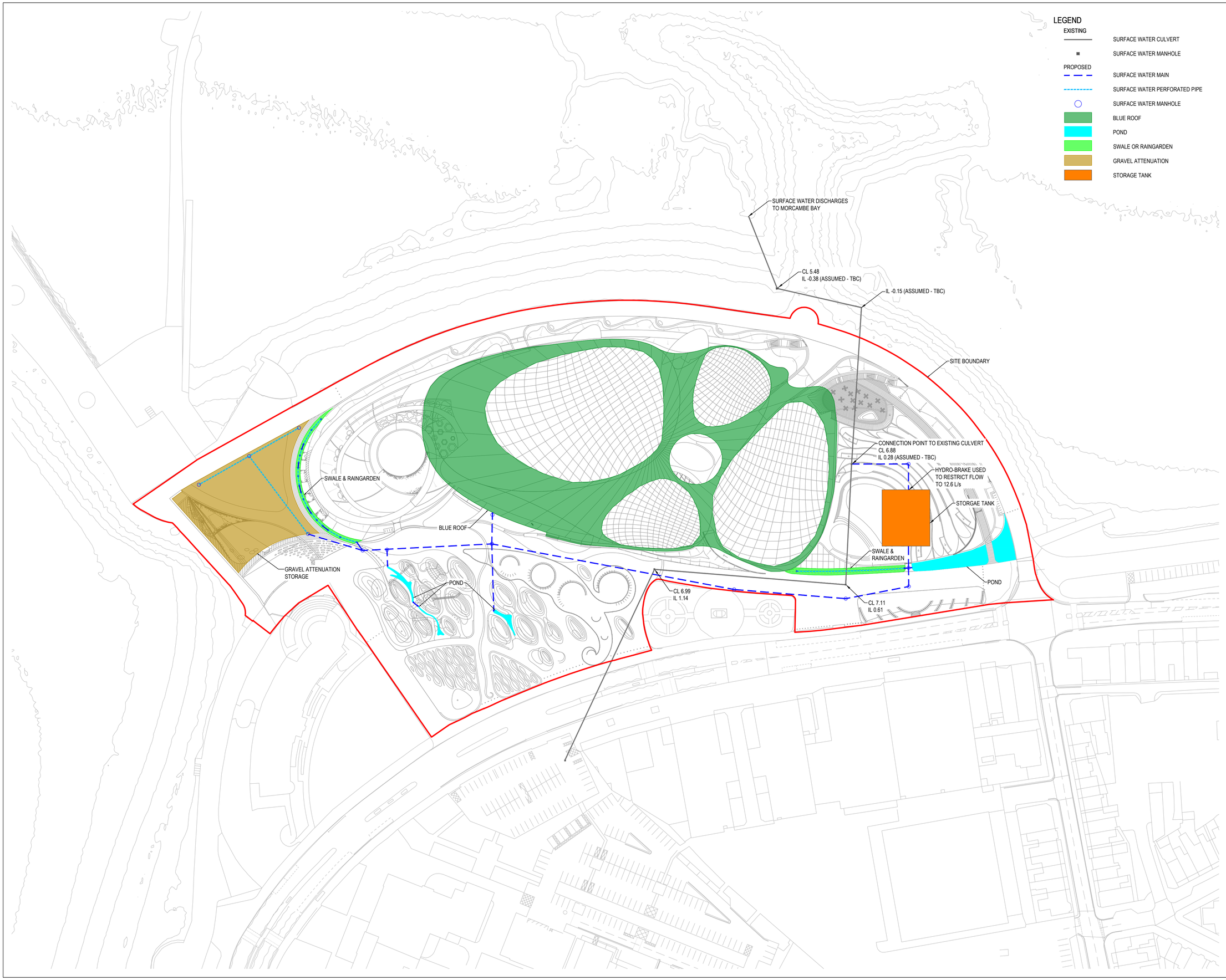
Checked By. CB

Approved By. CB

Drawing No. EDNN-BHE-XX-XX-DR-C-3000

Revision B

Stefan Gandler P:\047775 Eden North - Pre Feasibility (JE,SB Client - Initial)\1_Sheet\EDNN-BHE-XX-XX-DR-C-3000-PROPOSED STORMWATER NETWORK OPTION 1.dwg



LEGEND

EXISTING

- SURFACE WATER CULVERT
- SURFACE WATER MANHOLE

PROPOSED

- SURFACE WATER MAIN
- SURFACE WATER PERFORATED PIPE
- SURFACE WATER MANHOLE
- BLUE ROOF
- POND
- SWALE OR RAINGARDEN
- GRAVEL ATTENUATION
- STORAGE TANK

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B	FOR PLANNING	25/08/2021	SG	CB	CB
A	FOR PLANNING	18/08/2021	SG	CB	CB

PLANNING

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Architect: *GRIMSHAW*

Project: **EDEN PROJECT NORTH**

Drg Title: SURFACE WATER DRAINAGE - OPTION 2

Job No.: 0047775

Scale@A1: 1:750

Drawn/Designed By.: SG

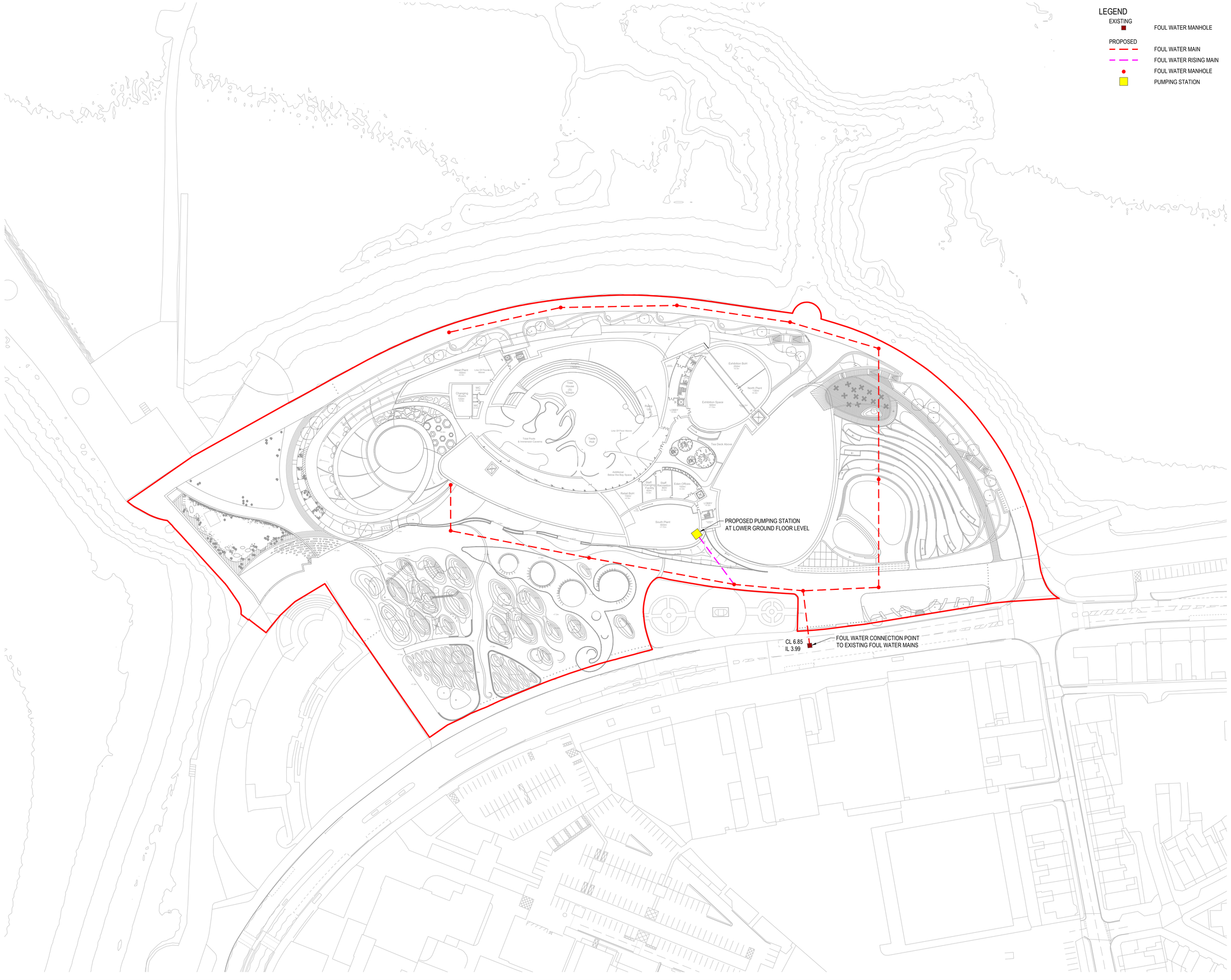
Checked By.: CB

Approved By.: CB

Drawing No.: EDNN-BHE-XX-XX-DR-C-3001

Revision: B

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Rev	Description	Date	Iss'd	Rev'd	App'd
A	FOR PLANNING	20/08/2021	SG	CB	CB

PLANNING

Project Stage

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Architect	*GRIMSHAW*
Project	**EDEN PROJECT NORTH**
Drg Title	FOUL WATER DRAINAGE

Job No.	Scale@A1
0047775	1:750

Drawn/Designed By.	Checked By.	Approved By.
SG	CB	CB

Drawing No.	Revision
EDNN-BHE-XX-XX-DR-C-3002	A

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Appendix G Greenfield Runoff

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Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Paige Bryce
Site name:	Eden North
Site location:	Morecambe

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	54.07220° N
Longitude:	2.87161° W
Reference:	1541074642
Date:	Jun 11 2021 08:17

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 4.575

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	1000	1000
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	12.66	12.66
1 in 1 year (l/s):	11.01	11.01
1 in 30 years (l/s):	21.51	21.51
1 in 100 year (l/s):	26.32	26.32
1 in 200 years (l/s):	29.99	29.99

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

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Appendix H SuDS Maintenance Plan

The table below is based on the CIRIA C753 SuDs Manual, 2015.

SUDS COMPONENTS MAINTENANCE REQUIREMENTS		
SUDS COMPONENT	**Swale**	
MAINTENANCE	**ACTION**	**FREQUENCY**
Regular maintenance	Litter and debris removal	Monthly
	Amenity grass cutting at 35-50mm	As required
	Grass cut to ditch access and overflows 75-100mm not to exceed 150mm	Monthly or as required
	Inspect and clear ditch where required, inlets, outlets and overflows	Monthly
Occasional tasks	Remove leaf accumulation	As required
	Cut back overhanging branches to allow dense vegetation growth	As required
Remedial work	Repair erosion, level uneven surfaces or damage by re-turfing or seeding	As required
	Repair or replace inlets, outlets or check dams to design detail	As required
	Remove silt and spread locally, reinstate surface	As required
SUDS COMPONENT	**Ponds**	
MAINTENANCE	**ACTION**	**FREQUENCY**
Regular maintenance	Remove litter and debris	Monthly
	Cut grass for spillways and access routes	Monthly or as required
	Cut grass – meadow grass in and around basin	Six monthly (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 during first year, then annually or as required
	Check any penstocks or 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 outlet pool where provided	Annually
Occasional tasks	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every two years or as required
	Remove sediments from inlets, outlet, forebay and main basin when required	Every 5 years or as required
Remedial work	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitate inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

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SUDS COMPONENT	Key design standards for adoption inlets, outlets and connections	
MAINTENANCE	**ACTION**	**FREQUENCY**
Regular maintenance	Litter and debris removal	Monthly
	Grass cut 1m around structure at 50mm where necessary	Monthly
	Remove silt from forebays, aprons or other structures if present	Monthly or as required
	Inspect and clear inlets, outlets, control structures and overflows	Monthly or as required
Occasional tasks	Removal of tree or shrub growth within 5m	As required

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