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Flood Risk Assessment for the Proposed Development at Medmerry Park, Stoney Lane, Earnley, Chichester, West Sussex

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1 Background and Scope of Appraisal

Herrington Consulting has been commissioned by Cove Communities Venture 2 Medmerry Ltd to prepare a Flood Risk Assessment (FRA) and Drainage Strategy for the proposed development at **Medmerry Park, Stoney Lane, Earnley, Chichester, West Sussex, PO20 7JP**.

Flooding is a major issue in the United Kingdom. The impacts can be devastating in terms of the cost of repairs, replacement of damaged property and loss of business. The objectives of the Flood Risk Assessment (FRA) are therefore to establish the following:

- whether a proposed development is likely to be affected by current or future flooding from any source.
- whether the development will increase flood risk elsewhere within the floodplain.
- whether the measures proposed to address these effects and risks are appropriate.
- whether the site will pass Part B of the Exception Test (where applicable).

A Flood Risk Assessment (FRA) appraises the risk of flooding to development at a site specific scale, and recommends appropriate mitigation measures to reduce the impact of flooding to both the site and the surrounding area. New development has the potential to increase the risk of flooding to neighbouring sites and properties through increased surface water runoff and as such, an assessment of the proposed site drainage can help to accurately quantify the runoff rates, flow pathways and the potential for infiltration at the site. This assessment considers the practicality of incorporating Sustainable Drainage Systems (SuDS) into the scheme design, with the aim of reducing the risk of flooding by actively managing surface water runoff.

New developments are also required to undertake an assessment to identify how the foul water from the site will be managed. This assessment considers how foul water is expected to be discharged from the proposed development and whether there are any appropriate connection points, such as nearby sewers or treatment plants.

This appraisal has been undertaken in accordance with the requirements of the National Planning Policy Framework (2021) and the National Planning Practice Guidance Suite (August 2022) that has been published by the Department for Communities and Local Government. The *Flood Risk and Coastal Change* planning practice guidance included within the Suite represents the most contemporary technical guidance on preparing FRAs. In addition, reference has also been made to Local Planning Policy.

To ensure that due account is taken of industry best practice, this FRA has been carried out in line with the CIRIA Report C624 'Development and flood risk - guidance for the construction industry' and reference has also been made to, CIRIA Report C753 'The SuDS Manual'.

2 Development Description and Planning Context

2.1 Site Location and Existing Development

The site is located at OS coordinates 481996, 095774, off Stoney Lane in Chichester. Medmerry Park includes 308no. holiday bungalows, support buildings, associated facilities and landscaped areas. The site is bounded by agricultural land to the north, east and north west. Earnley Beach Centre is located to the west of the site and is accessed from Earnley, via Drove Lane, to the entrance to the Park. Stoney Lane runs through the centre of the site.

The location of the site in relation to the surrounding area, watercourses and the English Channel is shown in Figure 2.1.

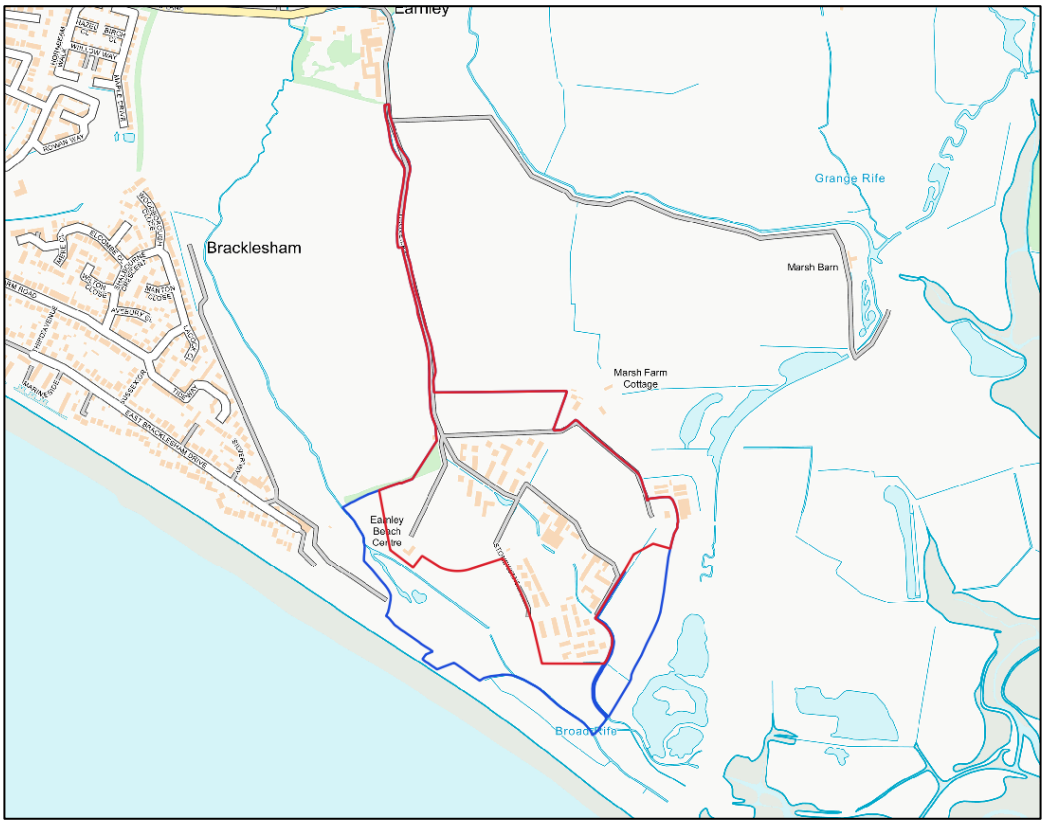


Figure 2.1 – Location map (contains Ordnance Survey data © Crown copyright and database right 2023). Application boundary shown in red, ownership boundary shown in blue.

The site plan included in Appendix A.1 of this report provides more detail in relation to the site location and layout.

2.2 Planning History

In 2019, a hybrid application was submitted on the site (Ref: 19/02840/FULEIA) by the previous applicant. The former application comprised the following:

- A full application for the redevelopment of Medmerry Park to provide 518 static holiday caravans and lodges in lieu of 308 holiday bungalows and associated works, including; drainage, landscaping, habitat enhancement areas, access roads and footpaths. The proposed scheme also included a comprehensive flood defence scheme, including a flood defence bund.

- An outline planning application for the part demolition of the existing facility buildings and erection of replacement facility buildings, together with extension/refurbishment of existing facility buildings (with all matters reserved except for access).

The 2019 application proposed to take a phased approach, with Phase 1 relocating 299 of the existing 308 units to higher ground within the site boundary. Phase 2 proposed the expansion of the park up to the proposed total of 518 units and included the construction of a bund to provide flood defence benefits. Alterations to the Earnley Rife and changes to the land levels across the site also formed part of the application for Phase 2.

The previous application was refused by Chichester District Council (CDC), with one reason related to flood risk, although the response was particularly focussed on Phase 2 of the proposed development, stating the following:

"The proposed expansion of the holiday park (phase 2) would result in a significant number of additional people occupying an area of high flood risk with risks predicted to increase due to climate change. The Local Planning Authority is not satisfied that sufficient wider sustainability benefits to the community could be reasonably secured and relied upon to outweigh the flood risk as required by the Exception Test in line with the National Planning Policy Framework and supported by Planning Practice Guidance."

The proposals for the new application are similar to the proposed Phase 1 development presented in the 2019 application, whereby there is no increase in the number of units. The primary reason for the proposals is to introduce high quality accommodation, which meet current and future visitor expectations.

The proposals represent an opportunity to reduce the risk of flooding by applying the sequential approach to development and introducing mitigation measures to further reduce the risk of flooding (refer to Section 6 of this report). CDC concluded within the delegated report (in relation to the 2019 application) that… *"There are two key phases of this project. Phase 1 is effectively the relocation of existing accommodation into areas of lower flood risk. This is a sequential approach on site which uses the higher areas of land to reduce the flood risks experienced by Park users on this established holiday site (see below for sequential test analysis).* ***This "betterment" is supported by the LPA and its flood risk consultees in principle.****"*

2.3 Proposed Development

This application proposes to redevelop the site by replacing the existing (outdated) 308no. units with 308no. new lodges, all of which will be compliant with building regulations and will utilise the higher land within the site (Figure 2.2). The redevelopment will be undertaken over several phases, with the total number of lodges never exceeding the existing number of 308 units in use at any one time. It is envisaged that the holiday accommodation will operate in the same way as the current operation, with overnight stays only being permitted between 1st March and 6th January each year. Day visits are permitted during the period January 6th to 1st March.

As part of the proposals, the leisure facilities are also to be improved along with site wide landscaping works. Land raising will be undertaken as a flood risk mitigation measure and a series of wetlands will be created to provide storage for the surface water generated by the site and to improve biodiversity across the park. The details of these measures are discussed in greater detail as part of this report.

Figure 2.2 – Proposed site layout

Further drawings of the proposed scheme are included in Appendix A.1 of this report.

2.4 The Sequential Test

The National Planning Policy Framework (NPPF) requires the Sequential Test to be applied at all stages of the planning process and generally the starting point is the Environment Agency's (EA) 'Flood Map for Planning' (Figure 2.3). These maps and the associated information are intended for guidance and cannot provide details for individual properties. They do not take into account other considerations such as existing flood defences, alternative flooding mechanisms and detailed site-based surveys. They do, however, provide high level information on the type and likelihood of flood risk in any particular area of the country. The Flood Zones are classified as follows:

Zone 1 – *Low probability of flooding* – This zone is assessed as having less than a 1 in 1000 annual probability of river or sea flooding in any one year.

Zone 2 – *Medium probability of flooding* – This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding or between 1 in 200 and 1 in 1000 annual probability of sea flooding in any one year.

Zone 3a – *High probability of flooding* - This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding or 1 in 200 or greater annual probability of sea flooding in any one year.

Zone 3b – *The Functional Floodplain* – This zone comprises land where water has to flow or be stored in times of flood and can be defined as land which would flood during an event having an annual probability of 1 in 30 or greater. This zone can also represent areas that are designed to flood in an extreme event as part of a flood alleviation or flood storage scheme.

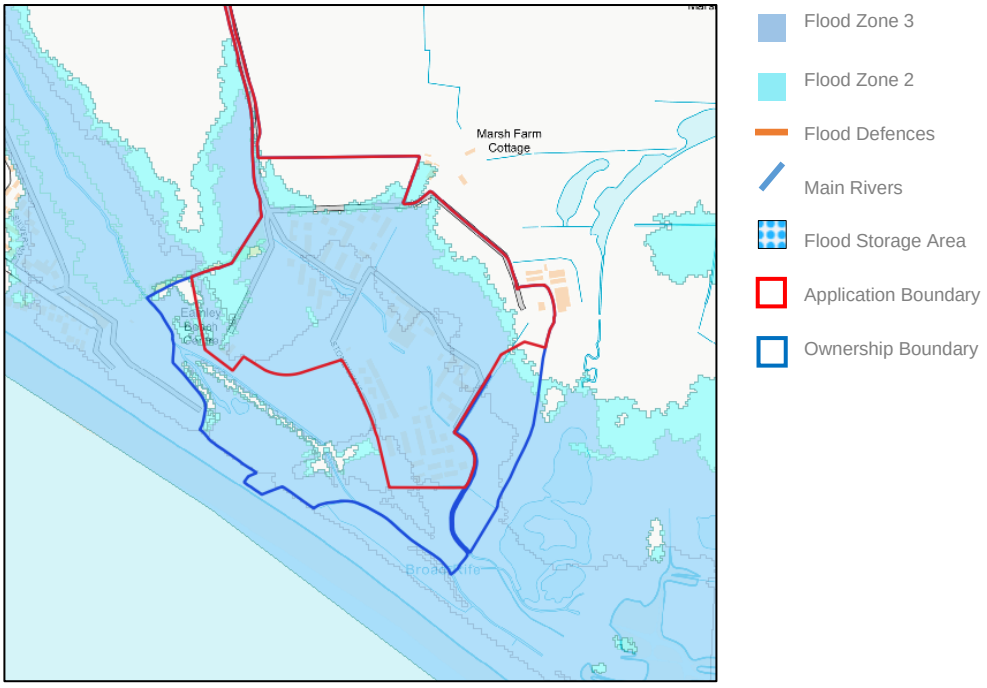


Figure 2.3 – EA's 'Flood Map for Planning' (© Environment Agency - contains Ordnance Survey data © Crown copyright and database right 2023).

Figure 2.3 shows the majority of the development site is located within Flood Zone 3 with some areas located in Flood Zone 1 and 2.

The NPPF states that the Local Planning Authority (LPA) should apply the sequential approach as part of the identification of land for development in areas at risk from flooding. The overarching objective of the Sequential Test is to ensure that lower risk sites are developed before sites in higher risk areas. When applying the Sequential Test, it is also necessary to ensure that the subject site is compared to only those sites that are available for development and are similar in size.

Undertaking the Sequential Test falls outside the scope of the FRA and therefore, has not been undertaken as part of this appraisal. However, a Sequential Test was undertaken as part of the 2019 application (by others), which concluded that the development passed the Sequential Test. CDC also concluded that the proposals passed the Sequential Test, as noted on page 40 of the delegated report.

Whilst a revised Sequential Test has not been undertaken as part of this application, considering the previous 2019 scheme passed the Sequential Test and that application proposed a greater number of units, it is concluded that the new scheme will also meet the requirements. It is considered extremely unlikely that an alternative comparable site will be found that is at lower risk of flooding.

In addition to the above, the proposals seek only to replace the existing units on site and will not introduce any additional residential units to an area at risk of flooding. As such, it is acknowledged that the proposals are simply to replace the existing buildings. As it is not possible to locate these units elsewhere (e.g. offsite), it is considered that there is evidence to suggest that the Sequential Test will be passed if it was to be reapplied.

2.5 The Exception Test

According to the NPPF, if it is not possible, consistent with wider sustainability objectives, for the development to be located in areas at lower risk, the Exception Test may have to be applied. The application of the Exception Test will depend on the type and nature of the development, in line with the Flood Risk vulnerability classification set out in the NPPG. This has been summarised in Table 2.1 below.

Flood Risk Vulnerability Classification	Zone 1	Zone 2	Zone 3a	Zone 3b
Essential Infrastructure – Essential transport infrastructure, strategic utility infrastructure, including electricity generating power stations.	✓	✓	e	e
High Vulnerability – Emergency services, basement dwellings, caravans and mobile homes intended for permanent residential use.	✓	e	×	×
More Vulnerable – Hospitals, residential care homes, buildings used for dwelling houses, halls of residence, pubs, hotels, non-residential uses for health services, nurseries and education.	✓	✓	e	×
Less Vulnerable – Shops, offices, restaurants, general industry, agriculture, sewerage treatment plants.	✓	✓	✓	×
Water Compatible Development – Flood control infrastructure, sewerage infrastructure, docks, marinas, ship building, water-based recreation etc.	✓	✓	✓	✓

Key :

✓ Development is appropriate

× Development should not be permitted

e Exception Test required

Shaded cell represents the classification of this development

Table 2.1 - Flood risk vulnerability and flood zone incompatibility.

From Table 2.1 above it can be seen that the development falls into a classification that requires the Exception Test to be applied. For the Exception Test to be passed it should be demonstrated that:

A. *the development would provide wider sustainability benefits to the community that outweigh the flood risk; and*

B. *the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*

Both parts of the test will have to be passed for development to be allocated or permitted.

Demonstrating that the development provides wider sustainability benefits to the community that outweigh flood risk is outside the scope of this report. Nevertheless, reference is made to the SFRA to establish the key risks associated with flooding and to help demonstrate that this objective can be achieved. The key focus of this FRA is therefore to establish whether the site is likely to pass Part B of the Exception Test.

3 Definition of Flood Hazard

3.1 Site Specific Information

Information from a wide range of sources has been referenced to appraise the true risk of flooding at this location. This section summarises the additional information collected as part of this FRA.

Herrington Consulting Limited (HCL) Numerical Flood Modelling – To facilitate a detailed assessment of the risk of flooding to the site, HCL has undertaken both tidal and pluvial numerical modelling. The results of this modelling are referenced throughout this document and separate technical notes describing the methodology have been prepared to accompany this report (Appendix 8.2 and 8.3 of the Environmental Statement).

Information contained within the SFRA – The interim Chichester District Council SFRA (2022) contains detailed mapping showing the historic extent of flooding from a wide range of sources. This document has been referenced as part of this site-specific FRA.

Information provided by Local Authority – CDC were contacted to obtain pre-application advice in September 2022. The information provided within the response has been considered as the scheme has been refined.

Information provided by Southern Water – Southern Water has provided the results of an asset location search for the site. The response is included in Appendix A.2.

Site specific topographic surveys – A topographic survey of the site was undertaken in March 2023 by RPS. A second topographic survey of the area surrounding the site, including the dimensions of the key watercourses and hydraulic structures was undertaken by Meridian Survey in 2019. A copy of these surveys is included in Appendix A.2.

Reference to the site-specific topographic survey identifies that the land levels across the site vary between 1.6m and 4.2m Above Ordnance Datum Newlyn (AODN). Land levels fall across the site towards the Park Rife (watercourse), which flows through the centre of the Park.

Geology – Reference to the British Geological Survey map shows that the underlying solid geology in the location of the subject site comprises ‘Earnley Sand Formation’ (sand, clay and silt) with ‘Wittering Formation’ (sand, silt and clay) underlying the northern part of the site.

Overlying the bedrock geology are superficial deposits of ‘River Terrace deposits’ (sand, silt and clay), ‘raised beach deposits’ (sand and gravel) and ‘raised marine deposits’ (clay, silt, sand and gravel). The geological make up is delineated in Figure 3.1 below.

Site investigations were undertaken in 2019 by Enzygo Environmental Consultants including infiltration testing and groundwater monitoring. The findings of the investigations can be found in Appendix A.3 of this report.

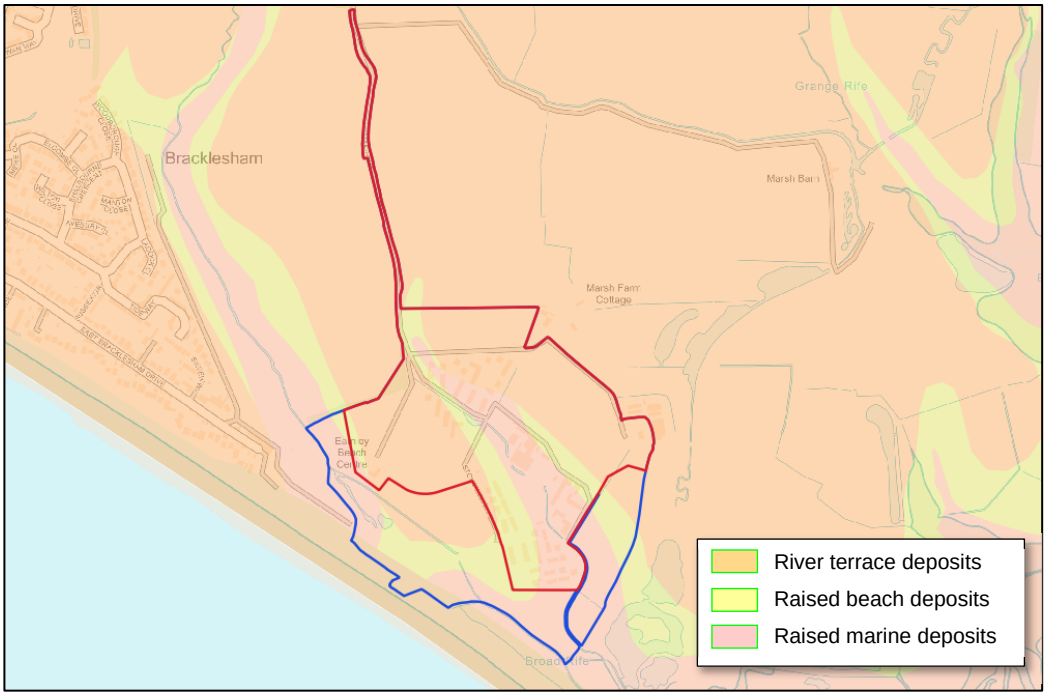


Figure 3.1 – Geology map showing the superficial deposits on the site (© British Geological Survey, mapping contains Ordnance Survey Data © Crown copyright and database right 2023).

Historic flooding – Information provided as part of the CDC SFRA identifies that there are historic records of flooding at the site, however, the source of flooding is unknown.

Further interrogation of the 'West Sussex County Council Report on June 2012 Flood Event' suggests that the historic records presented in the SFRA may have been a result of an extreme rainfall event with a return period equal to, or greater than, 1 in 200 years, which occurred in June 2012.

Correspondence with the EA has confirmed that they hold no historic records of flooding from a main river or the sea at the site. However, following a review of the documentation prepared for a previous application, it is evident that flooding was experienced at the site as a result of a sluice gate being closed (by an external party) at the south eastern corner of the application site.

3.2 Potential Sources of Flooding

The main sources of flooding have been assessed as part of this appraisal. The specific issues relating to each one and its impact on this development are discussed below. Table 3.1 at the end of this section summarises the risks associated with each of the sources of flooding.

Flooding from Surface Water – Surface water, or overland flooding, typically occurs in natural valley bottoms as normally dry areas become covered in flowing water and in low spots where water may pond. This mechanism of flooding can occur almost anywhere but is likely to be of particular concern in any topographical low spot, or where the pathway for runoff is restricted by terrain or man-made obstructions.

The EA's 'Flood Risk from Surface Water' map (Figure 3.2) shows that the majority of the site is shown to be at 'very low' risk of flooding from surface water. It is only areas in close proximity to the Park Rife, which flows through the centre of the site, which are shown to be at risk of surface water flooding. However, it is recognised that the surface water flood mapping does not take into consideration the influence of the Park Rife, which would intercept surface water and transport water through the Park. Consequently, in order to more accurately quantify the risk of flooding from this source, a pluvial numerical flood model has been constructed by HCL. The risk of flooding from surface water has therefore been appraised and is discussed in more detail in Section 5 of this report.

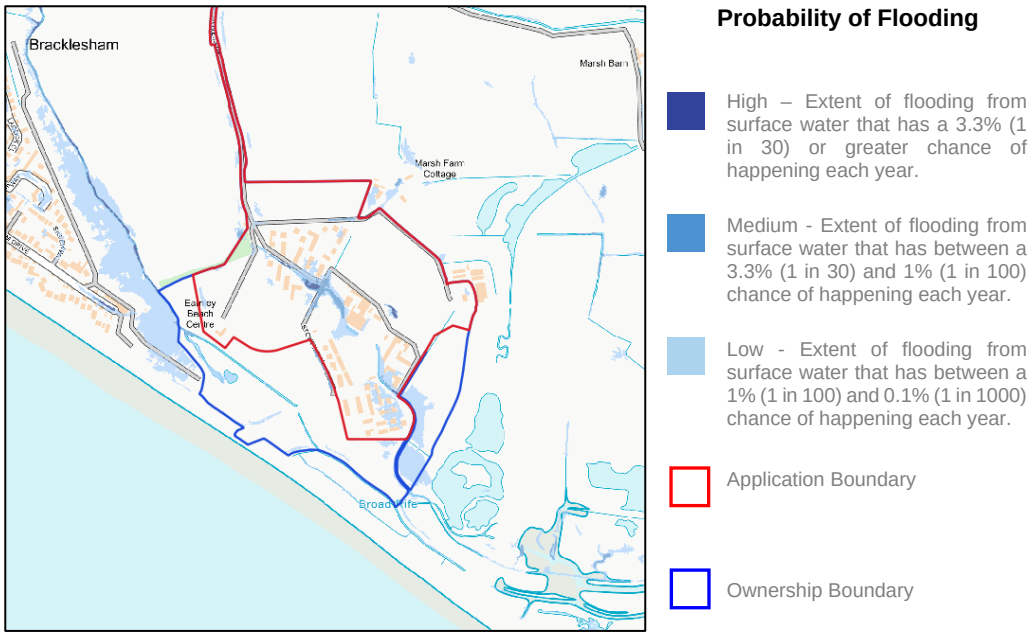


Figure 3.2 – EA's 'Flood Risk from Surface Water' map (© Environment Agency).

Flooding from Rivers, Ordinary and Man-made Watercourses – The EA's 'Flood Map for Planning' (Figure 2.3) identifies that the site is located within Flood Zone 3 of the adjacent Earnley Rife.

Inspection of the topographic survey and aerial height data of the wider area shows that the land levels in the surrounding area fall towards a localised network of land drainage ditches, which ultimately connect to the Earnley Rife, located approximately 100m to the southeast of the site. The Earnley Rife subsequently discharges to the sea, with the outfall located approximately 5km to the east of the development site.

The Park Rife, flowing through the development site, is a tributary of this wider drainage network and as such, the risk of flooding associated with the entire network has been considered in more detail within this FRA. The flows generated within both the Earnley Rife and the Park Rife are associated with a pluvial event and consequently, the risk of flooding from this source is considered in more detail within this report. The results from the pluvial modelling study are presented in Section 5 and 7 of this report.

Flooding from the Sea – As identified by the EA's 'Flood Map for Planning' (Figure 2.3), much of the site also lies within Flood Zones 2 and 3 associated with the sea. It is acknowledged that the EA's mapping is based on a national dataset and as such, cannot always be relied upon to determine the true extent of flooding at a site-specific scale. Consequently, more detailed numerical modelling has been undertaken to determine the true risk of flooding from this source, which is examined in more detail in Section 5.

Flooding from Groundwater – Water levels below the ground rise during wet winter months, and fall again in the summer as water flows out into rivers. In very wet winters, rising water levels may lead to the flooding of normally dry land, as well as reactivating flow in 'bournes' (streams that only flow for part of the year).

The underlying geology is Earnley Sand Formation (sand, clay and silt) and Wittering Formation (sand, silt and clay) overlain by superficial deposits of River Terrace deposits (sand, silt and clay), raised beach deposits (sand and gravel) and raised marine deposits. This type of geology is typically permeable and therefore, can be associated with groundwater emergence.

Groundwater monitoring has been undertaken at the site and the results show that groundwater was encountered more than 0.8m below the ground level. Therefore, consideration should be given to the impact of elevated groundwater levels when undertaking the detailed design of the proposed development. However, the Defra Groundwater Flood Scoping Study (May 2004) show that no groundwater flooding events were recorded during the very wet periods of 2000/01 or 2002/03 and that the site itself is not located within an area where groundwater emergence is predicted. Therefore, taking the above into consideration, the risk of above ground flooding due to groundwater emergence is considered to be low and is not considered in further detail as part of this FRA.

Flooding from Sewers – In urban areas, rainwater is typically drained into surface water sewers or sewers containing both surface and wastewater known as "combined sewers". Flooding can result when the sewer is overwhelmed by heavy rainfall, becomes blocked, or has inadequate capacity; this will continue until the water drains away.

Asset location data provided by Southern Water shows that there are no public sewers on site (Appendix A.2). It is recognised that the site has a network of private foul and surface water sewers, with the surface water runoff from the site currently being directed into the Park Rife. As such, the current risk of flooding from this source is attributed to blockages within the culverts located along the Park Rife. The proposals include implementing a new sustainable drainage system and as such, the risk of flooding from this source will be managed. The details of this are presented in Section 9 of this report.

With respect to the foul sewer network, the current system discharges flows to a pumping station, which is located in the southern half of the development site. This system discharges foul effluent into a rising main which crosses the western boundary of the site. The risk of flooding from the sewer network is limited to either a failure of the pumping station, or an exceedance event whereby the sewers have reached their maximum capacity. If water was to exit the sewer network, the result is likely to be shallow flooding in proximity of manholes on site and around the pumping station. Given the raised nature of the units and proposals to improve both the foul and surface water networks throughout the park, the risk of flooding from sewers is considered to be low.

Flooding from Reservoirs, Canals and Other Artificial Sources – Non-natural or artificial sources of flooding can include reservoirs, canals, and lakes, where water is retained above natural ground level. In addition, operational and redundant industrial processes including mining, quarrying, and sand or gravel extraction, may also increase the depth of floodwater in areas adjacent to these features.

The potential effects of flood risk management infrastructure and other structures also needs to be considered. For example, reservoir or canal flooding may occur as a result of the facility being overwhelmed and/or as a result of dam or bank failure.

Inspection of the OS mapping for the area shows that there are no artificial sources of flooding within close proximity to the site. In addition, the EA's 'Flood Risk from Reservoirs' map shows that the site is not located within an area considered to be at risk of flooding from reservoirs. Therefore, the risk of flooding from this source is considered to be *low.*

A summary of the overall risk of flooding from each source is provided in Table 3.1 below.

Source of Flooding	Initial Level of Risk	Appraisal method applied at the initial flood risk assessment stage
Surface Water	Appraised further in Section 5 & 7	EA's 'Flood Risk from Surface Water' map, OS mapping and site-specific topographic survey
Rivers, ordinary and man-made watercourses	Attributed to pluvial flooding	OS mapping and the EA's 'Flood Map for Planning'
Sea	Appraised further in Section 5 & 7	OS mapping and the EA's 'Flood Map for Planning'
Groundwater	Low	BGS Geology of Britain Mapping, Enzygo Environmental Consultants Site Investigations and Defra Groundwater Flood Scoping Study
Sewers	Low	Asset location data provided by Southern Water and information provided by the applicant
Artificial Sources	Low	OS mapping and EA's 'Flood Risk from Reservoirs' map

Table 3.1 – Summary of flood sources and risks.

4 Climate Change

The global climate is constantly changing, but it is widely recognised that we are now entering a period of accelerating change. Over the last few decades there have been numerous studies into the impact of potential changes in the future and there is now an increasing body of scientific evidence which supports the fact that the global climate is changing as a result of human activity. Past, present, and future emissions of greenhouse gases are expected to cause significant global climate change during this century.

The nature of climate change at a regional level will vary: for the UK, projections of future climate change indicate that more frequent short-duration, high-intensity rainfall and more frequent periods of long-duration rainfall could be expected.

These effects will tend to increase the size of Flood Zones associated with rivers, and the amount of flooding experienced from other inland sources. The rise in sea level will change the frequency of occurrence of high water levels relative to today's sea levels. It will also increase the extent of the area at risk should sea defences fail. Changes in wave heights due to increased water depths, as well as possible changes in the frequency, duration and severity of storm events are also predicted.

4.1 Planning Horizon

To ensure that any recommended mitigation measures are sustainable and effective throughout the lifetime of the development, it is necessary to base the appraisal on the extreme flood level that is commensurate with the planning horizon for the proposed development. The NPPF and supporting Planning Practice Guidance Suite state that residential development should be considered for a minimum of 100 years, but that the lifetime of a non-residential development depends on the characteristics of the development. For commercial development, a 75 year design life is typically assumed. The development that is the subject of this FRA is classified as both commercial and residential therefore a design life of 100 years has been assumed to take a precautionary approach.

4.2 Potential Changes in Climate

Extreme Sea Level

Global sea levels will continue to rise, depending on greenhouse gas emissions and the sensitivity of the climate system. The relative sea level rise in England also depends on the local vertical movement of the land, which is generally falling in the south-east and rising in the north and west.

Reference to guidance published by the EA specifies allowances for different epochs and regions across England. The predicted rates of relative sea level rise for the 'South East' region, relevant to the subject site, are shown in Table 4.1. These values which correspond with the Higher Central and Upper End percentiles (the 70th and 90th percentile respectively).

Administrative Region	Allowance Category	Net Sea Level Rise (mm/yr) (Relative to 2000)			
		2000 to 2035	2036 to 2065	2066 to 2095	2096 to 2125
South East	Higher Central	5.7	8.7	11.6	13.1
	Upper End	6.9	11.3	15.8	18.2

Table 4.1 – Recommended contingency allowances for net sea level rise.

From these values, the extreme sea level at the site can be seen to change with time and this change is not linear. The 1 in 200 year extreme sea level at the site has therefore been calculated for a number of steps between the current day and the year 2125 and these values are shown in Table 4.2 below.

Year	'Higher Central' Scenario	'Upper End' Scenario
Current Day (year 2017)	3.31	3.31
2035	3.41	3.43
2065	3.67	3.77
2075	3.79	3.93
2095	4.04	4.27
2125	**4.43**	**4.81**

Table 4.2 – Climate change impacts on extreme sea levels for a 1 in 200 year return period event based on values taken from the EA's Coastal Flood Boundary Condition database.

The development that is the subject of this FRA is classified as having a 100 year design life and therefore, the extreme sea level is taken as 4.43m AODN in the 'Higher Central' scenario, and 4.81m AODN in the 'Upper End' scenario. These levels have been applied to the HCL tidal modelling study.

Offshore Wind Speed and Extreme Wave Height

As a result of increased water depths resulting from changes in the climate, wave heights may change. The climate change allowances for offshore wind speed and wave height are shown in Table 4.3 below and where appropriate have been applied as part of this appraisal. These figures are applicable around the entire English coast and are relative to a 1990 baseline. They also include a sensitivity allowance which should be used to show that the range of impact of climate change is understood.

Parameter	2000 to 2055	2056 to 2125
Offshore wind speed allowance	+5%	+10%
Offshore wind speed sensitivity test	+10%	+10%
Extreme wave height allowance	+5%	+10%
Extreme wave height sensitive test	+10%	+10%

Table 4.3 – Recommended climate change allowance and sensitivity ranges for offshore wind speed and extreme wave height (relative to 1990).

The site-specific modelling undertaken by HCL, which has been referenced as part of this appraisal, includes the appropriate 10% allowance for both offshore wind speed and extreme wave height.

Peak Rainfall Intensity

Recognising that the impact of climate change will vary across the UK, the allowances were updated in May 2022 to show the anticipated changes to peak rainfall across a series of management catchments. The proposed development site is located in the **Arun and Western Streams Management Catchment**, as defined by the 'Peak Rainfall Allowance' maps, hosted by the Department for Environment, Food and Rural Affairs. Guidance provided by the EA states that this mapping should be used for site-scale applications (e.g. drainage design), in small catchments (less than 5km^2), or urbanised drainage catchments. For large rural catchments, the peak river flow allowances should be used.

The development site lies within a small drainage catchment and therefore, the Peak Rainfall Allowances for the Arun and Western Streams Management Catchment should be applied.

For each Management Catchment, a range of climate change allowances are provided for two time epochs and for each epoch, there are two climate change allowances defined. These represent different levels of statistical confidence in the possible scenarios on which they are calculated. The two levels are as follows:

- Central: based on the 50th percentile
- Upper End: based on the 90th percentile

The EA has provided guidance regarding the application of the climate change allowances and how they should be applied in the planning process. The range of allowances for the Management Catchment in which the development site is located are shown in Table 4.4 below.

Management Catchment Name	Annual exceedance probability	Allowance Category	2050s	2070s
Arun and Western Streams	3.3 %	Central	20%	25%
		Upper End	35%	40%
	1 %	Central	20%	25%
		Upper End	45%	**45%**

Table 4.4 – Recommended peak rainfall intensity allowances for each epoch for the Arun and Western Streams Management Catchment.

For a development with a design life of 100 years the Upper End climate change allowance is recommended to assess whether:

- there is no increase in flood risk elsewhere, and;
- the development will be safe from surface water flooding.

From Table 4.4 above, it can be seen that the recommended climate change allowance for this site is a 45% increase in peak rainfall. Therefore, this increase has been applied to the hydraulic drainage model constructed to inform the surface water management strategy. Where this allowance has been applied the abbreviation "+45%cc" has been used. The pluvial modelling study undertaken to accompany the application by HCL has also included an event with at 45% allowance for climate change.

All of the above recommended allowances for climate change should be used as a guideline and can be superseded if local evidence supports the use of other data or allowances. Additionally, in the instance where flood mitigation measures are not considered necessary at present, but will be required in the future to account for changes in the climate, a "managed adaptive approach" can be adopted. This approach allows appropriate mitigation measures to be incorporated into the development in the future to combat the impacts of climate change.

5 Risk of Flooding: Current Day and Future Risk

The initial appraisal undertaken in Section 3 of this report identifies that the site could be at risk of flooding during either an extreme pluvial or coastal flood event. To determine the baseline condition for the development site (i.e. pre-development), detailed studies to quantify the risk of flooding from coastal and pluvial sources has been undertaken by HCL. The following section summarises the risk of flooding to the development based on the outcomes of each of these studies.

5.1 Risk of Flooding from the Sea

The site is located within Flood Zones 2 and 3, and is situated in close proximity to the coastline. The EA's 'Flood Map for Planning' does not differentiate between Flood Zones 3a and 3b (i.e. the Functional Floodplain). The functional floodplain is defined by the NPPF as an area where '*water has to flow or be stored in times of flood*'. This is based on an assessment of local conditions, or the modelled extent of flooding during a 1 in 30 year return period event.

The site is currently protected by a naturally occurring shingle ridge which forms part of a mixed sand and gravel beach. The shingle ridge is characterised by a crest with a height of around 5.0mAODN along most of its length. The frontage directly adjacent to the site ('Medmerry frontage') also includes a number of timber groynes, the landward end of which are now covered completely by the shingle ridge. The ridge stretches from Bracklesham (south-west of the site), to the Medmerry Managed Realignment (MMR) scheme (to the east) as shown on Figure 5.1 below.

Figure 5.1 – Plan showing the extent of the existing defences along the coastline.

When the crest height of the existing shingle ridge is compared to the 1 in 30 year extreme sea level, it can be seen that the site would be defended. However, this does not account for the potential impact of waves overtopping the defences.

The detailed numerical modelling undertaken by HCL includes such a scenario. The results of the modelling (Figure 5.2) reveal that even when wave overtopping is taking into consideration, the site is not predicted to flooding during a 1 in 30 year return period event and therefore, is not classified as being located within the functional floodplain.

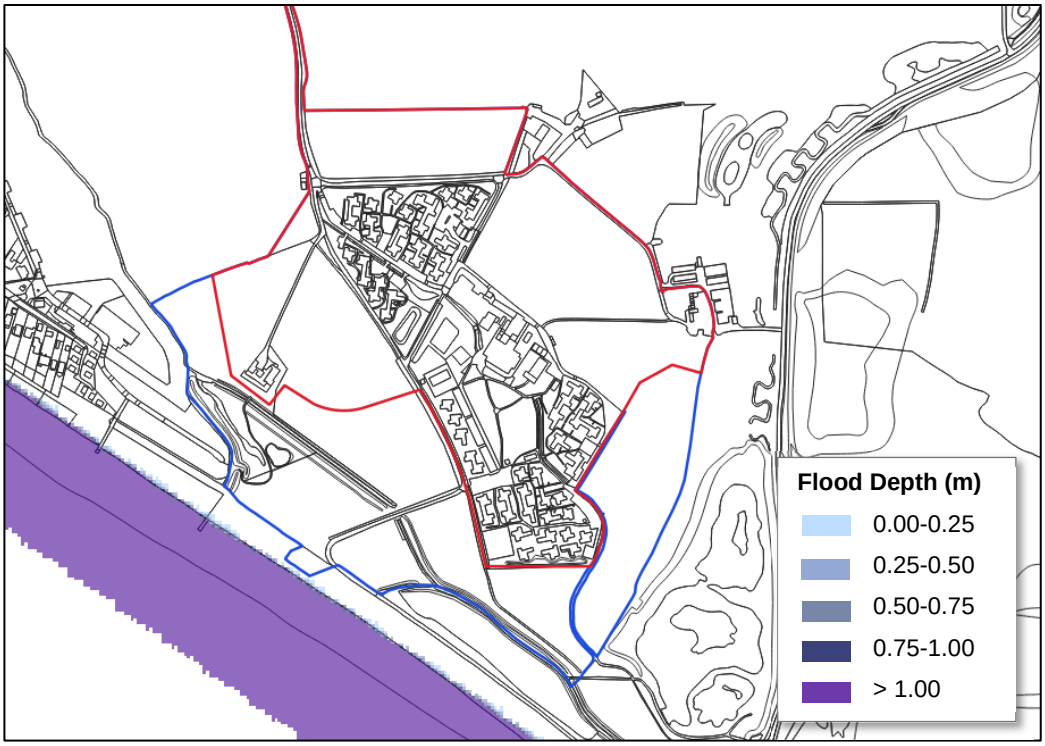


Figure 5.2 – Maximum depth of flooding under a 1 in 30 year event taking into consideration waves overtopping the existing defences (i.e. tidal Functional Floodplain).

The NPPG 2022 also requires the FRA to appraise the risk of flooding from an extreme tidal event with 1 in 200 year return period, for both current day conditions and including an allowance for climate change.

Reference to the EA's Coastal Flood Boundary database identifies that during a 1 in 200 year storm surge event the extreme water level along the Medmerry Frontage is 3.31mAODN. This water level is below the crest height of the current shingle ridge and the site remains dry.

In addition to the predicted impacts of a marginal extreme sea level, it is also necessary to consider the potential impact of waves overtopping the defences during a storm event of this magnitude. This scenario has been modelled using the site-specific flood model and the results show the site remains unaffected during such a scenario.

When the impacts of climate change are considered over the lifetime of the development (refer to Section 4) it is evident that the risk of flooding is increased as the sea level is predicted to rise. Reference to guidance on sea level rise outlined in the NPPG reveals that the extreme sea level for a 1 in 200 year return period event is expected to increase to a level of 4.43m AODN in the year 2125.

When the risk of flooding to the site during a 1 in 200 year return period for the year 2125 is considered, it can be seen from the results of the model that the site itself remains unaffected by flooding (Figure 5.3).

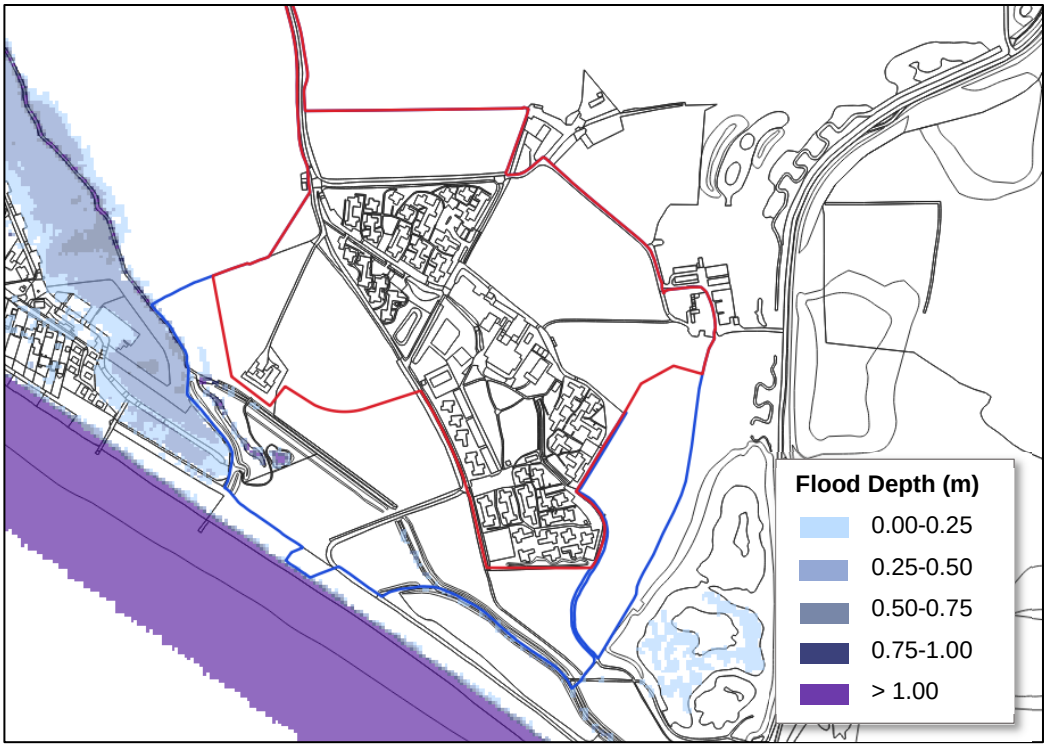


Figure 5.3 – Maximum depth of flooding resulting from waves overtopping the EA's defences during a 1 in 200 year return period coastal storm event including an allowance for climate change to the year 2125).

Whilst Figure 5.3 above shows the site itself to remain unaffected by flooding, it should be noted that the above assumes the shingle ridge adjacent to the site remains in place. This assumption does not take into consideration the potential morphological changes to the coastal frontage over the next 100 years. During this time there is an expectation that the condition of the EA defence will deteriorate, as a result of sea levels rising, and an increase in wave heights and wind speeds associated with climate change.

At this time, there is no strategy in place to confirm whether the EA will maintain or improve the defences along this frontage into the future. Consequently, a coastal processes report was undertaken as part of the previous application to better understand the frontage in more detail, predicting how the shingle ridge could respond to an extreme storm event into the future. The primary objective of the study was to confirm the standard of protection provided by the shingle ridge over the next 100 years, which was achieved by modelling the response of the defences at 10-year intervals up to the year 2115.

In summary, the report concluded that the existing sea defence (without intervention and improvement) is unlikely to provide a sufficient standard of protection to prevent the development site from flooding over the next 100 years. The report identifies that by the year 2070 a breach in the shingle embankment is likely to occur during an extreme storm event, which would result in extensive flooding at the study site. Figure 5.4 shows the impact of such an event in the year 2125.

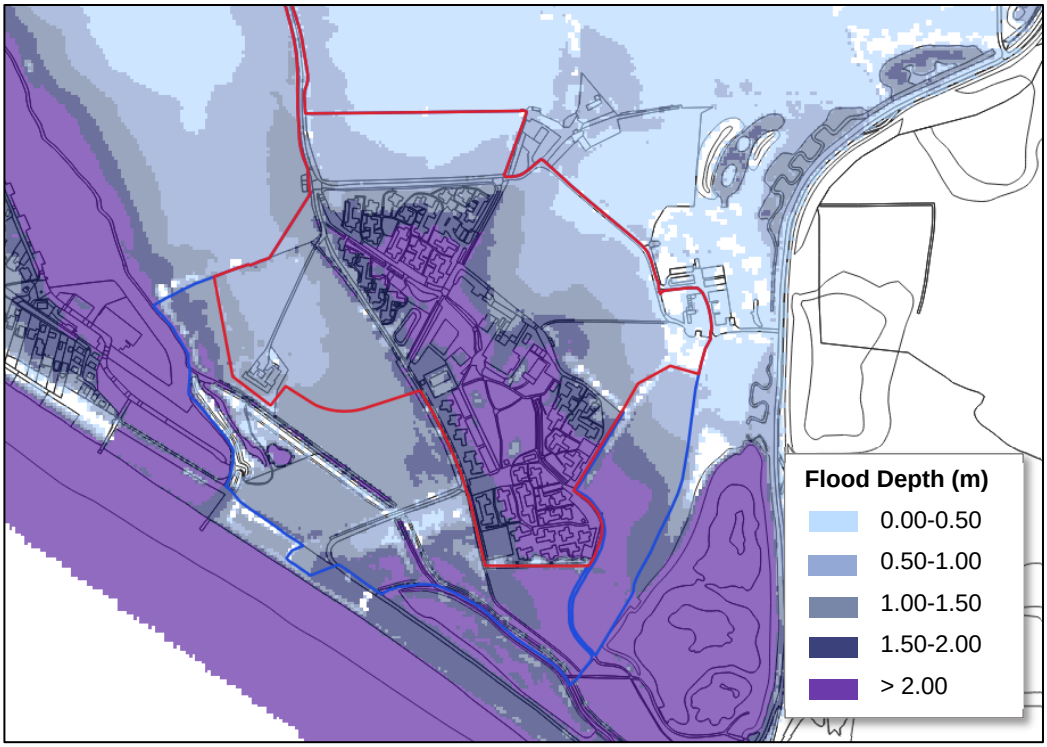


Figure 5.4 – Maximum depth of flooding under a 1 in 200 year event in the year 2125 whereby the existing EA defences would have breached.

Although it is recognised that a breach in the defences is unpredictable and would typically be classified as a 'residual risk' event, given the findings of the coastal process study report a more conservative approach has been adopted and this breach event has been classified as an 'actual risk' scenario in this case. The FRA has therefore been prepared based on the assumption that the defence will fail during the next 100 years, to ensure a precautionary approach is applied and that appropriate mitigation is considered over the lifetime of the development.

The results of the breach scenario reveal that the maximum depth of flooding within the park is predicted to reach up to 2.2m, relating to a flood level of 4.44m AODN. On this basis, it is evident that if no improvements to the defences are implemented, the site will be subject to significant flooding in the future. Section 6 of this report therefore discusses the numerous mitigation measures proposed to be included within the scheme to reduce the risk to the occupants.

5.2 Risk of Flooding from Pluvial Sources

In addition to the risk of flooding from the coast, it has been identified that the site could be at risk of flooding following an extreme rainfall event.

The EA's 'Flood Map for Planning' does not differentiate between the risk of flooding from the coast and main rivers and as such, the classification of the site within Flood Zone 3 does not necessary relate to risk of flooding from the coast alone. Further analysis is therefore required to determine whether the site is located within Flood Zones 3a or 3b of the Earnley Rife and Park Rife.

Previous correspondence with the EA has confirmed that there is no modelled flood level data available for either of these watercourses and consequently, HCL has undertaken site-specific numerical flood modelling to more accurately quantify the risk of flooding to the development site from these sources.

The technical details of the modelling are provided within a separate report (Appendix 8.3 of the Environmental Statement) and whilst the modelling results represent the maximum depth of flooding at any location throughout the model simulation, they should not be interpreted as a single snapshot in time.

Figure 5.5 below shows the model outputs for one of the scenarios run, used to determine the extent and depth of the current 'functional floodplain' (i.e. the 1 in 30 year return period event).

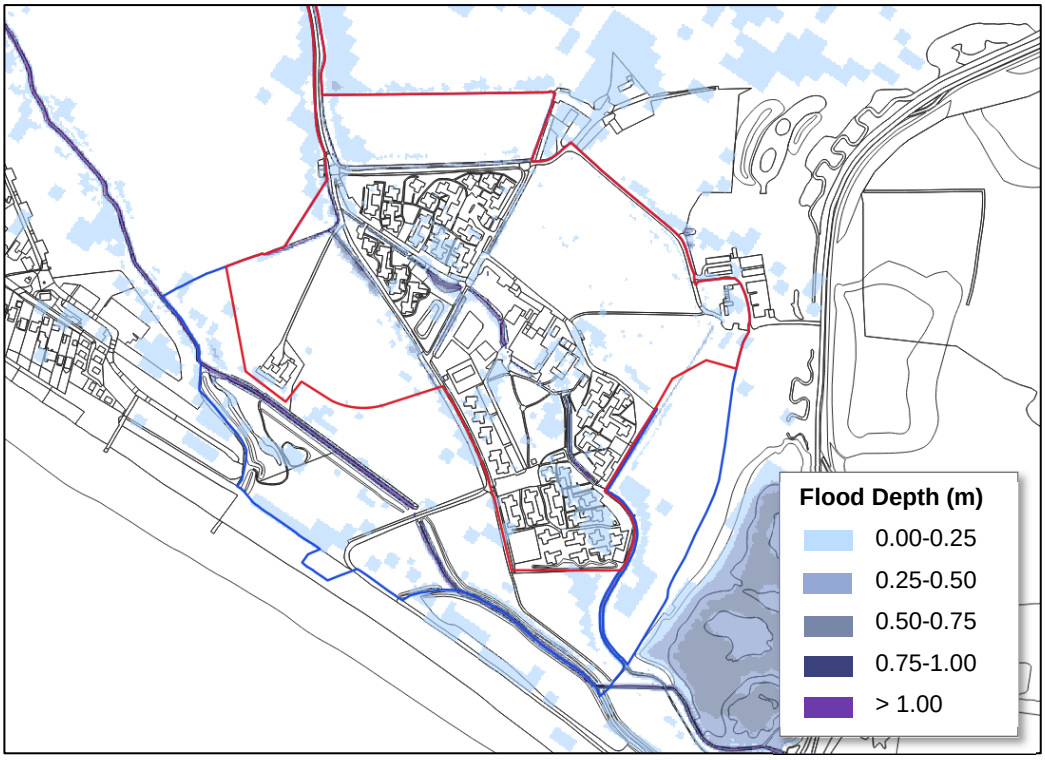


Figure 5.5 – Maximum depth of flooding under a 1 in 30 year rainfall event (i.e. defining the extent of the current Functional Floodplain).

Figure 5.5 delineates a number of areas across the site which could be affected during a 1 in 30 year return period event. These areas, which are predominantly confined to the area surrounding the watercourses, represent the current functional floodplain and are therefore, classified as Flood Zone 3b. As is evident from the above, the existing site includes units located within the extent of flooding during this scenario.

The NPPG also requires the risk of flooding from pluvial sources to be appraised for development sites during a 1 in 100 year return period event, including an appropriate allowance for climate change (Section 4). This is referred to as the '*design rainfall* event'. The numerical flood model has

been run for the 'design event scenario', assuming that the defences have not been breached. Consequently, the results provide a clearer indication of the risk associated with pluvial flooding in isolation.

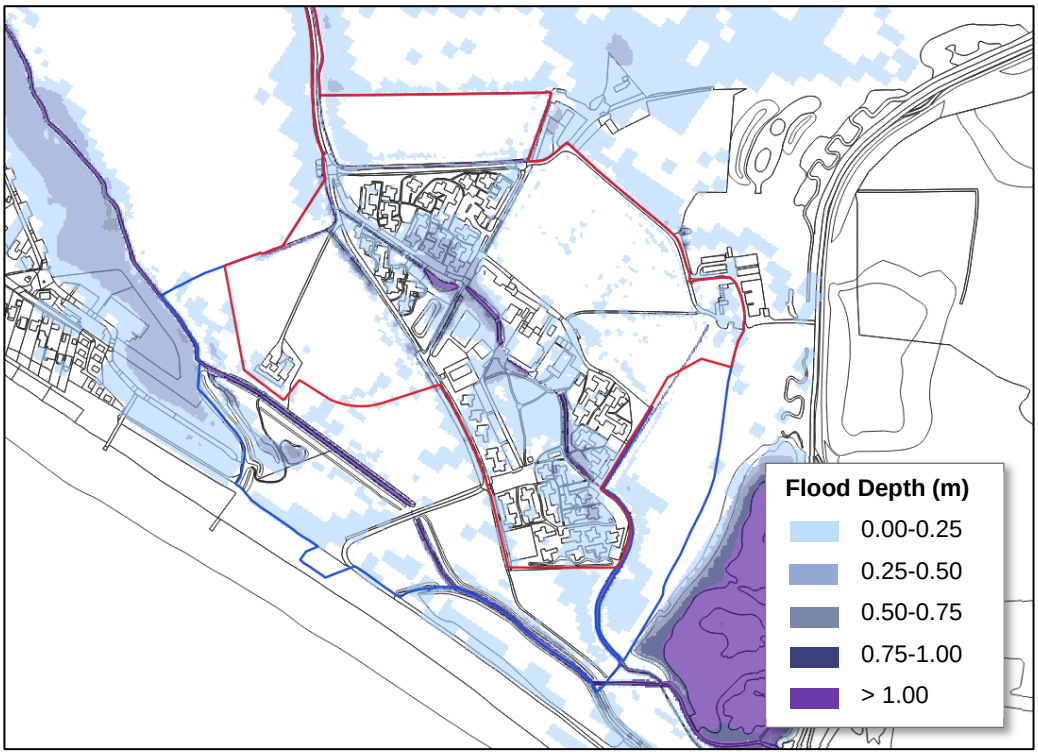


Figure 5.6 - Maximum modelled depth of flooding during the design rainfall event with the sea defences remaining in place (i.e. unbreached).

Figure 5.6 above shows that during the design rainfall event the majority of the flooding is predicted to occur along the Park Rife and surrounding area. Interrogation of the model results shows that the maximum predicted flood level, where the Park Rife enters the site is 3.84m AODN. The flood level then reduces along the Park Rife to a level of 2.06m AODN to the south of the site, following the natural the topography, which falls towards that coast. With the exception of flood depths within the rife and immediately adjacent to the rife, the depth of flooding across the site is less than 0.5m.

5.3 Flood Management Strategy

From the findings of the sections above it is evident that the site is predicted to be at risk of flooding from pluvial and coastal sources, with the extent and depth of flooding predicted to increase with climate change over the next 100 years. Consequently, the existing 308 units on site, many of which are currently single storey accommodation, will be at significant risk of flooding without intervention.

The existing Park has 308 units, which are currently located in an area shown by the modelling to be at high risk of flooding. The proposed development seeks to move development further back from the coastline and to the higher parts of the site. This alone would provide a betterment over the existing conditions, however, the proposals will reduce flood risk further by including numerous flood risk mitigation measures, which are discussed in the following section.

6 Flood Mitigation Measures

The key objectives of flood risk mitigation are:

- to reduce the risk of the development being flooded.
- to ensure continued operation and safety during flood events.
- to ensure that the flood risk downstream of the site is not increased by increased runoff.
- to ensure that the development does not have an adverse impact on flood risk elsewhere.

The following section of this report examines ways in which the risk of flooding at the development site can be mitigated.

Mitigation Measure	Appropriate	Comment
Careful location of development within site boundaries (i.e., Sequential Approach)	✓	Refer to Section 6.1
Raising floor levels	✓	Refer to Section 6.2
Land raising	✓	
Compensatory floodplain storage	x	Refer to Section 11.1
Flood resistance & resilience	✓	Refer to Section 6.3
Alterations/ improvements to channels and hydraulic structures	x	Refer to Section 6.4
Flood defences	x	Not required
Flood warning	✓	Refer to Section 6.5
Surface water management	✓	Refer to Section 8 & 9

Table 6.1 – Appropriateness of mitigation measures.

6.1 Application of the Sequential Approach at a Local Scale

The sequential approach to flood risk management can also be adopted on a site based scale and this can often be the most effective form of mitigation. For example, on a large scheme this would mean locating the more vulnerable dwellings on the higher parts of the site and placing parking, recreational land or commercial buildings in the lower lying and higher risk areas.

A key principle of the proposed development is to reduce the flood risk to the holiday park and therefore, the proposed layout applies the sequential approach by setting the replacement units back from the coastline on the higher parts of the site. The proposed new lodges are therefore primarily located in the centre and northern parts of the holiday park, away from the lowest areas of the site to the south and surrounding the Park Rife.

6.2 Raising Floor Levels & Land Raising

The proposed development provides a betterment over the existing situation by proposing to locate the new lodges further away from the coastline on the existing higher ground onsite. As a result, even at existing site levels, the new lodges in the proposed locations would experience a shallower depth of flooding during the design event, when compared to the current units. As the proposals comprise replacing the same number of units (i.e., 308 units with 308 new lodges), no further mitigation measures are technically required for the proposals to be acceptable in relation to flood risk.

Notwithstanding this, following the best practice principles promoted within the NPPF, the proposed development looks to reduce flood risk by including a combination of land and floor level raising across the site, to ensure that all of the replacement lodges have an internal floor level raised above the worst case tidal flood level of 4.44m AODN. A land raising plan has been prepared by others to show the proposed levels across the site.

6.3 Flood Resistance and Resilience

Flood Resistance or 'dry proofing', where flood water is prevented from entering the building. For example, using flood barriers across doorways and airbricks, or raising floor levels. These measures are considered appropriate for 'more vulnerable' development where recovery from internal flooding is not considered to be practicable.

Flood Resilience or 'wet proofing', accepts that flood water will enter the building and allows for this situation through careful internal design for example raising electrical sockets and fitting tiled floors. The finishes and services are such that the building can quickly be returned to use after the flood. Such measures are generally only considered appropriate for some 'less vulnerable' uses and where the use of an existing building is to be changed and it can be demonstrated that no other measure is practicable.

As detailed above, all the new lodges will be elevated to the design tidal flood level and therefore, internal flooding would not be expected even during an extreme event. Nevertheless, it is recommended that flood resistance and resilience measures be included up to 600mm above the

flood level of 4.4m AODN as a precautionary approach to manage the impact of flooding during any exceedance events.

Details of flood resilience and flood resistance construction techniques can be found in the document '*Improving the Flood Performance of New Buildings; Flood Resilient Construction'*, which can be downloaded from www.gov.uk.

It is not possible to elevate the retained commercial elements in the centre of the holiday park or to alter land levels around the existing Park Rife for ecological reasons. As such, it is recommended that flood resistance and resilience measures be retrofitted into these buildings and included within any new commercial elements onsite to manage the impact of flooding.

The National Flood Forum provides advice to property owners on flood resistance and resilience measures which can be retrofitted into an existing building. Advice can be found on their website at:

https://nationalfloodforum.org.uk/

A Code of Practice (CoP) for Property Flood Resilience (PFR) has been put in place to provide a standardised approach for the delivery and management of PFR. Further information on the CoP and guidance on how to make a property more flood resilient can be accessed, and downloaded, from the Construction Industry Research and Information Association (CIRIA) Website:

https://www.ciria.org/Resources/Free_publications/CoP_for_PFR_resource.aspx

6.4 Alterations to Channels and Hydraulic Structures

There is no opportunity to provide improvements to the existing Park Rife flowing through the site as a result of ecological surveys undertaken (by others), which confirm the presence of water vole habitats in the vicinity of the Park Rife.

6.5 Flood Warning

The EA operate a flood forecasting and warning service in areas at risk of flooding from rivers or the sea, which relies on direct measurements of rainfall, river levels, tide levels, in-house predictive models, rainfall radar data and information from the Met Office. This service operates 24 hours a day, 365 days a year.

Whilst the probability of an event of sufficient magnitude to cause floodwaters to reach the levels discussed in this report is very low, the risk of such an occurrence is always present. It is not possible to predict when a breach in the flood defences may occur, however, with the sophisticated techniques now employed by the EA to predict the onset of flood events the opportunity now exists for all residents within the flood risk area to receive early flood warnings of conditions which could result in flooding occurring.

This forewarning should be sufficient to allow occupants to evacuate the area or prepare themselves and their property for a flood event. It is therefore recommended that the occupants of the site sign up to the EA's Flood Warning Service either by calling 0345 988 1188, or by visiting;

www.gov.uk/sign-up-for-flood-warnings

Occupants and staff should also sign up to receive Met Office Weather Warnings to ensure that they are aware of conditions which could result in surface water flooding during extreme rainfall events. The Met Office weather warnings are available from the following link:

www.metoffice.gov.uk/weather/uk/uk_forecast_warnings.html

In the event that it is not possible to evacuate the site prior to the onset of flooding, all occupants will have safe refuge available within their lodge and staff/users of the central commercial facilities will be able to seek refuge within the central pub and restaurant, on the upper floors.

In addition to signing up for flood warnings, a Flood Warning and Evacuation Plan (FEP) has been prepared for the development site which will be distributed to all of the lodges and visitors on arrival to the park. The FEP, which is located at Appendix 8.4 of the Environmental Statement, will be used in combination with the EA's Early Flood Warning Service to ensure that the occupants are able to evacuate the Park *prior* to the onset of flooding. The FEP includes;

- Areas of the site that are above the predicted flood level and will therefore be used as a safe haven until floodwaters recede.
- Detailed site plans that identify emergency access routes through the site.
- Information to site staff and residents on flood warning procedures.
- Emergency contact numbers and other site-specific information that will enable staff to manage the impacts of a flood event.

The FEP prepared for the development site should be reviewed on an annual basis and any alterations should be disseminated to visitors to the park as new versions become available, to ensure that occupants are able to prepare their units and evacuate the park prior to the onset of flooding.

7 Risk of Flooding: Proposed Development Scenario

The following section presents the impact of the proposed development, taking into consideration the flood mitigation measures which are proposed to be incorporated within the scheme over the next 100 years.

7.1 Risk of Flooding from the Coast

The numerical flood model has been re-run to quantify the extent and depth of flooding under the 1 in 200 year tidal event including an allowance for 100 years of climate change. This scenario assumes that the *flood defences are no longer present* (Figure 7.1). This scenario includes the mitigation measures specified in Section 6 of this report.

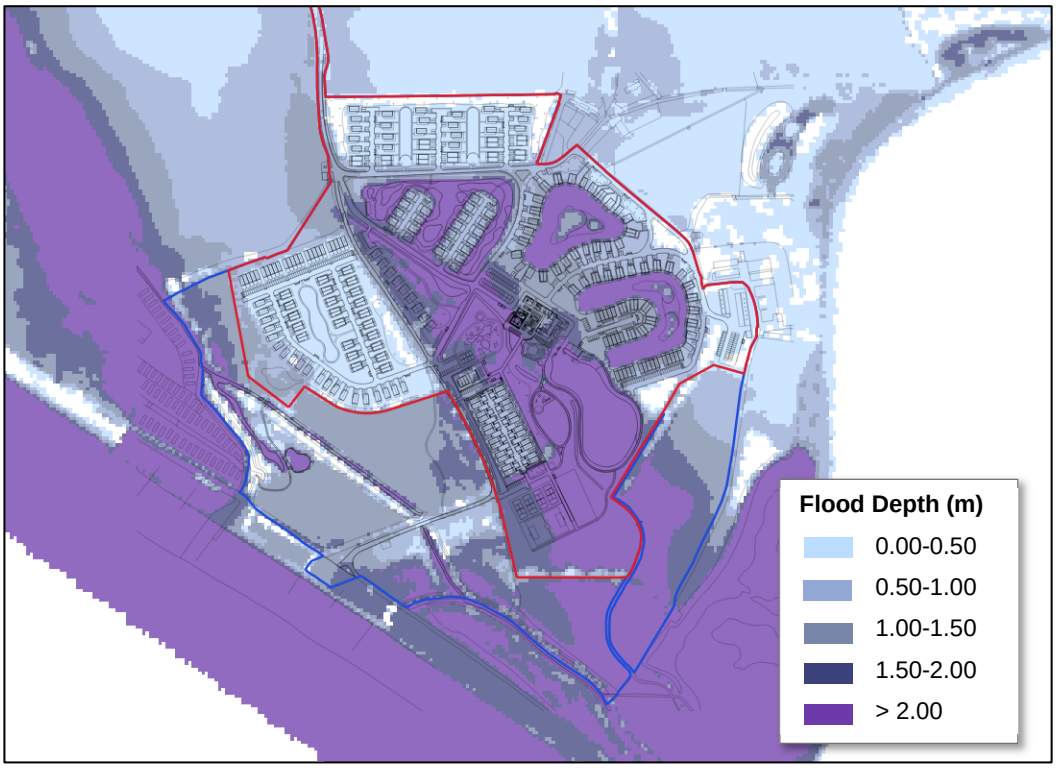


Figure 7.1 – Maximum depth of flooding under a 1 in 200 year event in the year 2125 whereby the existing EA defences would have breached with the proposed land raising included.

Whilst it is evident from Figure 7.1 that the majority of the site would still be subject to flooding, it is clear that the depth of flooding in the area of the proposed lodges has been reduced as a result of the land raising proposed. Additionally, when the floor level raising (which is not included within the model), is taken into account, all lodges will be elevated above the flood level of 4.44m AODN and therefore are predicted to remain dry during such an event.

7.2 Risk of Flooding from Pluvial Sources

The numerical flood model has been re-run to quantify the extent and depth of flooding under the design rainfall event. It is recognised that there is the potential for an extreme rainfall event to coincide with an extreme coastal storm event, however, the interaction between these scenarios is based on complex meteorological conditions in the English Channel which are difficult to predict. Therefore, as with the model results shown in section 5.2, the numerical flood model has been run assuming that the defence has not been breached, in order to provide a clearer indication of the risk associated with pluvial flooding in isolation. The results in Figure 7.2 below show the maximum depth of flooding at any one location for the duration of the simulation and should not be interpreted as a snapshot in time.

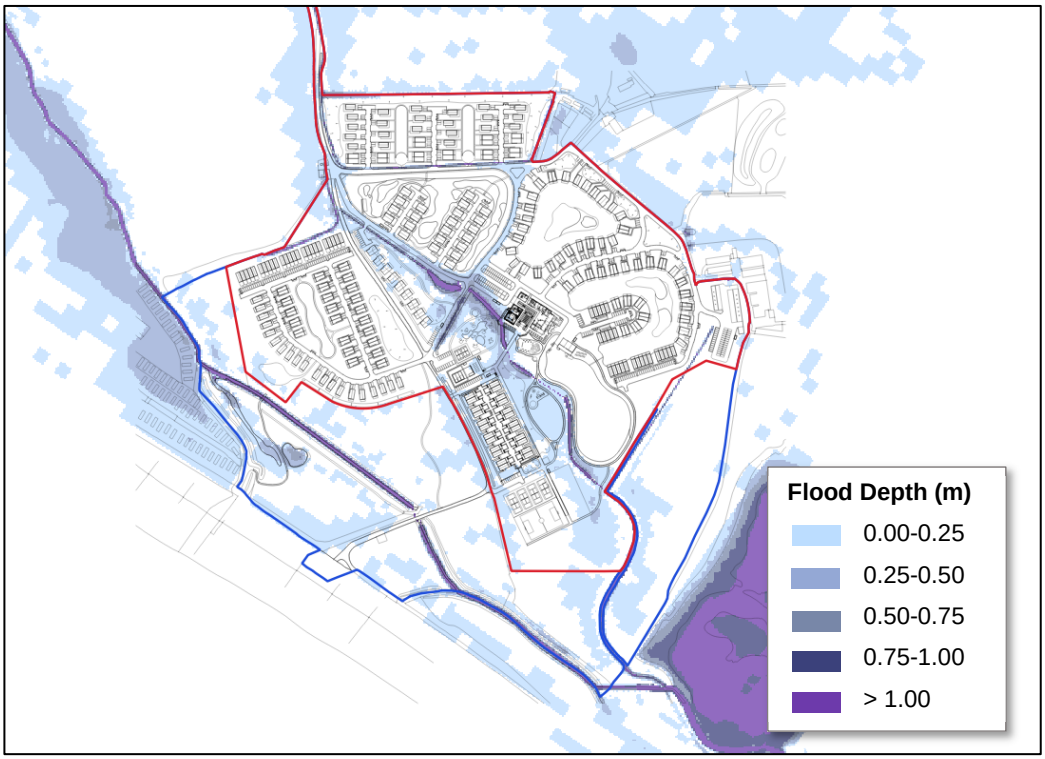


Figure 7.2 – Maximum modelled depth of flooding during the design rainfall event with the coastal defences remaining in place and with the proposed land raising included.

The model results identify that the maximum flood level where the Park Rife enters the park is 3.58m AODN, with the level reducing across the site to 1.89m AODN to the south of the site. As in the existing scenario, the flooding predicted is largely confined to the area directly adjacent to the Park Rife, but with all lodges having floor levels raised significantly above the pluvial flood levels the risk of internal flooding remains low.

8 Existing Drainage

8.1 Existing Surface Water Drainage

The developed areas within the site, currently drain at an unrestricted rate into the Park Rife. The undeveloped areas are assumed to drain informally into a series of ditches across the site and the surrounding area that subsequently drain into the Park Rife and the Earnley Rife.

Due to the extension of the site, it has been sub-divided into catchments for the purposes of this report. The extent of each of these catchments can be seen in Figure 8.1.

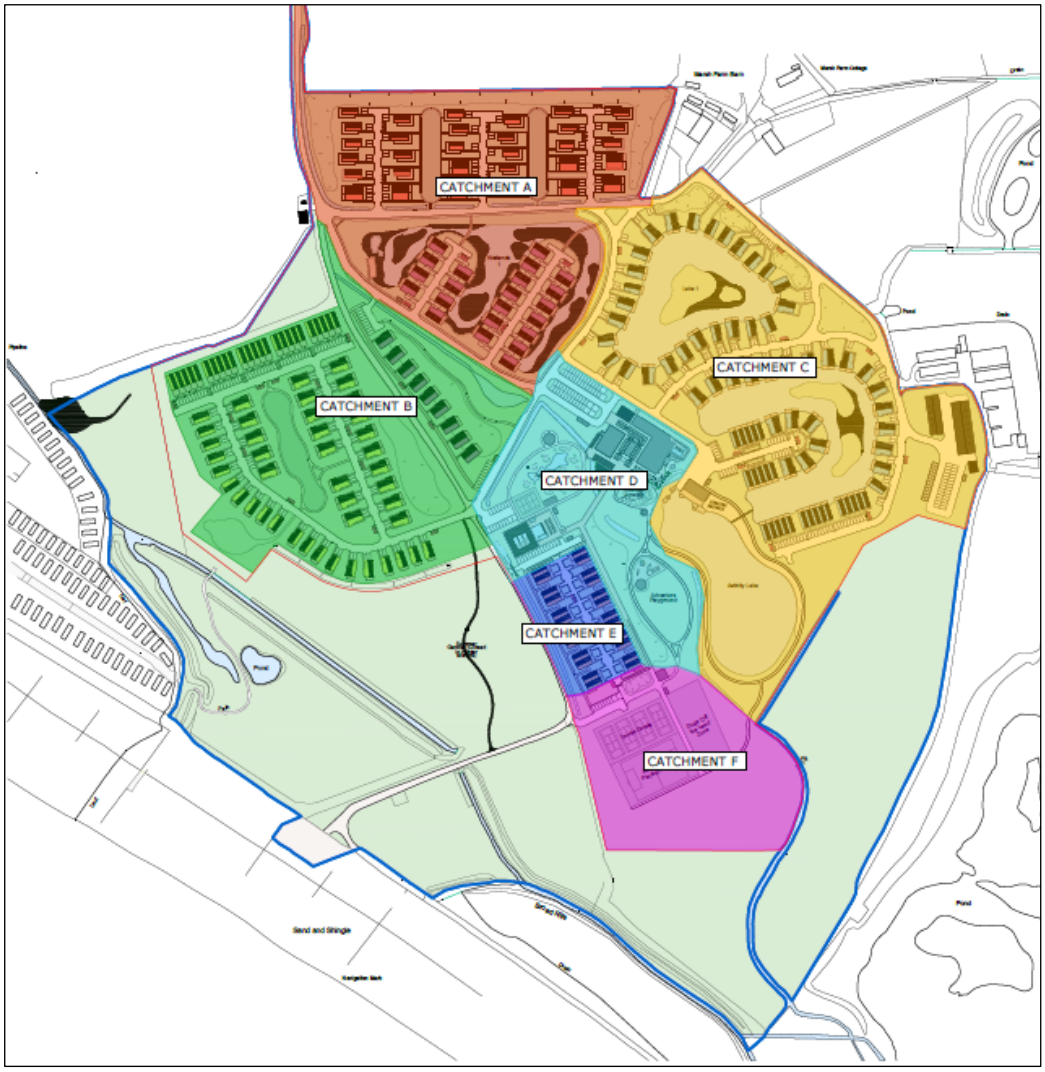


Figure 8.1 – Proposed layout plan delineating the drainage catchments.

Runoff rates generated on site for the existing conditions have been calculated for a range of rainfall events with varying return periods for each catchment. These hydrological calculations have been undertaken using the Modified Rational Method and synthetic rainfall data derived using the variables obtained from the Flood Estimation Handbook (FEH) online web service. Whilst it is

acknowledged that the existing drainage system is likely to restrict the discharge rates, due to its limited capacity, it should also be noted that in this case water would exit the system and flow towards the watercourses within the site. It is therefore considered appropriate to apply the Modified Rational Method to calculate brownfield runoff rates for this site. The results are summarised in Table 8.1 below.

Catchment	Brownfield Runoff Rates		
	1 in 2 years	1 in 30 years	1in100 years
Catchment A	238 l/s	587 l/s	738 l/s
Catchment B	128 l/s	315 l/s	396 l/s
Catchment C	205 l/s	506 l/s	636 l/s
Catchment D	184 l/s	453 l/s	570 l/s
Catchment E	53 l/s	130 l/s	163 l/s
Catchment F	172 l/s	424 l/s	533 l/s

Table 8.1 – Summary of peak runoff rates for the existing site, based on the existing impermeable area in each catchment.

Greenfield runoff rates have also been calculated using the FEH methodology and the area to be developed within each catchment. The results are summarised in Table 8.2 below.

Catchment	Greenfield Runoff Rates		
	1 in 2 years	1 in 30 years	1in100 years
Catchment A	6.2 l/s	14.3 l/s	19.8 l/s
Catchment B	6.7 l/s	15.4 l/s	21.4 l/s
Catchment C	10.1 l/s	23.1 l/s	32.0 l/s
Catchment D	3.5 l/s	8.1 l/s	11.3 l/s
Catchment E	0.7 l/s	1.7 l/s	2.3 l/s
Catchment F	1.4 l/s	3.2 l/s	4.5 l/s

Table 8.2 – Summary of greenfield runoff rates, based on the area to be developed in each catchment.

Southern Water (SW) has provided sewer mapping for the site and surrounding area which is included in Appendix A.2. This mapping shows that there are no public sewers in close proximity to the site. The closest public sewer is a foul water rising main located approximately 200m to the west of the site.

9 Sustainable Drainage Assessment

9.1 Site Characteristics

The important characteristics of the site, which have the potential to influence the surface water drainage strategy, are summarised in Table 9.1 below.

Site Characteristic	Development Site	
Total area of site	~21.7 ha	
Current site condition	Developed (brownfield)	
Greenfield runoff rates (based on the FEH methodology)	1:2 yr = 1.6 l/s/ha 1:30 yr = 3.6 l/s/ha 1:100 yr = 5.0 l/s/ha	
Infiltration	Negligible (based on site specific infiltration testing)	
Current surface water discharge method	Drains into a network of land drainage ditches, ultimately discharging to the Earnley Rife	
Is there a watercourse nearby?	Yes – Earnley Rife	
Impermeable area	**Existing** **~ 5.5 ha**	**Proposed** **~9.9 ha**

Table 9.1 – Site characteristics affecting rainfall runoff.

Based on Table 9.1 above, it is evident that the development proposals will increase the total impermeable area across the site. As a result, the rate at which the surface water runoff is discharged from the site is likely to increase. Consequently, measures will need to be put in place to ensure that the impact of this additional surface water runoff is appropriately managed.

Furthermore, the potential use of SuDS within the proposed development will be considered to assess the practicality of better replicating greenfield behaviour, in accordance with Local Planning Policy, and S3 and S5 of the NTSS.

9.2 Opportunities to Discharge Surface Water Runoff

Part H of the Building Regulations summarises a hierarchy of options for discharging surface water runoff from developments. The preferred option is to **infiltrate** water into the ground, as this deals with the water at source and serves to replenish groundwater. If this option is not viable, the next option is for the runoff to be discharged into a **watercourse**. The water should only be conducted into the **public sewer** system if neither of the previous options are possible.

The following opportunities for managing the surface water runoff discharged from the development site are listed in order of preference:

Water Re-Use – Water re-use systems should ideally be considered to reduce the reliance on the demand for potable water. However, such systems can rarely manage 100% of the surface water runoff discharged from a development, as this requires the yield from the building and hardstanding area to balance perfectly with the demand from the proposed development. Consequently, whilst rainwater recycling systems can be considered for inclusion within the scheme, an alternative solution for attenuating storm water will still be required.

Infiltration – Infiltration testing was undertaken on site by Enzygo Environmental Consultants in February 2019. The results indicate that none of the tests were successful, due to insufficient infiltration rates being recorded. As a result, infiltration SuDS are not considered to be a viable solution for managing surface water runoff discharged from the proposed development.

Discharge to Watercourses – Figure 2.1 shows the location of the Earnley Rife and the Park Rife, along with a number of drainage ditches crossing the site, that ultimately connect into the Earnley Rife. Direct connections to these watercourses are likely to be the most sustainable solution for draining surface water runoff from the proposed development.

Discharge to Public Sewer System – No public surface water sewers have been identified within the local area and a more suitable solution for discharging surface water from the proposed development is available. Discharging surface water from the development into the public sewer system is, therefore, not considered to be a viable solution.

9.3 Constraints and Further Considerations

The key constraints that are relevant to this development are listed below:

- Due to the poor infiltration rate, it will not be possible to reduce or maintain the volume of surface water runoff discharged from the development site.
- If connections to the Park Rife are to be constructed, it will be necessary to obtain ordinary watercourse consent from the LLFA before construction can commence. For any connections into the Earnley Rife, consent from the EA will be required.

- As part of the development, some existing structures will be retained and there may be limited opportunity to include SuDS within the existing buildings. Retrofitting SuDS into the retained parts of the development may present an unsustainable or unattainable situation.

- Ideally, post-development runoff rates should be restricted to greenfield runoff rates. In the case of brownfield sites, drainage proposals are typically measured against the existing performance of the site, although it is preferable (where practicable) to provide runoff characteristics that are similar to greenfield behaviour. Due to site constraints, it is not possible to restrict the total runoff rates from the site to greenfield runoff rates, however, a reduction has been provided for each catchment when compared to the existing situation.

9.4 Proposed SuDS

The different SuDS that have been proposed for the scheme are discussed below.

Gravel Paths

Where possible, the paths across the site will be made from gravel to maximise the volume of water that can be infiltrated into the ground.

Swales

Swales designed to blend into the site landscape can be included within the scheme and designed to transport and integrate water into and around the built environment. In addition, Swales can provide some storage for stormwater draining off the new developed areas.

Permeable Surfacing

Runoff from the parking areas and internal roads will be allowed to drain into a layer of open graded subbase material, located beneath permeable surfacing. This layer is designed to store and filter runoff before water is conveyed towards the watercourses across the site. Runoff from the roofs of units close to these roads can also be conveyed via rainwater pipes to the subbase layer.

Various Bioretention Systems

The proposed site landscaping also includes green areas which can be used as bioretention systems, designed to store small volumes of surface water runoff. These systems can also provide pollution control benefits. There is potential within the site to include multiple types of bioretention systems such as tree pits, raingardens, shallow basins or planters.

Lakes

The proposed development also includes a number of lakes that will provide recreational and biodiversity benefits. It is proposed to use these lakes to provide storage in order to attenuate surface water discharged from the development. To achieve this, the permanent water level will be kept 500mm below the top of the bank around each lake. An overflow will be provided above this level that will convey water to a flow control chamber before discharging it at a restricted rate into the drainage system. The lakes have been designed to ensure that a minimum 300mm freeboard is kept above the maximum water level for the design event.

9.5 Proposed Surface Water Management Strategy

The drainage strategy set out below discusses each of the different areas of the proposed scheme, along with the results from a numerical drainage model constructed for the site, which can be used to demonstrate how the overall objectives can be achieved. This does not represent a detailed surface water drainage design; it is simply an assessment to demonstrate that the objectives and requirements of the NPPF and NTSS can be met at the planning stage.

Phasing of the development

It is acknowledged that the development will be built in phases and therefore some areas will be developed before the lakes (that are designed to restrict the runoff rates) are built. A temporary solution for each phase will need to be specified at detailed design. One option would be to provide temporary connections from the affected areas into one of the already constructed lakes. In this circumstance, it would be necessary to keep the water level within these lakes temporarily at a lower level, to provide the required additional storage.

Catchment A

The orchard accommodation area is currently undeveloped. It is proposed to include permeable surfacing for the new roads and parking areas. Runoff from the roofs will be directed via underground pipes into the layer of open graded subbase. The permeable surfacing systems will discharge into landscaped depressions within the open spaces that will provide additional storage, before discharging into Lake 1 at a restricted rate. Both the permeable surfacing system and the landscaped depressions will provide pollution control benefits.

The accommodation in Lake 1 will also drain into permeable surfacing systems that will filter the runoff from the roofs and roads, before discharging it into the lake. The lake will provide additional storage to restrict the rates via the use of a vortex flow control device before discharging runoff into the Park Rife.

The existing roads will drain into the ditches as they currently do, and therefore runoff will be discharged at an unrestricted rate. However, runoff rates from the overall catchment will be significantly reduced.

It is also acknowledged that under the design rainfall event, there will be some flooding from the Park Rife. The results from a numerical rainfall model have been integrated in the hydraulic model to confirm that there is sufficient capacity within the lake to store water if the outfall was to become surcharged. The results show that under this scenario, a 300mm freeboard will still be available within the lake.

Catchment B

The woodland accommodation area is also currently undeveloped. Similar to catchment A, runoff from the roofs will be directed via underground pipes into a layer of open graded subbase located beneath permeable surfacing. The permeable surfacing systems will be connected to an offline landscaped depression that will provide additional storage, before discharging into the rife at a

restricted rate. Both the permeable surfacing system and the landscaped depression will provide pollution control benefits.

The rife accommodation is located in an area where no land raising is proposed, due to the proximity to the rife. There is very limited opportunity to provide storage to restrict the discharge into the rife due to the ecological constraints in this area. Notwithstanding this, the overall discharge rate from the catchment has been significantly reduced and permeable surfacing has been proposed within the carpark to provide pollution control.

Catchment C

Permeable surfacing has also been proposed for the roads in this area. Runoff from the roofs, in addition to the outfalls from the permeable surfacing will be discharged into the lakes. Lakes 2 and 3 are hydraulically linked and will have the same water level. A vortex flow control device has been proposed at the outfall from Lake 3 to maximise the storage within these lakes. The outflow from Lake 4 into the rife will also be restricted, in this case via the use of a 150mm pipe, although a vortex flow control could also be specified if required at the detailed design.

The hydraulic model has also been run considering a surcharged outfall, based on the results from the numerical rainfall model for the design event. The results show that under this scenario, a 300mm freeboard will still be available within the lake.

The existing roads will drain into the ditches as they currently do, and therefore runoff will be discharged at an unrestricted rate. However, runoff rates from the overall catchment will be significantly reduced.

Catchment D

The hub building and surrounding area will remain as it is and therefore, its drainage system will remain untouched, draining into the rife at an unattenuated rate. This area will not be raised due to its proximity to the rife and the ecological constraints. As such, there is limited opportunity to retrofit SuDS to restrict the discharge rate.

Notwithstanding this, the impermeable area within this catchment will be reduced and therefore the discharge rates from this catchment will also be reduced. The discharge rates are only increased when an allowance for climate change and urban creep are applied.

Catchment E

The secret garden accommodation will drain runoff into a permeable surfacing system, which will provide pollution control and storage before discharging into the rife at a restricted rate.

Catchment F

The impermeable surfacing within this catchment will be reduced significantly when compared to the existing situation. A swale has been proposed at its lowest point to collect any runoff draining from the catchment, before discharging water into the rife.

9.6 Indicative Drainage Layout Plan

Figure 9.1 below is an indicative drainage layout plan delineating how the proposed SuDS can be incorporated into the scheme proposals.

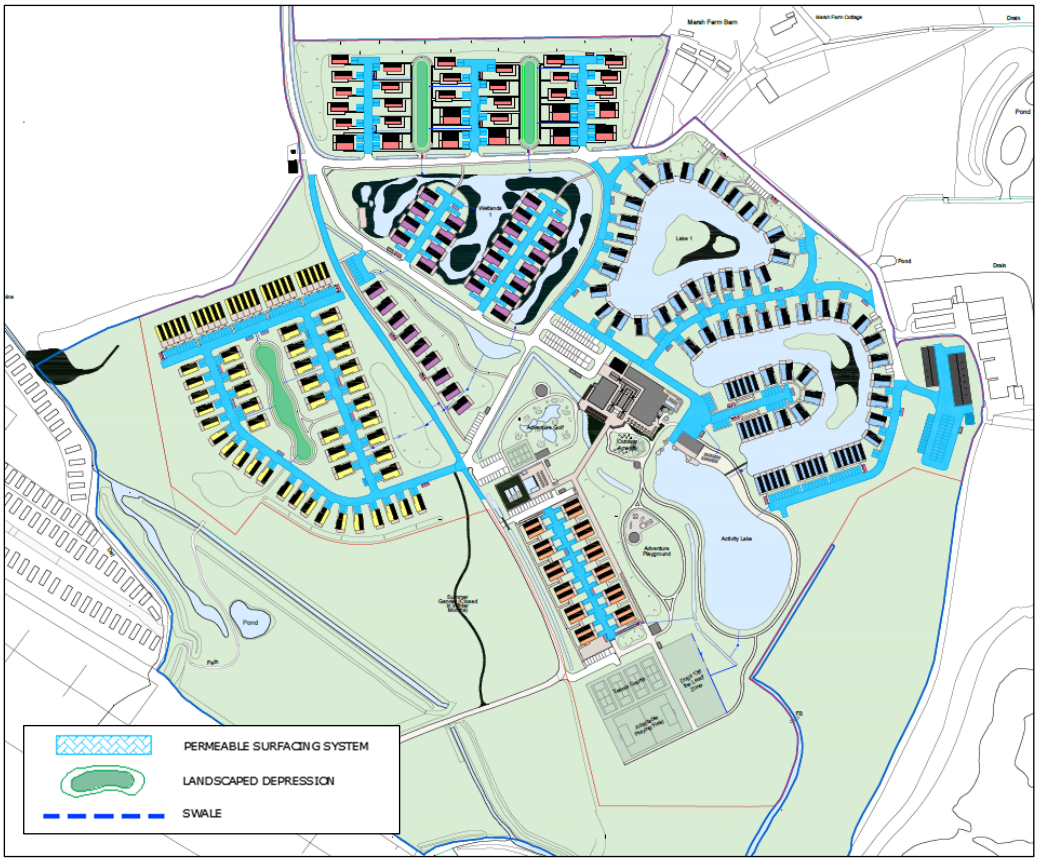


Figure 9.1 - Indicative drainage layout plan showing the proposed location of SuDS.

A full-scale copy of this layout is located in Appendix A.5 of this report.

Drainage Model

A drainage model for the proposed development has been constructed in Causeway Flow+ and the results are included in Appendix A.4. A 10% allowance has been applied to the impermeable areas to account for urban creep. A summary of these results is provided in Table 9.2 and the values confirm that by including the proposed SuDS, the rate at which runoff is discharged from the site can be reduced significantly.

Catchment	Proposed discharge rates Runoff Rates					
	1 in 2 yrs		1 in 30 yrs		1in100 yrs+45%cc	
	Discharge rate	% Betterment	Discharge rate	% Betterment	Discharge rate	% Betterment
Catchment A	68.2 l/s	71%	164.6 l/s	72%	321.5 l/s	56%
Catchment B	45.4 l/s	65%	92.4 l/s	71%	167.3 l/s	58%
Catchment C	42.3 l/s	79%	86.0 l/s	83%	182.5 l/s	71%
Catchment D	151.3 l/s	18%	372.8 l/s	18%	748.4 l/s	-31%
Catchment E	12 l/s	77%	12 l/s	91%	12 l/s	93%
Catchment F	38.9 l/s	77%	95.8 l/s	77%	192.4 l/s	64%
Entire Site		**63%**		**66%**		**47%**

Table 9.2 – Summary of peak runoff discharge rates for the proposed development

Whilst it is acknowledged that greenfield runoff rates have not been achieved for this site, there are a number of constraints within the site that should be taken into consideration, including existing areas to be retained and ecological constraints. It is therefore considered that a significant betterment has been provided within the site and that the discharge rates proposed are as close as reasonably practicable to the greenfield runoff rates for the site.

9.7 Management and Maintenance

In order for any surface water drainage system to operate as originally designed, it is necessary to ensure that it is adequately maintained throughout its lifetime. Therefore, over the lifetime of a development there is a possibility that the performance of the system could be reduced or could fail if it is not correctly maintained. This is even more important when SuDS form a part of the surface water management system, as these require a more onerous maintenance regime than a typical piped network.

The key requirements of any management regime are routine inspection and maintenance. When the development is taken forward to the detailed design stage, an ‘owner’s manual’ will need to be prepared. This should include:

- A description of the drainage scheme.
- A location plan showing all of the SuDS features and equipment, such as flow control devices etc.
- Maintenance requirements for each element, including any manufacturer-specific requirements.

- An explanation of the consequences of not carrying out the specified maintenance.
- Details of who will be responsible for the ongoing maintenance of the drainage system.

General maintenance schedules have been included within the appendices of this report, which demonstrate the maintenance requirements of the proposed SuDS. For developments such as this, that to some extent rely on the ongoing inspection and maintenance of SuDS, it will be necessary to ensure that measures are in place to maintain the system for the lifetime of the development. For this site, it is likely that the management company responsible for maintaining the rest of the site will be tasked with the inspection and maintenance of these features.

Further details of the maintenance and management strategy should be confirmed, following the completion of a detailed drainage design for the development.

9.8 Sensitivity Testing and Residual Risk

When considering residual risk, it is necessary to consider the impact of a flood event that exceeds the design event, or the implications if the proposed drainage system was to become blocked.

If an exceedance event was to occur, the water level within the lakes will go above the designed maximum level, filling up the lake and utilising the proposed 300mm freeboard. If water gets to the top of the bank, it will overflow towards the watercourses within the site where it will create some flooding. Other proposed SuDS within the site may also become overwhelmed and overflow.

It is however recognised that some areas within the site, in particular around the existing watercourses, are already flooding in the current situation. Notwithstanding this, it is recognised that the drainage proposals will incorporate a significant volume of additional storage for storm water, which is not currently provided on the existing site. As a result, when compared to the existing site, it is likely that the volume of water discharged from the site during an extreme rainfall will be reduced, thus minimising the potential impact of flooding to the surrounding area.

Based on the analysis above it is therefore concluded that the proposed drainage system outlined within this strategy will not result in an increased risk of flooding to properties at the site or within the surrounding area.

10 Foul Water Management Strategy

10.1 Background

The objective of this foul water drainage strategy is to ensure a viable solution is available for managing foul effluent discharged from the proposed development site.

In general, there are two methods for draining effluent from proposed developments. The preferred solution is a connection to the public sewer network, which is controlled by the sewerage undertaker. Nonetheless, if there are no sewers near to the development site or there are particular reasons why a connection to the public sewer system would not be possible i.e., topography, cost, environmental concerns, then the use of package treatment systems or cesspits is permitted.

The Environment Agency's "Binding Rules" control the use of package treatment systems and require the development to connect to the public sewer system if the site boundary is located within 30m of an existing sewer (plus an additional 30 meters for every proposed unit). In this case, the existing development already has a connection into a public foul sewer and therefore, the use of package treatment systems is unlikely to be considered appropriate for this development.

10.2 Sewer Connection

As indicated in Appendix A.2, there is an existing public foul sewer located approximately 200m to the west of the site, within East Bracklesham Drive. The site currently drains its foul water into a pumping station within the site that pumps the effluent into this public sewer. It is therefore anticipated that the proposed development will use the existing connection into the existing sewer network.

RGP Ltd prepared a Foul Water Management Strategy for the previous application, which stated that Southern Water agreed *"there will be no connection or infrastructure charges if the existing number of units is not exceeded as there would be no change in the anticipated levels of flow generated"*. Given that the new scheme would maintain the 308 units, it is considered that a strategy utilising the existing pumping station and holding tank will be appropriate. It is recommended that the capacity and condition of the existing holding tank, pumping station and connection to the sewer are confirmed, and Southern Water reconsulted to confirm that the previous arrangement is still acceptable.

10.3 Summary

The opportunities for managing foul effluent discharged from the development site have been analysed and it is concluded that the existing connection to the public sewer system located to the west of the site is likely to present the most viable solution.

Following the award of planning permission, the capacity of the existing system will need to be confirmed and a full detailed design of the foul drainage system will be required.

11 Offsite Impacts and Other Considerations

11.1 Displacement of Floodwater

The construction of a new building within the floodplain has the potential to displace floodwater and to increase the risk of flooding elsewhere by raising flood levels. However, where development is proposed in tidal floodplains, such as is the case here, it is generally accepted by the EA that raising the ground or building on the floodplain is unlikely to have a detrimental impact on the maximum tidal levels. Consequently, compensatory floodplain storage will not be required for tidal floodwater.

It has been identified that part of the site is also predicted to flood from the Park Rife during an extreme rainfall event and therefore, it is also necessary to consider the impact of the development on flood storage during extreme pluvial events. As a numerical flood model has been created, it is possible to compare the pre- and post-development scenarios, to determine whether the proposed land raising and buildings would result in an increased risk of flooding offsite.

When the first iteration of the pluvial proposed scenario was compared to the baseline scenario, a difference plot identified some areas where the proposed scheme led to an increase in flood risk outside the application boundary, albeit by less than 3cm. These areas were along the northern boundary, northeast boundary of the site adjacent to the neighbouring cottages and along the north east boundary of the site adjacent to the existing road. Whilst the increase was miniscule and could be considered negligible, some minor alterations were made to ensure this risk could be managed.

Interception ditches have been included in the proposed design in these locations in order to capture any surface water directed towards these areas and to provide additional storage within the site boundary, within which the water can be stored. The proposed land raising also includes low level bunding and alterations to existing ditches in the northeast corner of the site to ensure no increase offsite to the east of the existing roadway and to the cottages adjacent to the site.

It is acknowledged that there are minor areas shown to now be wet to the north of the site (Refer to Appendix 8.2 of the ES), however, considering the modelling also shows much larger areas of reduced flood risk to the north, it is concluded that the small areas shown to now be wet, which have a depth of flooding less than 3cm, are negligible and will have no material impact. It is also noted that there are some increases in flood depth and extent in the southwest part of the site during the design event. Whilst these areas are outside the red line boundary, the land affected is still within the ownership of the applicant and therefore these increases are considered acceptable.

11.2 Public Safety and Access

The NPPF states that safe access and escape should be available to/from new developments located within areas at risk of flooding. The Practice Guide goes on to state that access routes should enable occupants to safely access and exit their dwellings during design flood conditions and that vehicular access should be available to allow the emergency services to safely reach the development.

It has been identified within Section 5 and 7 that the site could be subject to flooding from pluvial and tidal sources during extreme events. Whilst all new lodges will have floor levels raised above the design tidal flood level, safe access to, from and around the site is unlikely to be available at the peak of such an event as floodwater will still accumulate within the lower areas of the site, particularly surrounding the Park Rife.

As discussed in Section 6.5, occupants should sign up to receive the EA's flood warnings and a Flood Evacuation Plan (FEP) has been prepared for the holiday park. With the flood warnings and FEP in place, occupants and users of the site will receive forewarning of conditions which could result in flooding and can evacuate to an area outside the flood extent or to their permanent place of residence prior to the onset of flooding.

If evacuation prior to a flood event is not possible, all occupants will have access to an area raised above the design flood level within their lodge and any users of the site can seek refuge within the upper floors of the central facilities.

11.3 Proximity to Watercourse and Flood Defence Structures

Main Rivers and Watercourses

Under the Water Resources Act 1991 and Land Drainage Byelaws, any proposals for development in close proximity to a 'main river' would need to take into account the EA's requirement for an 8m buffer zone between the riverbank and any permanent construction, such as buildings or defences etc. This buffer zone increases to 16m for tidal waterbodies and sea defence infrastructure.

This easement allows access for maintenance, to provide biodiversity opportunities, and also to provide room for the riverbanks to erode without threatening any development. Consequently, prior consent of the EA is required for any development within the bye-law distance and this consent is in addition to planning permission.

With respect to the Earnley Rife, the watercourse is not considered to be tidal and as such, the EA will require a maximum easement of 8m. The proposals will not encroach on this easement and as such, access for maintenance can be achieved.

The Park Rife is not classified as a main river and as such, will not compromise any of the EA's maintenance or access requirements. As a result of ecological surveys, which identified the presence of water vole habitats around the Park Rife, it is not possible to make changes within close proximity to large sections of the rife. However, it is recognised that formal written consent may be required from the LLFA for any works on/around the watercourse that could affect in-channel flows.

Sea Defence Easements

Typically, the EA require a 16m easement for tidal waterbodies and sea defence infrastructure, to allow for essential maintenance work to be undertaken. In this case, all works are located significantly further than 16m from the EA maintained defences and therefore will not infringe on the access requirements.

11.4 Impact on Coastal Morphology

As part of the coastal processes study undertaken for the previous application, it was confirmed that the site is not situated behind any morphologically active area and therefore, the proposals will not have any influence on the sediment transport regime or coastal processes at this location. Therefore, the proposal will not directly affect the coastal morphology.

12 Conclusions and Recommendations

The overarching objective of this report is to appraise the risk of flooding at Medmerry Park, Chichester to ensure that the proposals for development are acceptable and that any risk of flooding is appropriately mitigated, to ensure the safety of the occupants of the proposed lodges, the users of the park and the site staff. In addition, the NPPF also requires the risk of flooding offsite to be managed, to prevent any increase in flood risk as a result of the development proposals.

This report has therefore been prepared to appraise the risk of flooding from all sources and to provide a sustainable solution for managing the surface water runoff discharged from the development site, in accordance with the NPPF, NPPG, NTSS and local planning policy.

The site is located within Flood Zone 1, 2 and 3 and as such, the NPPF requires a Sequential Test to be undertaken. A Sequential Test was prepared as part of the previous application in 2019 (by others), which concluded that the development passed the Sequential Test. CDC concluded that the proposals passed the Sequential Test, as noted on page 40 of the delegated report. Whilst further Sequential Testing has not been undertaken to support the latest proposals, considering the previous assessment concluded the test was passed and the proposed development comprises the replacement of the same number of units as currently exists, it is assumed that the proposed development will pass the Sequential Test.

As much of the site is located within Flood Zones 3, it is also necessary to consider whether the development proposals pass the Exception Test. Through the appraisal of flooding from all sources, and detailed numerical flood modelling (pluvial and tidal), this report provides evidence to demonstrate that Part B of the Exception Test can be passed. This can be achieved by including appropriate mitigation within the scheme design.

The findings of the analysis conclude that the site could be subject to flooding from both tidal and pluvial sources. Section 5 of this report appraises the risk of flooding to the site from these sources in detail at a site-specific scale, to determine the type of mitigation measures required to manage the risk of flooding. This appraisal takes a precautionary approach in regard to assessing tidal flood risk, by assuming that the coastal defence adjacent to the site will not be maintained for the lifetime of the development. Consequently, the mitigation measures proposed in this report are based upon a worst case scenario.

A key aim of the proposed development was to reduce flood risk and therefore, the Sequential Approach has been applied to the layout of the proposed lodges, moving the more vulnerable lodges away from the coastline (when compared to the current site layout). These relocated lodges are to be situated on the highest areas of the site and by doing so, the proposed development provides a betterment when compared to the existing situation (before further mitigation measures are even considered).

Notwithstanding this, the proposed development will include a number of additional mitigation options in order to reduce the risk of flooding to the future residents of the proposed lodges and other users of the site. The following measures are recommended for inclusion within the scheme:

- **Land Raising** - Land raising is proposed across the site to reduce the predicted depth of flooding in the future. A land raising plan (prepared by others) is appended to this report at Appendix A.7.

- **Floor Level Raising** - The lodges will be located on the raised areas of the site with the floor levels of the lodges raised further to be above the worst case tidal flood level of 4.44m AODN.

- **Flood Resistance and Resilience Measures** - Flood resistance and resilience measures are recommended to be included (600mm above the flood level of 4.44m AODN), as a precautionary measure to manage the risk of flooding during an exceedance event. These measures are also recommended to be included within the existing commercial facilities that are to be retained.

- **Flood Warning and Flood Evacuation Plan** - Occupants and staff should sign up to receive flood warnings from the EA and Met Office Weather Warnings to ensure they are aware of conditions which could result in flooding. These warnings can be used in conjunction with the FEP which has been prepared for the site.

In addition to the above, this FRA has also demonstrated that the development will not increase the risk of flooding elsewhere. The Surface Water Management Strategy concludes that the most viable solution for managing all of the surface water runoff discharged from the proposed development will be via connections to the watercourses within the site.

Various SuDS have been proposed, including permeable surfacing, swales, bioretention systems and lakes. These SuDS will be used to store water onsite and provide pollution control benefits, before water is discharged to the watercourse. Surface water discharge rates from the development have been reduced significantly when compared to the existing situation and reflect the ecological constraints imposed on the Park Rife.

The opportunities for discharging foul effluent from the site have also been considered and the appraisal demonstrates that the most viable solution is to connect into the public foul sewer network using the existing connection.

In conclusion, following the recommendations of this report, the proposed development will provide as significant betterment compared to the existing site. The future occupants, users and staff of the site will be safe for the lifetime of the development and the development will not increase the risk of flooding elsewhere. Consequently, it has been demonstrated that the development can pass Part B of the Exception Test and will therefore meet the requirements of the NPPF, NTSS and local planning policy.

13 Appendices

Appendix A.1 – Drawings

Appendix A.2 – Southern Water Asset Location Data

Appendix A.3 – Site Investigations (undertaken by Enzygo Environmental Consultants)

Appendix A.4 – Surface Water Management Calculations

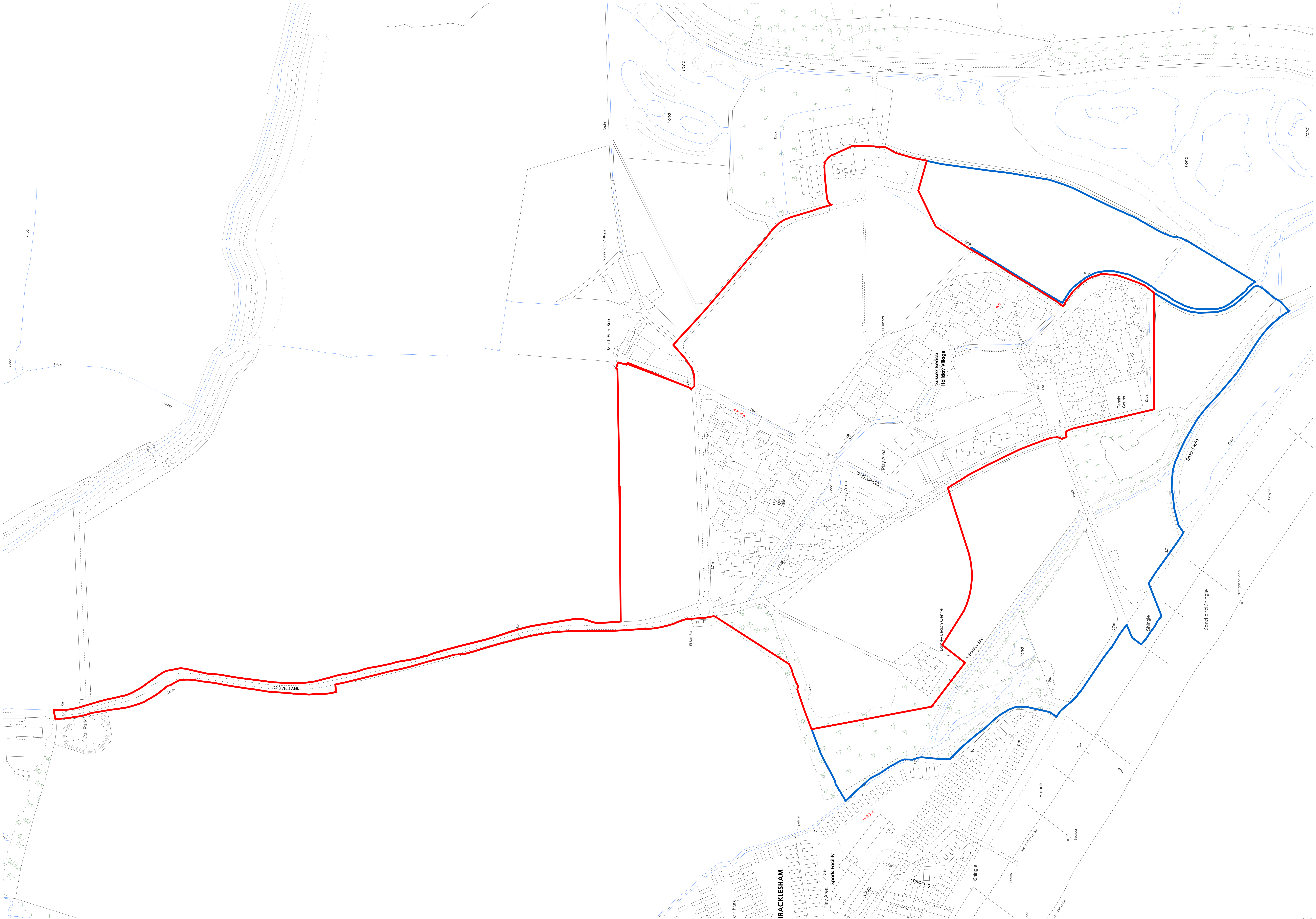
Appendix A.5 – Indicative Drainage Layout

Appendix A.6 – Maintenance Schedules

Appendix A.1 – Drawings

Key Plan

- Site Boundary (21.7HA, 53.6 Acre)
- Land Under Ownership (33.3HA, 82.4 Acre)



Site Location Plan
1:2,000 @ A1

0 12.5 25 37.5 50 62.5 75 87.5 100 112.5 125m

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- S3: Fit for internal review
- S4: Fit for construction approval
- D1: Fit for costing
- D2: Tender issue
- D3: Fit for contractor design
- D4: Fit for manufacture procurement
- A: Construction issue
- B: Partially signed-off
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Date	Rev ID	Description
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Project:
Medmerry Park - Site Redevelopment

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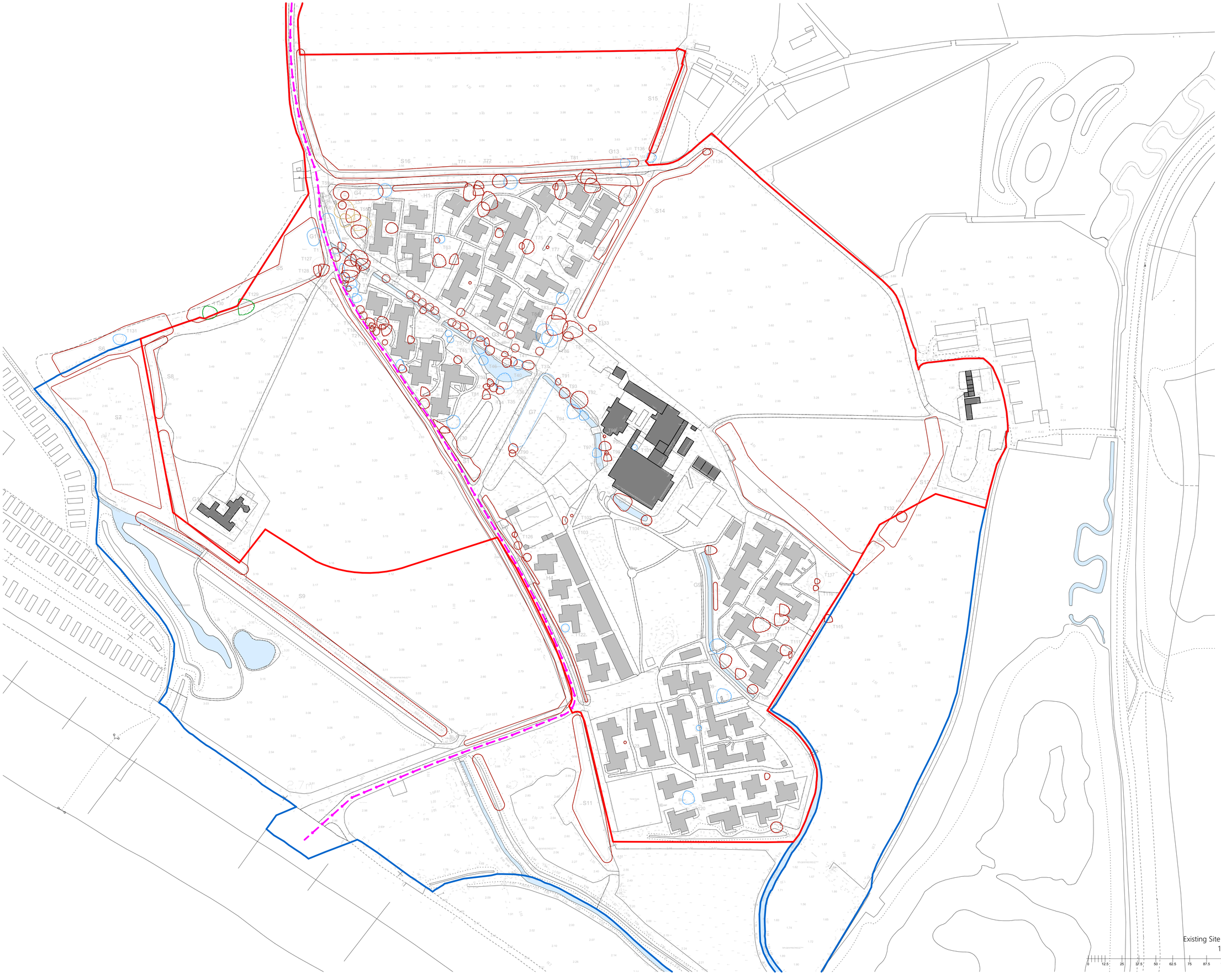

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Key Plan

- Site Boundary (21.7HA, 53.6 Acre)
- Land Under Ownership (33.3HA, 82.4 Acre)
- Public Right of Way
- Category A Tree
- Category B Tree
- Category C Tree
- Category U Tree

Refer to Submitted Tree Survey for Further Details

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Notes:

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Survey carried out to client specification and in accordance with RICS publication:
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Positional accuracy will vary with depth and pipe / duct material; an accuracy of +/- 150 mm is achievable in normal circumstances but this will be reduced for plastic pipes.

Existing information from historical plans is likely to be unreliable and is shown for guidance only.

Excavations in the area should be carried out with care and in accordance with HSG 47. No absolute guarantee of accuracy should be inferred from these plans.

The following text is an extract from Surveys of Land, Buildings and Utility Surveys at scales of 1:500 and Larger, 3rd Edition

"Electronic tracing is a reliable, method of locating buried services. ***On Heavy, built up sites 85% completeness is probably all that can be expected.*** *Plan accuracies of +/- 150mm may be achieved but this figure will depend on the depth of the service below ground level.* ***Where similar services run in close proximity, separation may be impossible. Successful tracing of non-metallic pipes may be limited.*** *Existing record information showing underground services is often incomplete and of doubtful accuracy. It should be regarded only as an indication and cannot be guaranteed"*

Standard Abbreviations

ACO	LINEAR DRAINAGE CHANNEL	Flat RF	FLAT ROOF LEVEL	RS	ROAD SIGN
AV	AIR VALVE	FH	FIRE HYDRANT	RSP	RAILWAY SIGNAL POST
A/R	ASSUMED ROUTE	FS	FLAG STAFF	RW	RETAINING WALL
BB	BELISH BEACON	G	GULLY	RWP	RAN WATER PIPE
BdL	BED LEVEL	GIS	GAS INLET POINT	Sap	SAPLING
BH	BOREHOLE	GP	GUIDE POST	SB	SIGN BOARD
Bol	BOLLARD	GPR	GROUND PROBING RADAR	Shlt	SHELTER
BP	BOUNDARY POST	Grl	GRILLE COVER	Si	SPUN IRON
B Pvg	BLOCK PAVING	GV	GAS VALVE COVER	SL	SOFFIT LEVEL
BRck	BICYCLE RACK	HrI	HAND RAIL	Slt	SILT LEVEL
BS	BUS STOP	IC	INSPECTION COVER	SMP	SETTLEMENT MONITORING Pnt
BT	BRITISH TELECOM COVER	IL	INVERT LEVEL	SP	SIGN POST
BW	BRICK WALL	I/R	IRON RAILING FENCE	Spd Hump	SPEED HUMP
BWF	BARBED WIRE FENCE	KO	KERB OUTLET	SPt	SAMPLING POINT
CAP	CABLE WINDING MACHINE	Lby	LIFEBUOY	SS	STRUCTURE POINT
Cat	CATENARY LEVEL	Lck	LOCK GATE	ST	STAND PIPE / SUPPLY TAP
CATV	CABLE TV COVER	Ldr	LADDER	Sti	STILE
CB	CONTROL BOX	LOR	LOSS OF REFLECTION (gpr)	Stone Pvg	STONE PAVING SLABS
C/B	CLOSE BOARDED FENCE	LOS	LOSS OF SIGNAL (eml)	STP	STAND PIPE
CD	CHAMBER DEPTH	LP	LAMP POST	StPO	STAY POST
Cgd	CATTLE GRID	Mcy	MACHINERY	Stu	STUMP
Ci	CAST IRON	MH	MANHOLE	StW	STAYWIRE
CIP	CABLE INLET POINT	MgP	MOORING POST	SV	STOP VALVE
CL	COVER LEVEL	Mkr	MARKER POST	SW	STONE WALL
C/L	CHAIN LINK FENCE	MP	MILE POST	Tac	TACTILE PAVING
Col	COLUMN	MS	MILESTONE	TBM	TEMPORARY BENCH MARK
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Conc Pvg	CONCRETE PAVING	NVP	NO VISIBLE PIPE	TCB	TELEPHONE CALL BOX
CP	CATCHPIT	NP	NAME PLATE	TCP	TELEPHONE CALL POST
Cpe	CHILDRENS PLAY EQUIPMENT	OSA	OUTSIDE SURVEY AREA	TEL	TELECOM COVER
Cpy	BUILDING CANOPY	OSBM	OS BENCH MARK	ThL	THRESHOLD LEVEL
Cpsn	CAPSTAN	OGC	OVERGROUND CONDUIT	TL	TRAFFIC SIGNAL POST
CR	CRANE / HOIST	OHC	OVERHEAD CONDUIT	TM	TICKET MACHINE
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Ct	CABLE TRAY/ TROUGH	OHG	OVERHEAD GANTRY	TP	TELEGRAPH POLE
CW	CONCRETE WALL	OHStruct	OVERHEAD STRUCTURE	Tpt	TRIAL PIT
Dav	Davit	OHT	OVERHEAD TELECOMS	Tr	TROUGH
DC	DUCT COVER	OHU	OVERHEAD UNKNOWN	UTA	UNABLE TO ACCESS
Di	DUCTILE IRON	P	POST	UTL	UNABLE TO LOCATE
(dilap)	DILAPIDATED	PB	POST BOX	UTR	UNABLE TO RAISE
(dis)	DISUSED	PC	SECURITY CAMERA	UTS	UNABLE TO SURVEY
DPC	DAMP PROOF COURSE	Pcg	PEDESTRIAN CROSSING	UTT	UNABLE TO TRACE (utilities)
DS	DIRECTION SIGN	PD	PIT DEPTH	VC	VITRIFIED CLAY
DSW	DRYSTONE WALL	P/F	PANEL FENCE	VDP	VEHICLE DETECTION PAD
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CTV	CCTV CABLE	OIL	OIL PIPELINE
CTV(r)	TAKEN FROM RECORDS	OIL(r)	TAKEN FROM RECORDS
CW	COMBINED WATER	PWR	POWER FEATURE
CW(r)	TAKEN FROM RECORDS	SW	SURFACE WATER
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EA(r)	TAKEN FROM RECORDS	TLM	TELEMETRY CABLE
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FL(r)	TAKEN FROM RECORDS	UK(r)	TAKEN FROM RECORDS
FW	FOUL WATER	VNT	VENT
FW(r)	TAKEN FROM RECORDS	VNT(r)	TAKEN FROM RECORDS
GAS	GAS	W	WATER
GAS(r)	TAKEN FROM RECORDS	W(r)	TAKEN FROM RECORDS
GPR	GPR FEATURE	HV	HV ELECTRIC
GPR(r)	TAKEN FROM RECORDS	HV(r)	TAKEN FROM RECORDS
Helium	HELIUM FEATURE	REF:GPR02	REFERENCE TO GPR DATA IN REPORT
Helium(r)	TAKEN FROM RECORDS		

PAS 128 Quality Levels:

SURVEY TYPE, QUALITY LEVELS AND ACCURACY	SUPPORTING DATA
VERIFICATION: QL-A: HORIZONTAL ± 50MM VERTICAL ± 25MM	HORIZONTAL & VERTICAL LOCATION OF THE TOP AND/OR BOTTOM OF THE ITEM.
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SITE RECONNAISSANCE: QL-C	---
DESKTOP: QL-D	---

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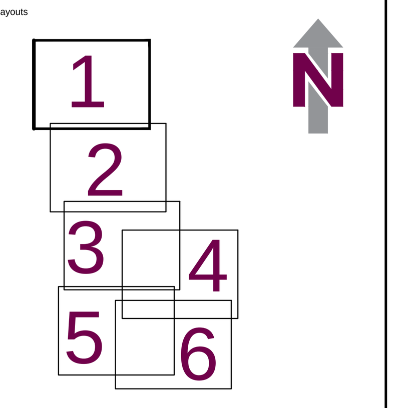

Grid:
National Grid by GPS Observations to the OS Active Network (OSTN15)

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Ordnance Datum by GPS Observations to the OS Active Network (OSGM15)

Revision:	Amendments:	Date:	Name:
-	-	-	-
-	-	-	-
-	-	-	-
A	ORIGINAL ISSUE	MAR'23	JH

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THE SURVEY ASSOCIATION
A TETRA TECH COMPANY
Stafford - Clevedon - Milton Keynes - Warrington - Edinburgh
T: 0800 917 8227 E: rps.survey@rpsgroup.com www.rpsgroup.com
Red Deer House, Dunston Business Village, Stafford Road, Dunston, Staffordshire, ST18 9AB

CLIENT:
Laister Planning Limited
Ground Floor, Oddfellows Hall, London Road
Chipping Norton, Oxfordshire
OX7 5QH

PROJECT:
Medmerry
Holiday Village

TITLE:
Topographical
Survey

Drawn: JH/MV/GK/MK	Checked: RJ
Date: March 2023	Scale: 1:500 @ A0 (1:200 Text)
Drg No: UAT3127_A	Sheet: 1 of 6

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CTV(r)	TAKEN FROM RECORDS	O/F(r)	TAKEN FROM RECORDS
CTV	CCTV CABLE	OIL	OIL PIPELINE
CTV(r)	TAKEN FROM RECORDS	OIL(r)	TAKEN FROM RECORDS
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DUC(r)	TAKEN FROM RECORDS	T	TELECOMMUNICATION CABLE
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EA(r)	TAKEN FROM RECORDS	TLM	TELEMETRY CABLE
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FW(r)	TAKEN FROM RECORDS	VNT(r)	TAKEN FROM RECORDS
GAS	GAS	W	WATER
GAS(r)	TAKEN FROM RECORDS	W(r)	TAKEN FROM RECORDS
GPR	GPR FEATURE	HV	HV ELECTRIC
GPR(r)	TAKEN FROM RECORDS	HV(r)	TAKEN FROM RECORDS
Helium	HELIUM FEATURE	REF GPR02	REFERENCE TO GPR DATA IN REPORT
Helium(r)	TAKEN FROM RECORDS		

PAS 128 Quality Levels:

SURVEY TYPE, QUALITY LEVELS AND ACCURACY	SUPPORTING DATA
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SITE RECONNAISSANCE: QL-C	---
DESKTOP: QL-D	---

NOTES: HORIZONTAL/VERTICAL VARIABLES BASED ON DETECTED LOCATION OF UTILITY
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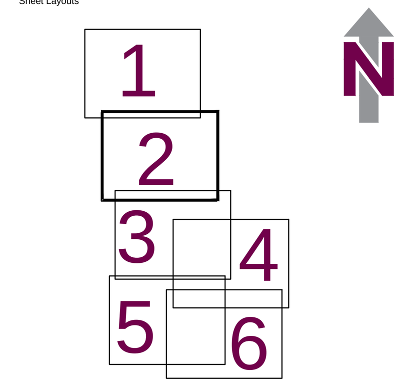

Grid:	Datum:
National Grid by GPS Observations to the OS Active Network (OSTN15)	Ordnance Datum by GPS Observations to the OS Active Network (OSGM15)

Revision:	Amendments:	Date:	Name:
-	-	-	-
-	-	-	-
-	-	-	-
A	ORIGINAL ISSUE	MAR'23	JH

MAKING COMPLEX EASY

THE SURVEY ASSOCIATION

A TETRA TECH COMPANY
Stafford - Clevedon - Milton Keynes - Warrington - Edinburgh
T: 0800 917 8227 E: rps.survey@rpsgroup.com www.rpsgroup.com
Red Deer House, Dunston Business Village, Stafford Road, Dunston, Staffordshire, ST18 9AB

CLIENT:
Laister Planning Limited
Ground Floor, Oddfellows Hall, London Road
Chipping Norton, Oxfordshire
OX7 5QH

PROJECT:
Medmerry
Holiday Village

TITLE:
Topographical
Survey

Drawn: JH/MV/GK/MK	Checked: RJ
Date: March 2023	Scale: 1:500 @ A0 (1:200 Text)
Drg No: UAT3127_A	Sheet: 2 of 6

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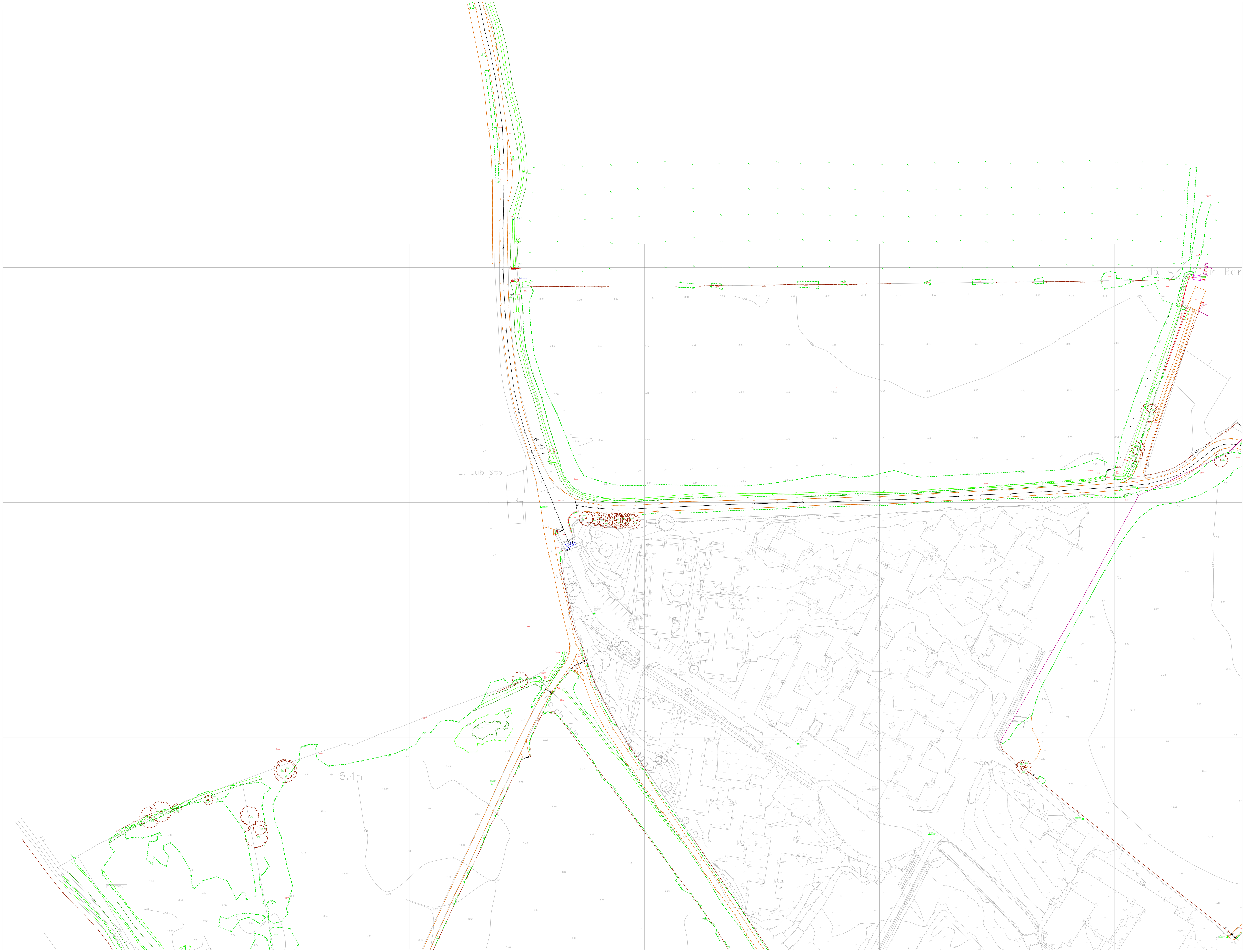

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Positional accuracy will vary with depth and pipe / duct material; an accuracy of +/- 150 mm is achievable in normal circumstances but this will be reduced for plastic pipes.

Existing information from historical plans is likely to be unreliable and is shown for guidance only.

Excavations in the area should be carried out with care and in accordance with HSG 47. No absolute guarantee of accuracy should be inferred from these plans.

The following text is an extract from Surveys of Land, Buildings and Utility Surveys at scales of 1:500 and Larger, 3rd Edition

*"Electronic tracing is a reliable, method of locating buried services. **On Heavy, built up sites 85% completeness is probably all that can be expected.** Plan accuracies of +/- 150mm may be achieved but this figure will depend on the depth of the service below ground level. **Where similar services run in close proximity, separation may be impossible. Successful tracing of non-metallic pipes may be limited.** Existing record information showing underground services is often incomplete and of doubtful accuracy. It should be regarded only as an indication and cannot be guaranteed"*

Standard Abbreviations

ACO	LINEAR DRAINAGE CHANNEL	Flat RF	FLAT ROOF LEVEL	RS	ROAD SIGN
AV	AIR VALVE	FH	FIRE HYDRANT	RSP	RAILWAY SIGNAL POST
A/R	ASSUMED ROUTE	FS	FLAG STAFF	RW	RETAINING WALL
BB	BELISH BEACON	G	GULLY	RWP	RAIN WATER PIPE
BdL	BED LEVEL	GIS	GAS INLET POINT	Sap	SAPLING
BH	BOREHOLE	GP	GUIDE POST	SB	SIGN BOARD
Bol	BOLLARD	GPR	GROUND PROBING RADAR	Shlt	SHELTER
BP	BOUNDARY POST	Grl	GRILLE COVER	SI	SPUN IRON
B Pvg	BLOCK PAVING	GV	GAS VALVE COVER	SL	SOFFIT LEVEL
BRck	BICYCLE RACK	HrI	HAND RAIL	Slt	SILT LEVEL
BS	BUS STOP	IC	INSPECTION COVER	SMP	SETTLEMENT MONITORING Pnt
BT	BRITISH TELECOM COVER	IL	INVERT LEVEL	SP	SIGN POST
BW	BRICK WALL	I/R	IRON RAILING FENCE	Spd Hump	SPEED HUMP
BWF	BARBED WIRE FENCE	KO	KERB OUTLET	SPt	SAMPLING POINT
CAP	CABLE WINDING MACHINE	Lby	LIFEBUOY	SS	STRUCTURE POINT
Cat	CATENARY LEVEL	Lck	LOCK GATE	ST	STAND PIPE / SUPPLY TAP
CATV	CABLE TV COVER	Ldr	LADDER	Sti	STILE
CB	CONTROL BOX	LOR	LOSS OF REFLECTION (gpr)	Stone Pvg	STONE PAVING SLABS
C/B	CLOSE BOARDED FENCE	LOS	LOSS OF SIGNAL (eml)	STP	STAND PIPE
CD	CHAMBER DEPTH	LP	LAMP POST	StPO	STAY POST
Cgd	CATTLE GRID	Mcy	MACHINERY	Stu	STUMP
CI	CAST IRON	MH	MANHOLE	StW	STAYWIRE
CIP	CABLE INLET POINT	MgP	MOORING POST	SV	STOP VALVE
CL	COVER LEVEL	Mkr	MARKER POST	SW	STONE WALL
C/L	CHAIN LINK FENCE	MP	MILE POST	Tac	TACTILE PAVING
Col	COLUMN	MS	MILESTONE	TBM	TEMPORARY BENCH MARK
Conc	CONCRETE	MU	ELECTRIC MOTOR	TBol	BOLLARD (Dept Transport)
Conc Pvg	CONCRETE PAVING	NVP	NO VISIBLE PIPE	TCB	TELEPHONE CALL BOX
CP	CATCHPIT	NP	NAME PLATE	TCP	TELEPHONE CALL POST
Cpe	CHILDRENS PLAY EQUIPMENT	OSA	OUTSIDE SURVEY AREA	TEL	TELECOM COVER
Cpy	BUILDING CANOPY	OSBM	OS BENCH MARK	ThL	THRESHOLD LEVEL
Cpsn	CAPSTAN	OGC	OVERGROUND CONDUIT	TL	TRAFFIC SIGNAL POST
CR	CRANE / HOIST	OHC	OVERHEAD CONDUIT	TM	TICKET MACHINE
Cul	CULVERT	OHE	OVERHEAD ELECTRIC	ToV	TOP OF VALVE LEVEL
Ct	CABLE TRAY/ TROUGH	OHG	OVERHEAD GANTRY	TP	TELEGRAPH POLE
CW	CONCRETE WALL	OHStruct	OVERHEAD STRUCTURE	Tpt	TRIAL PIT
Dav	Davit	OHT	OVERHEAD TELECOMS	Tr	TROUGH
DC	DUCT COVER	OHU	OVERHEAD UNKNOWN	UTA	UNABLE TO ACCESS
DI	DUCTILE IRON	P	POST	UTL	UNABLE TO LOCATE
(dilap)	DILAPIDATED	PB	POST BOX	UTR	UNABLE TO RAISE
(dis)	DISUSED	PC	SECURITY CAMERA	UTS	UNABLE TO SURVEY
DPC	DAMP PROOF COURSE	Pcg	PEDESTRIAN CROSSING	UTT	UNABLE TO TRACE (utilities)
DS	DIRECTION SIGN	PD	PIT DEPTH	VC	VITRIFIED CLAY
DSW	DRYSTONE WALL	P/F	PANEL FENCE	VDP	VEHICLE DETECTION PAD
Eav	EAVES LEVEL	PP	PETROL PUMP	VP	VENT PIPE
EIC	ELECTRICITY COVER	P/R	POST & RAIL FENCE	VW	VALVE WHEEL
EOT	END OF TRACE (utility)	Psk	PENSTOCK	WB	WEIGH BRIDGE
EP	ELECTRICITY POLE	PV	VERTICAL PIPE	WG	WATER GAUGE
ER	EARTH ROD	Pyl	PYLON	WL	WATER LEVEL
ESP	ELECTRICITY SUPPLY POINT	PZ	PIEZOMETER	WM	WATER METER
ESW	ELECTRICITY SWITCH BOX	Rdg	RIDGE LEVEL	W/M	WIRE MESH FENCE
EVC	ELECTRIC VEHICLE CHARGING	RE	RODDING EYE	WO	WASHOUT COVER
FB	FOOTBRIDGE	RG	RAIN GAUGE	WS	WIND SOCK POLE
FL	FLOOR LEVEL	RL	RIDGE LEVEL	WSR	WATER LEVEL SENSOR
FFL	FINISHED FLOOR LEVEL	RMP	RESRVOIR MONITORING Pnt		
Flgt	FLOOR LIGHT	RP	REFLECTOR POST		

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BT	BRITISH TELECOM	HW	HOT WATER
BT(r)	TAKEN FROM RECORDS	HW(r)	TAKEN FROM RECORDS
CTV	CATV CABLE	O/F	OPTIC FIBRE
CTV(r)	TAKEN FROM RECORDS	O/F(r)	TAKEN FROM RECORDS
CTV	CCTV CABLE	OIL	OIL PIPELINE
CTV(r)	TAKEN FROM RECORDS	OIL(r)	TAKEN FROM RECORDS
CW	COMBINED WATER	PWR	POWER FEATURE
CW(r)	TAKEN FROM RECORDS	SW	SURFACE WATER
DUC	EMPTY DUCT	SW(r)	TAKEN FROM RECORDS
DUC(r)	TAKEN FROM RECORDS	T	TELECOMMUNICATION CABLE
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FW	FOUL WATER	VNT	VENT
FW(r)	TAKEN FROM RECORDS	VNT(r)	TAKEN FROM RECORDS
GAS	GAS	W	WATER
GAS(r)	TAKEN FROM RECORDS	W(r)	TAKEN FROM RECORDS
GPR	GPR FEATURE	HV	HV ELECTRIC
GPR(r)	TAKEN FROM RECORDS	HV(r)	TAKEN FROM RECORDS
Helium	HELIUM FEATURE	REF:GPR02	REFERENCE TO GPR DATA IN REPORT
Helium(r)	TAKEN FROM RECORDS		

PAS 128 Quality Levels:

SURVEY TYPE, QUALITY LEVELS AND ACCURACY	SUPPORTING DATA
VERIFICATION: QL-A: HORIZONTAL ± 50MM VERTICAL ± 25MM	HORIZONTAL & VERTICAL LOCATION OF THE TOP AND/OR BOTTOM OF THE ITEM.
DETECTION: QL-B4	A UTILITY WHICH IS SUSPECTED TO EXIST BUT HAS NOT BEEN DETECTED AND IS SHOWN AS AN ASSUMED ROUTE.
QL-B3/p: HORIZONTAL ±500MM	HORIZONTAL LOCATION ONLY OF THE UTILITY DETECTED BY ONE TECHNIQUE.
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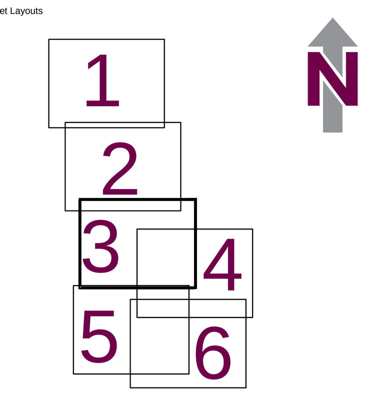
QL-B1/p: HORIZONTAL ±150MM/±15% VERTICAL ±15%	HORIZONTAL AND VERTICAL LOCATION OF UTILITY DETECTED BY MULTIPLE TECHNIQUES.
SITE RECONNAISSANCE: QL-C	---
DESKTOP: QL-D	---

NOTES: HORIZONTAL/VERTICAL VARIABLES BASED ON DETECTED LOCATION OF UTILITY
P = POST PROCESSING
REFER TO FULL PAS128 DOCUMENT FOR FURTHER INFORMATION

Sheet Layouts



Grid:
National Grid
by GPS Observations
to the OS Active
Network (OSTN15)

Datum:
Ordnance Datum
by GPS Observations
to the OS Active
Network (OSGM15)

Revision:	Amendments:	Date:	Name:
-	-	-	-
-	-	-	-
-	-	-	-
A	ORIGINAL ISSUE	MAR'23	JH

MAKING COMPLEX EASY

A TETRA TECH COMPANY

THE SURVEY ASSOCIATION AFFILIATE MEMBER

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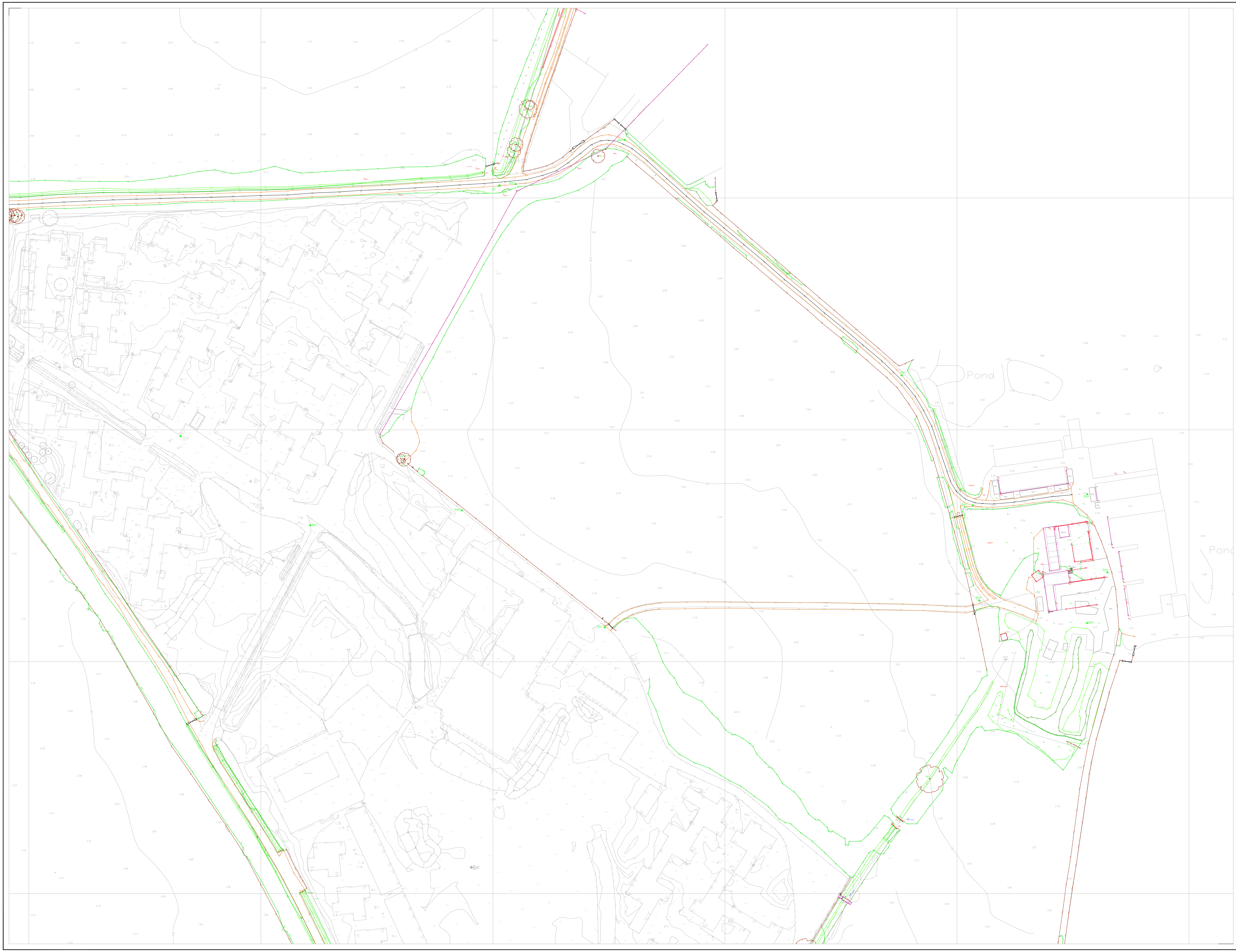
CLIENT:
Laister Planning Limited
Ground Floor, Oddfellows Hall, London Road
Chipping Norton, Oxfordshire
OX7 5QH

PROJECT:
Medmerry
Holiday Village

TITLE:
Topographical
Survey

Drawn:	JH/MV/GK/MK	Checked:	RJ
Date:	March 2023	Scale:	1:500 @ A0 (1:200 Text)
Drg No:	UAT3127_A	Sheet:	3 of 6

MAKING
COMPLEX
EASY



Notes:

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The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work starts. The Contractor is to comply in all respects with current Building Legislation, British Standard Specifications, Building Regulations, Construction (Design & Management) Regulations, Party Wall Act, etc. whether or not specifically stated on this drawing. This drawing must be read with and checked against any structural, geotechnical or other specialist documentation provided.

This drawing is not intended to show details of foundations, ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor. A suitable method of foundation should be provided allowing for existing ground conditions. Any suspect or fluid ground, contaminates on or within the ground, should be further investigated by a suitable expert. Any earthwork constructions shown indicate typical slopes for guidance only & should be further investigated by a suitable expert.

Where existing trees are to be retained they should be subject to a full Arboricultural inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services. A suitable method of foundation is to be provided to accommodate the proposed tree planting. All tree types are provided as a guide only and a full Arboricultural survey to be conducted to determine the exact tree types should be completed.

Sketch proposals are for illustrative purposes only & as such are subject to detailed site investigation including ground conditions/contaminants, drainage, design & planning/density negotiations. Sketch proposals may be based upon enlargements of OS sheets & visual estimations of existing site features, accuracy will therefore need to be verified by survey. Sketch proposals have not been considered in respect of CDM Regulations.

Survey carried out to client specification and in accordance with RICS publication:
SURVEYS OF LAND , BUILDING & UTILITY SERVICES AT SCALES 1:500 & LARGER, 3rd EDITION.

Utility Services Location Note:

This survey has been carried out using a combination of observation and detection using electrolocation and ground probing radar equipment. Connections between reference points such as manholes are assumed to be straight unless bends are indicated. The accuracy is limited to the tolerances normally expected from the equipment used.

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Standard Abbreviations

ACO	LINEAR DRAINAGE CHANNEL
AV	AIR VALVE
A/R	ASSUMED ROUTE
BB	BELISH BEACON
BdL	BED LEVEL
BH	BOREHOLE
Bol	BOLLARD
BP	BOUNDARY POST
B Pvg	BLOCK PAVING
BRck	BICYCLE RACK
BS	BUS STOP
BT	BRITISH TELECOM COVER
BW	BRICK WALL
BWF	BARBED WIRE FENCE
CAP	CABLE WINDING MACHINE
Cat	CATENARY LEVEL
CATV	CABLE TV COVER
CB	CONTROL BOX
C/B	CLOSE BOARDED FENCE
CD	CHAMBER DEPTH
Cgd	CATTLE GRID
CI	CAST IRON
CIP	CABLE INLET POINT
CL	COVER LEVEL
C/L	CHAIN LINK FENCE
Col	COLUMN
Conc	CONCRETE
Conc Pvg	CONCRETE PAVING
CP	CATCHPIT
Cpe	CHILDRENS PLAY EQUIPMENT
Cpy	BUILDING CANOPY
Cpsn	CAPSTAN
CR	CRANE / HOIST
Cul	CULVERT
Ct	CABLE TRAY/ TROUGH
CW	CONCRETE WALL
Dav	Davit
DC	DUCT COVER
DI	DUCTILE IRON
(dilap)	DILAPIDATED
(dis)	DISUSED
DPC	DAMP PROOF COURSE
DS	DIRECTION SIGN
DSW	DRYSTONE WALL
Eav	EAVES LEVEL
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EOT	END OF TRACE (utility)
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ESW	ELECTRICITY SWITCH BOX
EVC	ELECTRIC VEHICLE CHARGING
FB	FOOTBRIDGE
FL	FLOOR LEVEL
FFL	FINISHED FLOOR LEVEL
Flgt	FLOOR LIGHT
Flat RF	FLAT ROOF LEVEL
FH	FIRE HYDRANT
FS	FLAG STAFF
G	GULLY
GIS	GAS INLET POINT
GP	GUIDE POST
GPR	GROUND PROBING RADAR
Grl	GRILLE COVER
GV	GAS VALVE COVER
HH	HAND RAIL
IC	INSPECTION COVER
IL	INVERT LEVEL
I/R	IRON RAILING FENCE
KO	KERB OUTLET
Lby	LIFEBUOY
Lck	LOCK GATE
Ldr	LADDER
LOR	LOSS OF REFLECTION (gpr)
LOS	LOSS OF SIGNAL (eml)
LP	LAMP POST
Mcy	MACHINERY
MH	MANHOLE
MgP	MOORING POST
Mkr	MARKER POST
MP	MILE POST
MS	MILESTONE
MU	ELECTRIC MOTOR
NVP	NO VISIBLE PIPE
NP	NAME PLATE
OSA	OUTSIDE SURVEY AREA
OSBM	OS BENCH MARK
OGC	OVERGROUND CONDUIT
OHC	OVERHEAD CONDUIT
OHE	OVERHEAD ELECTRIC
OHG	OVERHEAD GANTRY
OHStruct	OVERHEAD STRUCTURE
OHT	OVERHEAD TELECOMS
OHU	OVERHEAD UNKNOWN
P	POST
PB	POST BOX
PC	SECURITY CAMERA
Pcg	PEDESTRIAN CROSSING
PD	PIT DEPTH
P/F	PANEL FENCE
PP	PETROL PUMP
P/R	POST & RAIL FENCE
Psk	PENSTOCK
PV	VERTICAL PIPE
Pyl	PYLON
PZ	PIEZOMETER
Rdg	RIDGE LEVEL
RE	RODDING EYE
RG	RAIN GAUGE
RL	RIDGE LEVEL
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RS	ROAD SIGN
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RWP	RAN WATER PIPE
Sap	SAPLING
SB	SIGN BOARD
Shlt	SHELTER
SI	SPUN IRON
SL	SOFFIT LEVEL
Slt	SILT LEVEL
SMP	SETTLEMENT MONITORING Pnt
SP	SIGN POST
Spd Hump	SPEED HUMP
SPt	SAMPLING POINT
SS	STRUCTURE POINT
ST	STAND PIPE / SUPPLY TAP
Sti	STILE
Stone Pvg	STONE PAVING SLABS
STP	STAND PIPE
StPO	STAY POST
Stu	STUMP
StW	STAYWIRE
SV	STOP VALVE
SW	STONE WALL
Tac	TACTILE PAVING
TBM	TEMPORARY BENCH MARK
TBol	BOLLARD (Dept' Transport)
TCB	TELEPHONE CALL BOX
TCP	TELEPHONE CALL POST
TEL	TELECOM COVER
ThL	THRESHOLD LEVEL
TL	TRAFFIC SIGNAL POST
TM	TICKET MACHINE
ToV	TOP OF VALVE LEVEL
TP	TELEGRAPH POLE
Tpt	TRIAL PIT
Tr	TROUGH
UTA	UNABLE TO ACCESS
UTL	UNABLE TO LOCATE
UTR	UNABLE TO RAISE
UTS	UNABLE TO SURVEY
UTT	UNABLE TO TRACE (utilities)
VC	VITRIFIED CLAY
VDP	VEHICLE DETECTION PAD
VP	VENT PIPE
VW	VALVE WHEEL
WB	WEIGH BRIDGE
WG	WATER GAUGE
WL	WATER LEVEL
WM	WATER METER
W/M	WIRE MESH FENCE
WO	WASHOUT COVER
WS	WIND SOCK POLE
WSR	WATER LEVEL SENSOR

	SURVEY EXTENTS	D=1.00m 1.00d	DEPTH INFORMATION
BT	BRITISH TELECOM	HW	HOT WATER
BT(r)	TAKEN FROM RECORDS	HW(r)	TAKEN FROM RECORDS
CTV	CATV CABLE	O/F	OPTIC FIBRE
CTV(r)	TAKEN FROM RECORDS	O/F(r)	TAKEN FROM RECORDS
CTV	CCTV CABLE	OIL	OIL PIPELINE
CTV(r)	TAKEN FROM RECORDS	OIL(r)	TAKEN FROM RECORDS
CW	COMBINED WATER	PWR	POWER FEATURE
CW(r)	TAKEN FROM RECORDS	SW	SURFACE WATER
DUC	EMPTY DUCT	SW(r)	TAKEN FROM RECORDS
DUC(r)	TAKEN FROM RECORDS	T	TELECOMMUNICATION CABLE
EA	EARTHING FEATURE	T(r)	TAKEN FROM RECORDS
EA(r)	TAKEN FROM RECORDS	TLM	TELEMETRY CABLE
E	ELECTRIC CABLE	TRA	TRAFFIC SIGNALS
E(r)	TAKEN FROM RECORDS	TRA(r)	TAKEN FROM RECORDS
FL	FUEL LINE	UK	UNKNOWN SERVICE
FL(r)	TAKEN FROM RECORDS	UK(r)	TAKEN FROM RECORDS
FW	FOUL WATER	VNT	VENT
FW(r)	TAKEN FROM RECORDS	VNT(r)	TAKEN FROM RECORDS
GAS	GAS	W	WATER
GAS(r)	TAKEN FROM RECORDS	W(r)	TAKEN FROM RECORDS
GPR	GPR FEATURE	HV	HV ELECTRIC
GPR(r)	TAKEN FROM RECORDS	HV(r)	TAKEN FROM RECORDS
Helium	HELIUM FEATURE	REF:GPR02	REFERENCE TO GPR DATA IN REPORT
Helium(r)	TAKEN FROM RECORDS		

PAS 128 Quality Levels:

SURVEY TYPE, QUALITY LEVELS AND ACCURACY	SUPPORTING DATA
VERIFICATION: QL-A: HORIZONTAL ± 50MM VERTICAL ± 25MM	HORIZONTAL & VERTICAL LOCATION OF THE TOP AND/OR BOTTOM OF THE ITEM.
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SITE RECONNAISSANCE: QL-C	---
DESKTOP: QL-D	---

NOTES: HORIZONTAL/VERTICAL VARIABLES BASED ON DETECTED LOCATION OF UTILITY
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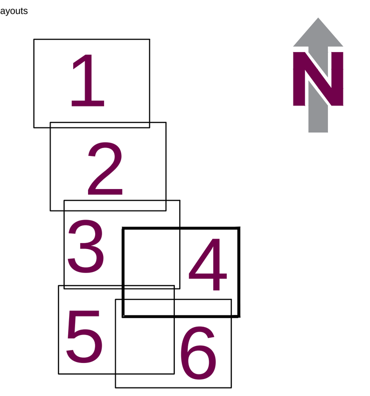
Sheet Layouts



Grid:	Datum:
National Grid by GPS Observations to the OS Active Network (OSTN15)	Ordnance Datum by GPS Observations to the OS Active Network (OSGM15)

Revision:	Amendments:	Date:	Name:
-	-	-	-
-	-	-	-
-	-	-	-
A	ORIGINAL ISSUE	MAR'23	JH

MAKING COMPLEX EASY

A TETRA TECH COMPANY

THE SURVEY ASSOCIATION AFFILIATE MEMBER

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Red Deer House, Dunston Business Village, Stafford Road, Dunston, Staffordshire, ST18 9AB

CLIENT:
Laister Planning Limited
Ground Floor, Oddfellows Hall, London Road
Chipping Norton, Oxfordshire
OX7 5QH

PROJECT:
Medmerry
Holiday Village

TITLE:
Topographical
Survey

Drawn: JH/MV/GK/MK	Checked: RJ
Date: March 2023	Scale: 1:500 @ A0 (1:200 Text)
Drg No: UAT3127_A	Sheet: 4 of 6

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Notes:

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BdL	BED LEVEL	GIS	GAS INLET POINT	Sap	SAPLING
BH	BOREHOLE	GP	GUIDE POST	SB	SIGN BOARD
Bol	BOLLARD	GPR	GROUND PROBING RADAR	Shlt	SHELTER
BP	BOUNDARY POST	Grl	GRILLE COVER	SI	SPUN IRON
B Pvg	BLOCK PAVING	GV	GAS VALVE COVER	SL	SOFFIT LEVEL
BRck	BICYCLE RACK	Hrl	HAND RAIL	Slt	SILT LEVEL
BS	BUS STOP	IC	INSPECTION COVER	SMP	SETTLEMENT MONITORING Pnt
BT	BRITISH TELECOM COVER	IL	INVERT LEVEL	SP	SIGN POST
BW	BRICK WALL	I/R	IRON RAILING FENCE	Spd Hump	SPEED HUMP
BWF	BARBED WIRE FENCE	KO	KERB OUTLET	SPt	SAMPLING POINT
CAP	CABLE WINDING MACHINE	Lby	LIFEBUOY	SS	STRUCTURE POINT
Cat	CATENARY LEVEL	Lck	LOCK GATE	ST	STAND PIPE / SUPPLY TAP
CATV	CABLE TV COVER	Ldr	LADDER	Sti	STILE
CB	CONTROL BOX	LOR	LOSS OF REFLECTION (gpr)	Stone Pvg	STONE PAVING SLABS
C/B	CLOSE BOARDED FENCE	LOS	LOSS OF SIGNAL (eml)	STP	STAND PIPE
CD	CHAMBER DEPTH	LP	LAMP POST	StPO	STAY POST
Cgd	CATTLE GRID	Mcy	MACHINERY	Stu	STUMP
CI	CAST IRON	MH	MANHOLE	StW	STAYWIRE
CIP	CABLE INLET POINT	MgP	MOORING POST	SV	STOP VALVE
CL	COVER LEVEL	Mkr	MARKER POST	SW	STONE WALL
C/L	CHAIN LINK FENCE	MP	MILE POST	Tac	TACTILE PAVING
Col	COLUMN	MS	MILESTONE	TBM	TEMPORARY BENCH MARK
Conc	CONCRETE	MU	ELECTRIC MOTOR	TBol	BOLLARD (Dept' Transport)
Conc Pvg	CONCRETE PAVING	NVP	NO VISIBLE PIPE	TCB	TELEPHONE CALL BOX
CP	CATCHPIT	NP	NAME PLATE	TCP	TELEPHONE CALL POST
Cpe	CHILDRENS PLAY EQUIPMENT	OSA	OUTSIDE SURVEY AREA	TEL	TELECOM COVER
Cpy	BUILDING CANOPY	OSBM	OS BENCH MARK	ThL	THRESHOLD LEVEL
Cpsn	CAPSTAN	OGC	OVERGROUND CONDUIT	TL	TRAFFIC SIGNAL POST
CR	CRANE / HOIST	OHC	OVERHEAD CONDUIT	TM	TICKET MACHINE
Cul	CULVERT	OHE	OVERHEAD ELECTRIC	ToV	TOP OF VALVE LEVEL
Ct	CABLE TRAY/ TROUGH	OHG	OVERHEAD GANTRY	TP	TELEGRAPH POLE
CW	CONCRETE WALL	OHStruct	OVERHEAD STRUCTURE	Tpt	TRIAL PIT
Dav	Davit	OHT	OVERHEAD TELECOMS	Tr	TROUGH
DC	DUCT COVER	OHU	OVERHEAD UNKNOWN	UTA	UNABLE TO ACCESS
DI	DUCTILE IRON	P	POST	UTL	UNABLE TO LOCATE
(dilap)	DILAPIDATED	PB	POST BOX	UTR	UNABLE TO RAISE
(dis)	DISUSED	PC	SECURITY CAMERA	UTS	UNABLE TO SURVEY
DPC	DAMP PROOF COURSE	Pcg	PEDESTRIAN CROSSING	UTT	UNABLE TO TRACE (utilities)
DS	DIRECTION SIGN	PD	PIT DEPTH	VC	VITRIFIED CLAY
DSW	DRYSTONE WALL	P/F	PANEL FENCE	VDP	VEHICLE DETECTION PAD
Eav	EAVES LEVEL	PP	PETROL PUMP	VP	VENT PIPE
EIC	ELECTRICITY COVER	P/R	POST & RAIL FENCE	VW	VALVE WHEEL
EOT	END OF TRACE (utility)	Psk	PENSTOCK	WB	WEIGH BRIDGE
EP	ELECTRICITY POLE	PV	VERTICAL PIPE	WG	WATER GAUGE
ER	EARTH ROD	Pyl	PYLON	WL	WATER LEVEL
ESP	ELECTRICITY SUPPLY POINT	PZ	PIEZOMETER	WM	WATER METER
ESW	ELECTRICITY SWITCH BOX	Rdg	RIDGE LEVEL	W/M	WIRE MESH FENCE
EVC	ELECTRIC VEHICLE CHARGING	RE	RODDING EYE	WO	WASHOUT COVER
FB	FOOTBRIDGE	RG	RAIN GAUGE	WS	WIND SOCK POLE
FL	FLOOR LEVEL	RL	RIDGE LEVEL	WSR	WATER LEVEL SENSOR
FFL	FINISHED FLOOR LEVEL	RMP	RESRVOIR MONITORING Pnt		
Flgt	FLOOR LIGHT	RP	REFLECTOR POST		

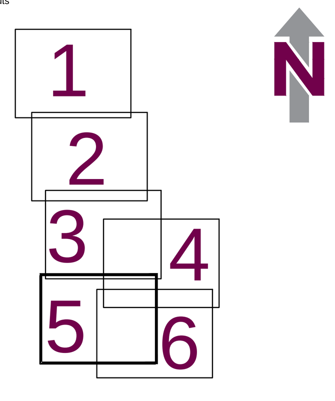
	SURVEY EXTENTS	D=1.00m 1.00d	DEPTH INFORMATION
BT	BRITISH TELECOM	HW	HOT WATER
BT(r)	TAKEN FROM RECORDS	HW(r)	TAKEN FROM RECORDS
CTV	CATV CABLE	O/F	OPTIC FIBRE
CTV(r)	TAKEN FROM RECORDS	O/F(r)	TAKEN FROM RECORDS
CTV	CCTV CABLE	OIL	OIL PIPELINE
CTV(r)	TAKEN FROM RECORDS	OIL(r)	TAKEN FROM RECORDS
CW	COMBINED WATER	PWR	POWER FEATURE
CW(r)	TAKEN FROM RECORDS	SW	SURFACE WATER
DUC	EMPTY DUCT	SW(r)	TAKEN FROM RECORDS
DUC(r)	TAKEN FROM RECORDS	T	TELECOMMUNICATION CABLE
EA	EARTHING FEATURE	T(r)	TAKEN FROM RECORDS
EA(r)	TAKEN FROM RECORDS	TLM	TELEMETRY CABLE
E	ELECTRIC CABLE	TRA	TRAFFIC SIGNALS
E(r)	TAKEN FROM RECORDS	TRA(r)	TAKEN FROM RECORDS
FL	FUEL LINE	UK	UNKNOWN SERVICE
FL(r)	TAKEN FROM RECORDS	UK(r)	TAKEN FROM RECORDS
FW	FOUL WATER	VNT	VENT
FW(r)	TAKEN FROM RECORDS	VNT(r)	TAKEN FROM RECORDS
GAS	GAS	W	WATER
GAS(r)	TAKEN FROM RECORDS	W(r)	TAKEN FROM RECORDS
GPR	GPR FEATURE	HV	HV ELECTRIC
GPR(r)	TAKEN FROM RECORDS	HV(r)	TAKEN FROM RECORDS
Helium	HELIUM FEATURE	REF:GPR02	REFERENCE TO GPR DATA IN REPORT
Helium(r)	TAKEN FROM RECORDS		

PAS 128 Quality Levels:

SURVEY TYPE, QUALITY LEVELS AND ACCURACY	SUPPORTING DATA
VERIFICATION: QL-A: HORIZONTAL ± 50MM VERTICAL ± 25MM	HORIZONTAL & VERTICAL LOCATION OF THE TOP AND/OR BOTTOM OF THE ITEM.
DETECTION: QL-B4	A UTILITY WHICH IS SUSPECTED TO EXIST BUT HAS NOT BEEN DETECTED AND IS SHOWN AS AN ASSUMED ROUTE.
QL-B3/p: HORIZONTAL ±500MM	HORIZONTAL LOCATION ONLY OF THE UTILITY DETECTED BY ONE TECHNIQUE.
QL-B2/p: HORIZONTAL ±250MM/±40% VERTICAL ±40%	HORIZONTAL AND VERTICAL LOCATION OF UTILITY DETECTED BY ONE TECHNIQUE ONLY.
QL-B1/p: HORIZONTAL ±150MM/±15% VERTICAL ±15%	HORIZONTAL AND VERTICAL LOCATION OF UTILITY DETECTED BY MULTIPLE TECHNIQUES.
SITE RECONNAISSANCE: QL-C	---
DESKTOP: QL-D	---

NOTES: HORIZONTAL/VERTICAL VARIABLES BASED ON DETECTED LOCATION OF UTILITY
P = POST PROCESSING
REFER TO FULL PAS128 DOCUMENT FOR FURTHER INFORMATION

Sheet Layouts



Grid:	Datum:
National Grid by GPS Observations to the OS Active Network (OSTN15)	Ordnance Datum by GPS Observations to the OS Active Network (OSGM15)

Revision:	Amendments:	Date:	Name:
-	-	-	-
-	-	-	-
-	-	-	-
A	ORIGINAL ISSUE	MAR'23	JH

MAKING COMPLEX EASY

THE SURVEY ASSOCIATION AFFILIATE MEMBER

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Red Deer House, Dunston Business Village, Stafford Road, Dunston, Staffordshire, ST18 9AB

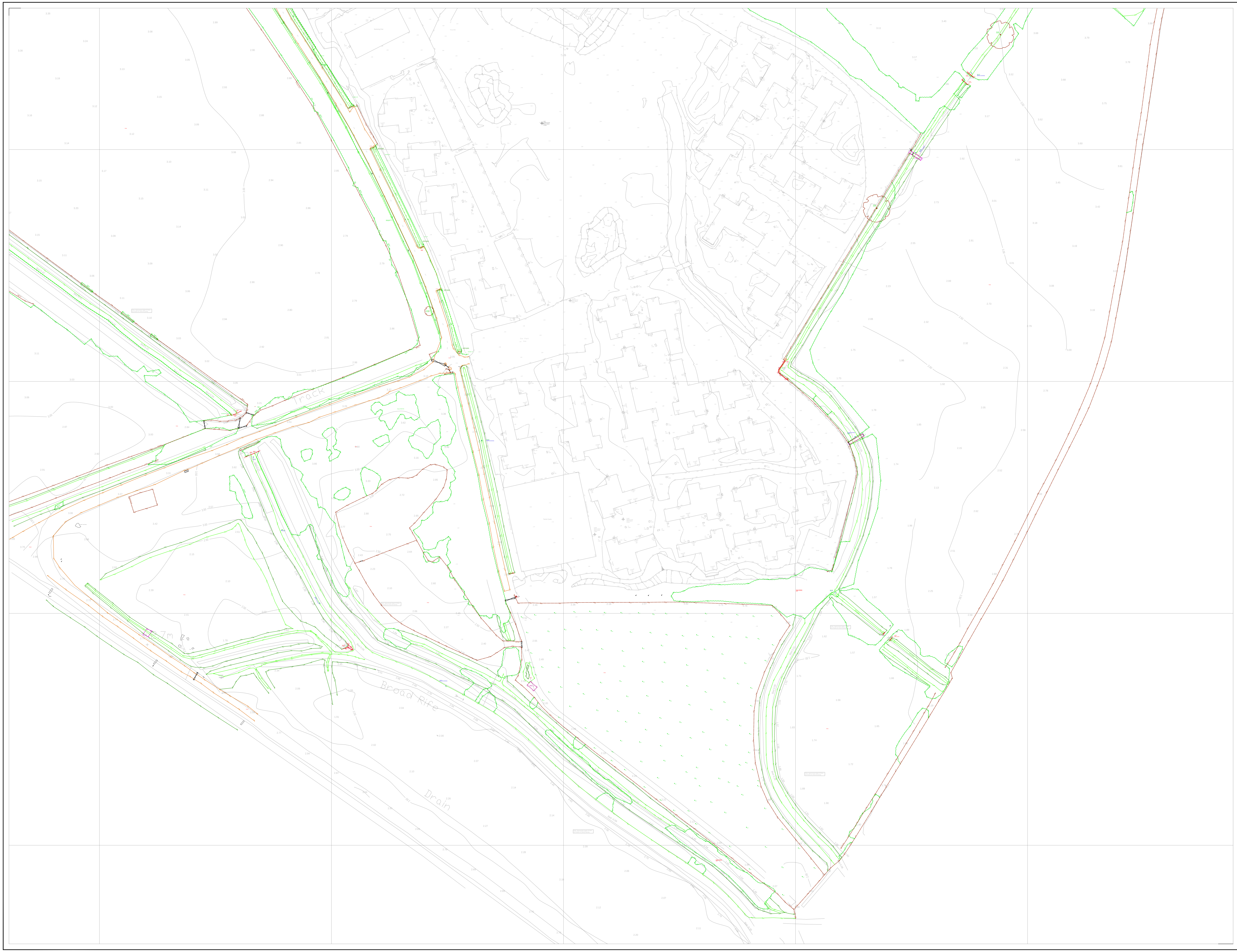
CLIENT:
Laister Planning Limited
Ground Floor, Oddfellows Hall, London Road
Chipping Norton, Oxfordshire
OX7 5QH

PROJECT:
Medmerry
Holiday Village

TITLE:
Topographical
Survey

Drawn: JH/MV/GK/MK	Checked: RJ
Date: March 2023	Scale: 1:500 @ A0 (1:200 Text)
Drg No: UAT3127_A	Sheet: 5 of 6

MAKING COMPLEX EASY



Notes:

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The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work starts. The Contractor is to comply in all respects with current Building Legislation, British Standard Specifications, Building Regulations, Construction (Design & Management) Regulations, Party Wall Act, etc. whether or not specifically stated on this drawing. This drawing must be read with and checked against any structural, geotechnical or other specialist documentation provided.

This drawing is not intended to show details of foundations, ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor. A suitable method of foundation should be provided allowing for existing ground conditions. Any suspect or fluid ground, contaminates on or within the ground, shall be further investigated by a suitable expert. Any earthwork constructions shown indicate typical slopes for guidance only & should be further investigated by a suitable expert.

Where existing trees are to be retained they should be subject to a full Arboricultural inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services. A suitable method of foundation is to be provided to accommodate the proposed tree planting. All tree types are provided as a guide only and a full Arboricultural survey to be conducted to determine the exact tree types should be completed.

Sketch proposals are for illustrative purposes only & as such are subject to detailed site investigation including ground conditions/contaminants, drainage, design & planning/density negotiations. Sketch proposals may be based upon enlargements of OS sheets & visual estimations of existing site features, accuracy will therefore need to be verified by survey. Sketch proposals have not been considered in respect of CDM Regulations.

Survey carried out to client specification and in accordance with RICS publication:
SURVEYS OF LAND , BUILDING & UTILITY SERVICES AT SCALES 1:500 & LARGER, 3rd EDITION.

Utility Services Location Note:

This survey has been carried out using a combination of observation and detection using electrolocation and ground probing radar equipment. Connections between reference points such as manholes are assumed to be straight unless bends are indicated. The accuracy is limited to the tolerances normally expected from the equipment used.

The following indications of completeness and accuracy are for guidance only:

In areas where there is a large concentration of services, the completeness will be between 80% and 90%. This will be reduced where there are obstructions at ground level.

Positional accuracy will vary with depth and pipe / duct material; an accuracy of +/- 150 mm is achievable in normal circumstances but this will be reduced for plastic pipes.

Existing information from historical plans is likely to be unreliable and is shown for guidance only.

Excavations in the area should be carried out with care and in accordance with HSG 47. No absolute guarantee of accuracy should be inferred from these plans.

The following text is an extract from Surveys of Land, Buildings and Utility Surveys at scales of 1:500 and Larger, 3rd Edition

*"Electronic tracing is a reliable, method of locating buried services. **On Heavy, built up sites 85% completeness is probably all that can be expected.** Plan accuracies of +/- 150mm may be achieved but this figure will depend on the depth of the service below ground level. **Where similar services run in close proximity, separation may be impossible. Successful tracing of non-metallic pipes may be limited.** Existing record information showing underground services is often incomplete and of doubtful accuracy. It should be regarded only as an indication and cannot be guaranteed"*

Standard Abbreviations

ACO	LINEAR DRAINAGE CHANNEL	Flat RF	FLAT ROOF LEVEL	RS	ROAD SIGN
AV	AIR VALVE	FH	FIRE HYDRANT	RSP	RAILWAY SIGNAL POST
A/R	ASSUMED ROUTE	FS	FLAG STAFF	RW	RETAINING WALL
BB	BELISH BEACON	G	GULLY	RWP	RAN WATER PIPE
BdL	BED LEVEL	GIS	GAS INLET POINT	Sap	SAPLING
BH	BOREHOLE	GP	GUIDE POST	SB	SIGN BOARD
Bol	BOLLARD	GPR	GROUND PROBING RADAR	Shlt	SHELTER
BP	BOUNDARY POST	Grl	GRILLE COVER	SI	SPUN IRON
B Pvg	BLOCK PAVING	GV	GAS VALVE COVER	SL	SOFFIT LEVEL
BRck	BICYCLE RACK	HH	HAND RAIL	Slt	SILT LEVEL
BS	BUS STOP	IC	INSPECTION COVER	SMP	SETTLEMENT MONITORING Pnt
BT	BRITISH TELECOM COVER	IL	INVERT LEVEL	SP	SIGN POST
BW	BRICK WALL	I/R	IRON RAILING FENCE	Spd Hump	SPEED HUMP
BWF	BARBED WIRE FENCE	KO	KERB OUTLET	SPt	SAMPLING POINT
CAP	CABLE WINDING MACHINE	Lby	LIFEBUOY	SS	STRUCTURE POINT
Cat	CATENARY LEVEL	Lck	LOCK GATE	ST	STAND PIPE / SUPPLY TAP
CATV	CABLE TV COVER	Ldr	LADDER	Sti	STILE
CB	CONTROL BOX	LOR	LOSS OF REFLECTION (gpr)	Stone Pvg	STONE PAVING SLABS
C/B	CLOSE BOARDED FENCE	LOS	LOSS OF SIGNAL (eml)	STP	STAND PIPE
CD	CHAMBER DEPTH	LP	LAMP POST	StPD	STAY POST
Cgd	CATTLE GRID	Mcy	MACHINERY	Stu	STUMP
CI	CAST IRON	MH	MANHOLE	StW	STAYWIRE
CIP	CABLE INLET POINT	MgP	MOORING POST	SV	STOP VALVE
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Conc	CONCRETE	MU	ELECTRIC MOTOR	TBol	BOLLARD (Dept' Transport)
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Cpe	CHILDRENS PLAY EQUIPMENT	OSA	OUTSIDE SURVEY AREA	TEL	TELECOM COVER
Cpy	BUILDING CANOPY	OSBM	OS BENCH MARK	ThL	THRESHOLD LEVEL
Cpsn	CAPSTAN	OGC	OVERGROUND CONDUIT	TL	TRAFFIC SIGNAL POST
CR	CRANE / HOIST	OHC	OVERHEAD CONDUIT	TM	TICKET MACHINE
Cul	CULVERT	OHE	OVERHEAD ELECTRIC	ToV	TOP OF VALVE LEVEL
Ct	CABLE TRAY/ TROUGH	OHG	OVERHEAD GANTRY	TP	TELEGRAPH POLE
CW	CONCRETE WALL	OHStruct	OVERHEAD STRUCTURE	Tpt	TRIAL PIT
Dav	Davit	OHT	OVERHEAD TELECOMS	Tr	TROUGH
DC	DUCT COVER	OHU	OVERHEAD UNKNOWN	UTA	UNABLE TO ACCESS
DI	DUCTILE IRON	P	POST	UTL	UNABLE TO LOCATE
(dilap)	DILAPIDATED	PB	POST BOX	UTR	UNABLE TO RAISE
(dis)	DISUSED	PC	SECURITY CAMERA	UTS	UNABLE TO SURVEY
DPC	DAMP PROOF COURSE	Pcg	PEDESTRIAN CROSSING	UTT	UNABLE TO TRACE (utilities)
DS	DIRECTION SIGN	PD	PIT DEPTH	VC	VITRIFIED CLAY
DSW	DRYSTONE WALL	P/F	PANEL FENCE	VDP	VEHICLE DETECTION PAD
Eav	EAVES LEVEL	PP	PETROL PUMP	VP	VENT PIPE
EIC	ELECTRICITY COVER	P/R	POST & RAIL FENCE	VW	VALVE WHEEL
EOT	END OF TRACE (utility)	Psk	PENSTOCK	WB	WEIGH BRIDGE
EP	ELECTRICITY POLE	PV	VERTICAL PIPE	WG	WATER GAUGE
ER	EARTH ROD	Pyl	PYLON	WL	WATER LEVEL
ESP	ELECTRICITY SUPPLY POINT	PZ	PIEZOMETER	WM	WATER METER
ESW	ELECTRICITY SWITCH BOX	Rdg	RIDGE LEVEL	W/M	WIRE MESH FENCE
EVC	ELECTRIC VEHICLE CHARGING	RE	RODDING EYE	WO	WASHOUT COVER
FB	FOOTBRIDGE	RG	RAIN GAUGE	WS	WIND SOCK POLE
FL	FLOOR LEVEL	RL	RIDGE LEVEL	WSR	WATER LEVEL SENSOR
FFL	FINISHED FLOOR LEVEL	RMP	RESRVOIR MONITORING Pnt		
Flgt	FLOOR LIGHT	RP	REFLECTOR POST		

	SURVEY EXTENTS	D=1.00m 1.00d	DEPTH INFORMATION
BT	BRITISH TELECOM	HW	HOT WATER
BT(r)	TAKEN FROM RECORDS	HW(r)	TAKEN FROM RECORDS
CTV	CATV CABLE	O/F	OPTIC FIBRE
CTV(r)	TAKEN FROM RECORDS	O/F(r)	TAKEN FROM RECORDS
CTV	CCTV CABLE	OIL	OIL PIPELINE
CTV(r)	TAKEN FROM RECORDS	OIL(r)	TAKEN FROM RECORDS
CW	COMBINED WATER	PWR	POWER FEATURE
CW(r)	TAKEN FROM RECORDS	SW	SURFACE WATER
DUC	EMPTY DUCT	SW(r)	TAKEN FROM RECORDS
DUC(r)	TAKEN FROM RECORDS	T	TELECOMMUNICATION CABLE
EA	EARTHING FEATURE	T(r)	TAKEN FROM RECORDS
EA(r)	TAKEN FROM RECORDS	TLM	TELEMETRY CABLE
E	ELECTRIC CABLE	TRA	TRAFFIC SIGNALS
E(r)	TAKEN FROM RECORDS	TRA(r)	TAKEN FROM RECORDS
FL	FUEL LINE	UK	UNKNOWN SERVICE
FL(r)	TAKEN FROM RECORDS	UK(r)	TAKEN FROM RECORDS
FW	FOUL WATER	VNT	VENT
FW(r)	TAKEN FROM RECORDS	VNT(r)	TAKEN FROM RECORDS
GAS	GAS	W	WATER
GAS(r)	TAKEN FROM RECORDS	W(r)	TAKEN FROM RECORDS
GPR	GPR FEATURE	HV	HV ELECTRIC
GPR(r)	TAKEN FROM RECORDS	HV(r)	TAKEN FROM RECORDS
Helium	HELIUM FEATURE	REF:GPR02	REFERENCE TO GPR DATA IN REPORT
Helium(r)	TAKEN FROM RECORDS		

PAS 128 Quality Levels:

SURVEY TYPE, QUALITY LEVELS AND ACCURACY	SUPPORTING DATA
VERIFICATION: QL-A: HORIZONTAL ± 50MM VERTICAL ± 25MM	HORIZONTAL & VERTICAL LOCATION OF THE TOP AND/OR BOTTOM OF THE ITEM.
DETECTION: QL-B4	A UTILITY WHICH IS SUSPECTED TO EXIST BUT HAS NOT BEEN DETECTED AND IS SHOWN AS AN ASSUMED ROUTE.
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QL-B1/p: HORIZONTAL ±150MM/±15% VERTICAL ±15%	HORIZONTAL AND VERTICAL LOCATION OF UTILITY DETECTED BY MULTIPLE TECHNIQUES.
SITE RECONNAISSANCE: QL-C	---
DESKTOP: QL-D	---

NOTES: HORIZONTAL/VERTICAL VARIABLES BASED ON DETECTED LOCATION OF UTILITY
P = POST PROCESSING
REFER TO FULL PAS128 DOCUMENT FOR FURTHER INFORMATION

Sheet Layouts

1 2 3 4 5 6

N

Grid:	Datum:
National Grid by GPS Observations to the OS Active Network (OSTN15)	Ordnance Datum by GPS Observations to the OS Active Network (OSGM15)

Revision:	Amendments:	Date:	Name:
-	-	-	-
-	-	-	-
-	-	-	-
A	ORIGINAL ISSUE	MAR'23	JH

rps MAKING COMPLEX EASY

THE SURVEY ASSOCIATION AFFILIATE MEMBER

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T: 0800 917 8227 E: rps.survey@rpsgroup.com www.rpsgroup.com
Red Deer House, Dunston Business Village, Stafford Road, Dunston, Staffordshire, ST18 9AB

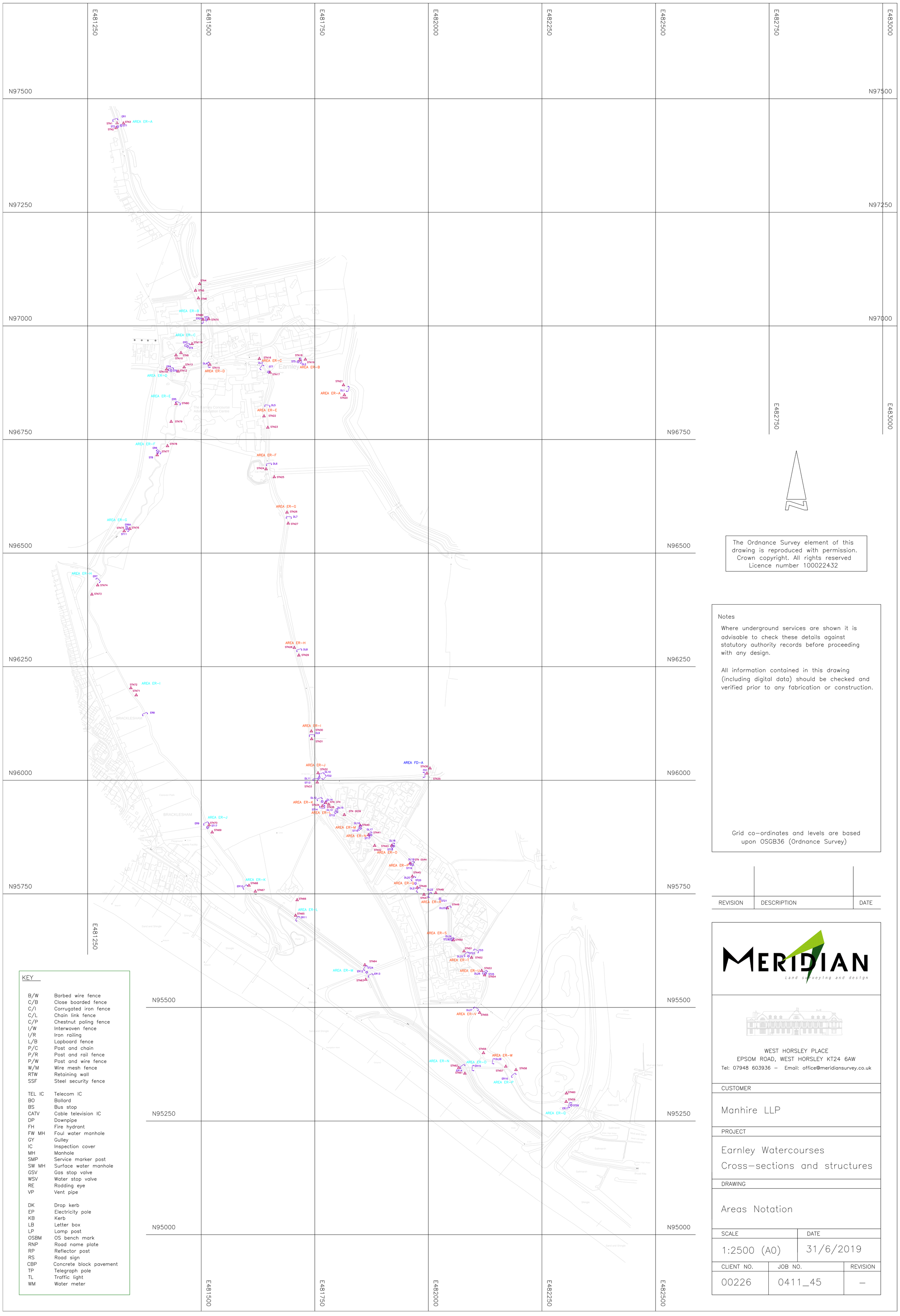
CLIENT:
Laister Planning Limited
Ground Floor, Oddfellows Hall, London Road
Chipping Norton, Oxfordshire
OX7 5QH

PROJECT:
Medmerry
Holiday Village

TITLE:
Topographical
Survey

Drawn:	JH/MV/GK/MK	Checked:	RJ
Date:	March 2023	Scale:	1:500 @ A0 (1:200 Text)
Drg No:	UAT3127_A	Sheet:	6 of 6

MAKING COMPLEX EASY



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Notes

Where underground services are shown it is advisable to check these details against statutory authority records before proceeding with any design.

All information contained in this drawing (including digital data) should be checked and verified prior to any fabrication or construction.

Grid co-ordinates and levels are based upon OSGB36 (Ordnance Survey)

REVISION	DESCRIPTION	DATE

KEY

B/W	Barbed wire fence
C/B	Close boarded fence
C/I	Corrugated iron fence
C/L	Chain link fence
C/P	Chestnut paling fence
I/W	Interwoven fence
I/R	Iron railing
L/B	Lapboard fence
P/C	Post and chain
P/R	Post and rail fence
P/W	Post and wire fence
W/M	Wire mesh fence
RTW	Retaining wall
SSF	Steel security fence
TEL IC	Telecom IC
BO	Bollard
BS	Bus stop
CATV	Cable television IC
DP	Downpipe
FH	Fire hydrant
FW MH	Foul water manhole
GY	Gulley
IC	Inspection cover
MH	Manhole
SMP	Service marker post
SW MH	Surface water manhole
GSV	Gas stop valve
WSV	Water stop valve
RE	Rodding eye
VP	Vent pipe
DK	Drop kerb
EP	Electricity pole
KB	Kerb
LB	Letter box
LP	Lamp post
OSBM	OS bench mark
RNP	Road name plate
RP	Reflector post
RS	Road sign
CBP	Concrete block pavement
TP	Telegraph pole
TL	Traffic light
WM	Water meter

MERIDIAN
Land surveying and design

WEST HORSLEY PLACE
EPSOM ROAD, WEST HORSLEY KT24 6AW
Tel: 07948 603936 – Email: office@meridiansurvey.co.uk

CUSTOMER

Manhire LLP

PROJECT

Earnley Watercourses
Cross-sections and structures

DRAWING

Areas Notation

SCALE	DATE	
1:2500 (A0)	31/6/2019	
CLIENT NO.	JOB NO.	REVISION
00226	0411_45	–

AMENITY KEY:

1 - Access/Approach Signage Wall
2 - The Village Hub
3 - Boathouse Store and F&B
4 - Pop-Up Dining/Picnic Area, Children's Play Area, & Open-Air Cinema
5 - Adventure Playground
6 - Adventure Golf and Padel Tennis
7 - Beachside Pool
8 - The Activity Lake & Beach
9 - Medmerry Outdoor Amenity Area
10 - Wildlife Corner Picnic Space
11 - Back of House/Facilities

ACCOMMODATION KEY:

- Orchard Accommodation - 40no.
- Wetlands & Rife Accommodation - 31no.
- Lakeside Accommodation - 100no.
- Secret Garden Accommodation - 24no.
- Woodland Accommodation - 113no.

Total Lodges - 308

N

Proposed Site Masterplan
1:1,250 @ A1

0 12.5 25 37.5 50 62.5 75 87.5 100 112.5 125m

Please consider the environment before printing.

Key Plan

- Site Boundary (21.7HA, 53.6 Acre)
- Land Under Ownership (33.3HA, 82.4 Acre)
- Public Right of Way
- Existing Tree Location
- Proposed Landscaping

IMPORTANT NOTICE

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THIS DRAWING HAS BEEN PREPARED FROM SITE SURVEY INFORMATION TAKEN BY OTHERS

Contractors must check ALL dimensions on site. Only figured dimensions are to be worked from.
Discrepancies must be reported immediately to the client before proceeding. Neither IPL nor the client accepts responsibility for works undertaken or materials purchased without accurate site assessment and specific measurement

- Survey
- SO: For discussion
- S1: Fit for coordination
- X S2: Fit for information
- S3: Fit for internal review
- S4: Fit for construction approval
- D1: Fit for costing
- D2: Tender issue
- D3: Fit for contractor design
- D4: Fit for manufacture procurement
- A: Construction issue
- B: Partially signed-off
- AB: As built drawing

Date	Rev ID	Description
10/07/2023	P1	Planning Issue
07/06/2023	10	Consultant Issue
10/05/2023	09	Retention of Rife
24/03/2023	08	Masterplan Update
10/03/2023	07	Issue with Updates
09/01/2023	06	Issue for Comment
02/12/2022	05	Masterplan Update
25/11/2022	04	Masterplan Update
24/11/2022	03	Revised Masterplan
18/11/2022	02	Revised Masterplan
21/09/2022	01	Issue for Comment

Client Approval

X	*A - Approved*
	B - Approved with Comments
	C - Do Not Use

Project:
Medmerry Park - Site Redevelopment

Drawn: **JG** Date: **July'23**

Sheet Size: **A1** Scale: **1:1250**

Drawing:
Proposed Masterplan

Drawing Subset:
Masterplan

Drawing Status: **S2** Purpose of Issue: **Comment**

Sheet Number: **427.01_1000.2** Rev: **P1**

Appendix A.2 – Southern Water Asset Location Data

SOUTHERN WATER

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site.

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O.S. REF: SZ8195NE

Scale: 1:1250

Sewer Plot

WARNING: BAC pipes are constructed of Bonded Asbestos Cement

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement

N

Printed By: Mercy

Site Plan

Requested By:

Date: 25-3-2019

Southern Water

Appendix A.3 – Site Investigations (undertaken by Enzygo Environmental Consultants)

enzygo
environmental consultants

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F.A.O Ken Brown
Medmerry Park Limited
29-30 Watling Street
Top Floor
Canterbury
Kent
CT1 2UD

Our Ref: SHF.245.002.GE.L.001.A
Date: 26th March 2019

Dear Ken,

MEDMERRY PARK HOLIDAY VILLAGE – SOAKAWAY LETTER REPORT

Enzygo Geo-environmental Ltd. [Enzygo] were employed by Medmerry Park Ltd. [the Client] to undertake trial pitting and soakaway testing in accordance with BRE365 Soakaway design, 2001, for a proposed development of additional lodges at Medmerry Park Holiday Village. In addition to this window sampling was to be undertaken with one position to be installed for long term groundwater monitoring. This letter report covers an assessment of the encountered ground conditions and the potential suitability for a soakaway drainage option for the development site.

Geology

With reference to the British Geological Survey (BGS) website[1], the south and west of site is indicated to be underlain by superficial strata of River Terrace Deposits (Sand, Silt and Clay) and Raised Beach Deposits (Sand and Gravel) with Raised Marine Deposits (Clay, Silt, Sand and Gravel) running northwest/southeast across site. The underlying bedrock across majority of site is shown to be the Earnley Sand Formation (Sand, Silt and Clay) with the Wittering Formation (Sand, Silt and Clay) underlying the northern part of site.

Given the variable nature of the strata onsite, trial pits were, where possible, targeted at the more permeable strata to undertake infiltration testing.

With reference to the aquifer designation, taken from Magic.gov.uk website[2], the superficial deposits are all classified as Secondary A aquifers.

Ground Investigation

The ground investigation was undertaken between the 25th to 27th February 2019, comprising the excavation of eight trial pits (SA01 – SA08) and six window sample boreholes (WS01 – WS06), one of which (WS01) was installed with a data logger taking hourly readings for three months of the groundwater levels.

The trial pit locations proposed for soakaway testing, were located based upon anticipated geology and the topography of the site i.e. potentially most suitable location for an actual soakaway drain. The window sample boreholes were positioned around site to provide coverage with an install in the approximate centre of site for groundwater monitoring.

[1] *The British Geological Survey, www.bgs.ac.uk (Date accessed March 2019)*

[2] *The Magic website, www.magic.gov.uk (Date accessed March 2019)*

The exploratory hole locations are shown on the exploratory hole location plan referenced, SHF.245.002.GE.DR.001, which is appended to this report.

Trial pits were established to depths of between 2.00m (SA05) and 2.60m (SA01) below existing ground level (m begl) to represent typical infiltration depths for conventional soakaway drainage assets inclusive of chambers and infiltration trenches. Due to adverse wet ground conditions which resulted in the digger becoming stuck, the pits were fenced off during testing and backfilled with arisings upon completion of the works. A tractor towed water bowser was utilised to fill the pits with clean water and the fall in water level was monitored and recorded over time.

Ground Conditions

Typical ground and groundwater conditions have been assessed by Enzygo using the available data and are summarised below. Full details of the ground and groundwater conditions encountered during the works are given on the exploratory hole records appended to this letter report and are summarised in further detail in the section below.

Table 1: Summary of Ground and Groundwater Conditions

Strata	Summary Description	Depth (m)
Made Ground	Topsoil	0.00 to 0.30
	Orange brown clayey sandy gravel	0.00 to 0.80
	Firm consistency pale brown sandy gravelly clay	0.30 to 0.80
Superficial	Very soft to stiff consistency grey green/grey brown/orange brown sandy gravelly clay	0.20 to 3.50
	Yellow brown gravelly sand	0.30 to 1.20
	Firm dark grey sandy silty clay	0.80 to 1.00
	Green grey/orange brown silty clayey fine to medium sand	1.20 to 4.45
	Soft consistency blue grey clay	1.40 to 2.00
	Orange brown sandy gravel	1.40 to 2.10
	Firm dark grey silty clay	3.50 to 4.45
Groundwater	Noted in SA02, SA03, SA04, SA05, SA08 and WS06	1.90 to 3.30

Made Ground

Made Ground was encountered across the site typically from ground level to 0.30m begl comprising of topsoil underlain by reworked deposits of sandy clayey gravel from 0.15 to 0.80m begl.

Superficial Deposits

Natural deposits were generally consistent with the published BGS information and varied in thickness across site and comprised of interbedded cohesive and granular strata to a maximum depth of 4.45m begl.

Bedrock

Bedrock was not encountered.

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Groundwater

Groundwater seepage was encountered at depths ranging from 1.90m begl (SA05) to 3.30m begl (WS01). Likely due to the proximity of surface water features.

Soakaway Results

The soakaway test results are summarised in Table 2, present below with the full test results attached to this letter report.

Table 2: Soakaway Infiltration Rates

Test Pit	Soakaway Infiltration Rate (m/s)			Worst case Infiltration Rate (m/s)
	Test 1	Test 2	Test 3	
SA01	Test abandoned due to poor infiltration rates.			
SA02	Test abandoned due to poor infiltration rates.			
SA03	Test abandoned due to poor infiltration rates.			
SA04	Test abandoned due to poor infiltration rates.			
SA05	Test abandoned due to poor infiltration rates.			
SA06	Test abandoned due to poor infiltration rates.			
SA07	Test abandoned due to poor infiltration rates.			
SA08	Test abandoned due to poor infiltration rates.			

Recommendations and Conclusions

None of the soakaways tests were successful due to insufficient infiltration rates being recorded. This is likely related to the encountered shallow groundwater [I.e. high pore-water pressures] most likely due to the presence of the surface water features on site and the nearby water course. These features will generally elevate groundwater conditions across the site. Therefore, it is advised that soakaway drainage would not be suitable for this development site and alternative drainage methods should be utilised.

Ongoing groundwater monitoring is being conducted within the install at WS01 and will be covered under another a separate cover.

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If you have any queries, or require further information, please do not hesitate to contact the under signed.

Yours sincerely,

Deanna Leedle – BSc (Hons), FGS.
Graduate Geo-Environmental Engineer

Reviewed by,

Nick Brook – BSc (Hons), FGS.
Senior Consultant
ENCL.
SHF.245.002.GE.DR.001 – Exploratory Hole Location Plan
Exploratory Hole Logs
Soakaway Test Results

NOTES

1. Do not scale from this drawing.
2. All dimensions are in meters.
3. This drawing is to be read in conjunction with all relevant documentation.
4. All surveyed information including levels and layout is provided by others.
5. All existing and proposed dimensions, levels and locations to be checked and verified by the main contractor on site prior to the commencement of the works and any anomalies reported to the engineer.

Key:

Site Boundary

WS* Window Sample location with Installation

WS Window Sample Location

TP Soakaway Pit location

REV:	DATE:	DETAIL:	DES:	CHK:	APP:
P02	25/03/19	Ammendments	NB	SD	SD
P01	06/02/19	First Issue	NB	SD	SD

enzygo environmental consultants

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CLIENT: Medmerry Park Limited

PROJECT: Medmerry Park

DRAWING TITLE: Exploratory Hole Location Plan

DRAWN:	DESIGNED:	CHECKED:	APPROVED:
NB	NB	SD	SD

DATE:	SCALE @ A3:
06/02/19	Not to Scale

PROJECT NO.:	DRAWING NO.:
SHF.245.002	001

DRAWING STATUS:	ISSUE:
FOR INFORMATION	P02

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Site				
Medmerry Park Holiday Village				**SA01**
Job No: SHF.245.002	Dates: Start 25-02-19, Finish 25-02-19	Ground Level (m)	Co-Ordinates	
Client: Medmerry Park Ltd.				Sheet: 1 of 1

Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
							MADE GROUND: Turf over firm consistency brown very sandy clayey topsoil. Sand is fine to coarse. 0.00 - 0.30 Many rootlets.
				0.30			Yellow brown gravelly fine to medium SAND. Gravel is subangular to subrounded fine to coarse of flint. 0.30 - 1.20 Clayey in pockets.
				1.20			Green orange brown clayey fine to medium SAND.
				2.60 {2.60}			Trial Pit completed at 2.60m.

0
1
2

General Remarks

Dimensions: 1.80x0.30x2.60
1. Machine excavated trial pit using a JCB 3CX to 2.60m begl due to reaching required depth.
2. Groundwater was not encountered.
3. Log completed inaccordance with BS5930:2015.
4. Trial pit was backfilled with single size gravel and installed with a 63mm slotted pipe for testing purposes.
5. Coordinates and levels were not obtained.

All dimensions in metres Scale 1:16.25		Logged By RM

1.1 ENZYGO TP LOG SHF.245.002 LOGS ATTEMPT 4.GPJ GINT STD AGS 3_1 ENZYGO.GPJ 26/3/19

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Site				
Medmerry Park Holiday Village				**SA02**
Job No: SHF.245.002	Dates: Start 25-02-19, Finish 26-02-19	Ground Level (m)	Co-Ordinates	
Client: Medmerry Park Ltd.				Sheet: 1 of 1

Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
							MADE GROUND: Turf over firm consistency brown very sandy clayey topsoil. Sand is fine to coarse. 0.00 - 0.30 Many rootlets.
				0.30			Firm consistency yellow brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of flint and chert. Sand is fine to coarse. 1.00 - 1.50 Occasional chalk fragments.
				1.50			Green grey slightly gravelly clayey fine to medium SAND. Gravel is subangular fine to coarse of shell fragments.
▽				2.20			Water Seepage. Trial Pit completed at 2.20m.
				{2.60}			

0 1 2

General Remarks

Dimensions: 1.80x0.30x2.20
1. Machine excavated trial pit using a JCB 3CX to 2.20m begl due to groundwater.
2. Groundwater seepage was encountered at 2.20m begl.
3. Log completed inaccordance with BS5930:2015.
4. Trial pit was backfilled with arisings upon completion of soakaway testing.
5. Coordinates and levels were not obtained.

All dimensions in metres
Scale 1:16.25

Logged By: RM

1.1 ENZYGO TP LOG SHF.245.002 LOGS ATTEMPT 4.GPJ GINT STD AGS 3_1 ENZYGO.GPJ 26/3/19

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Site				
Medmerry Park Holiday Village				**SA03**
Job No: SHF.245.002	Dates: Start 25-02-19, Finish 26-02-19	Ground Level (m)	Co-Ordinates	
Client: Medmerry Park Ltd.				Sheet: 1 of 1

Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
							MADE GROUND: Turf over firm consistency brown slightly sandy clayey topsoil. Sand is fine to coarse. 0.00 - 0.30 Many rootlets.
				0.30			Firm consistency orange brown/yellow brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of flint. Sand is fine to coarse.
				1.30			Soft consistency grey brown very sandy CLAY. Sand is fine to coarse. 1.30 - 1.60 Locally gravelly of subangular fine to coarse shell fragments.
				1.60			Green grey fine to medium SAND.
▽				2.30			Water seepage. Trial Pit completed at 2.30m.
				{2.60}			

0
1
2

General Remarks

Dimensions: 2.40x0.30x2.30
1. Machine excavated trial pit using a JCB 3CX to 2.30m begl due to groundwater.
2. Groundwater seepage was encountered at 2.30m begl.
3. Log completed inaccordance with BS5930:2015.
4. Trial pit was backfilled with arisings upon completion of soakaway testing.
5. Coordinates and levels were not obtained.

All dimensions in metres Scale 1:16.25		Logged By RM

1.1 ENZYGO TP LOG SHF.245.002 LOGS ATTEMPT 4.GPJ GINT STD AGS 3_1 ENZYGO.GPJ 26/3/19

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Site				
Medmerry Park Holiday Village				**SA04**
Job No: SHF.245.002	Dates: Start 25-02-19, Finish 26-02-19	Ground Level (m)	Co-Ordinates	
Client: Medmerry Park Ltd.				Sheet: 1 of 1

Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
							MADE GROUND: Turf over firm consistency brown very sandy clayey topsoil. Sand is fine to coarse. 0.00 - 0.30 Many rootlets.
				0.30			Firm consistency orange brown slightly silty sandy CLAY. Sand is fine to coarse.
				0.90			Firm consistency orange brown slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of flint. Sand is fine to coarse.
				1.40			Orange brown very sandy GRAVEL with a low cobble content of flint, chert and quartz. Gravel is subangular to subrounded fine to coarse of flint, chert and quartz. Sand is fine to coarse.
				2.10			Water seepage. Trial Pit completed at 2.10m.
				{2.60}			

0
1
2

General Remarks

Dimensions: 2.20x0.30x2.10
1. Machine excavated trial pit using a JCB 3CX to 2.10m begl due to groundwater.
2. Groundwater seepage was encountered at 2.10m begl.
3. Log completed inaccordance with BS5930:2015.
4. Trial pit was backfilled with arisings upon completion of soakaway testing.
5. Coordinates and levels were not obtained.

All dimensions in metres Scale 1:16.25		Logged By RM

1.1 ENZYGO TP LOG SHF.245.002 LOGS ATTEMPT 4.GPJ GINT STD AGS 3_1 ENZYGO.GPJ 26/3/19

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Site				
Medmerry Park Holiday Village				**SA05**
Job No: SHF.245.002	Dates: Start 26-02-19, Finish 27-02-19	Ground Level (m)	Co-Ordinates	
Client: Medmerry Park Ltd.				Sheet: 1 of 1

Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
				0.10			MADE GROUND: Turf over firm consistency brown slightly gravelly sandy clayey topsoil with a low cobble content of flint. Gravel is subangular to subrounded fine to medium of flint. Sand is fine to coarse.
				0.20			MADE GROUND: Brown slightly clayey sandy gravel. Gravel is subangular to subrounded fine to coarse of flint, brick, concrete and wood.
							Firm to stiff consistency pale brown/orange brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of flint. Sand is fine to coarse.
				1.40			Very soft consistency blue grey CLAY.
▽							1.90 Water seepage.
				2.00			Trial Pit completed at 2.00m.
				{2.60}			

Depth scale: 0, 1, 2

General Remarks

Dimensions: 1.60x0.30x2.00
1. Machine excavated trial pit using a JCB 3CX to 2.00m begl due to groundwater.
2. Groundwater seepage was encountered at 1.90m begl.
3. Log completed inaccordance with BS5930:2015.
4. Trial pit was backfilled with arisings upon completion of soakaway testing.
5. Coordinates and levels were not obtained.

All dimensions in metres
Scale 1:16.25

Logged By: RM

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Site				
Medmerry Park Holiday Village				**SA06**
Job No: SHF.245.002	Dates: Start 26-02-19, Finish 27-02-19	Ground Level (m)	Co-Ordinates	
Client: Medmerry Park Ltd.				Sheet: 1 of 1

Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
				0.15			MADE GROUND: Turf over firm consistency brown slightly gravelly slightly sandy clayey topsoil. Gravel is subangular to subrounded fine to medium of flint. Sand is fine to coarse.
				0.25			MADE GROUND: Brown grey clayey gravel. Gravel is subangular to subrounded fine to coarse of concrete. Sand is fine to coarse.
				0.50			Firm to stiff consistency grey brown/orange brown slightly sandy CLAY. Sand is fine to coarse. 0.25 - 0.50 Ocassional decaying organic fragments.
				1.90			Firm consistency green grey/orange brown slightly gravelly sandy CLAY. Gravel is subangular fine to medium of shell fragments. Sand is fine to coarse.
				2.50			Soft consistency blue grey/orange brown very sandy CLAY. Sand is fine to coarse.
				{2.60}			Trial Pit completed at 2.50m.

0
1
2

General Remarks

Dimensions: 1.80x0.30x2.50
1. Machine excavated trial pit using a JCB 3CX to 2.50m begl due to reaching required depth.
2. Groundwater was not encountered.
3. Log completed inaccordance with BS5930:2015.
4. Trial pit was backfilled with arisings upon completion of soakaway testing.
5. Coordinates and levels were not obtained.

All dimensions in metres Scale 1:16.25		Logged By RM

1.1 ENZYGO TP LOG SHF.245.002 LOGS ATTEMPT 4.GPJ GINT STD AGS 3_1 ENZYGO.GPJ 26/3/19

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Site				
Medmerry Park Holiday Village				**SA07**
Job No: SHF.245.002	Dates: Start 26-02-19, Finish 27-02-19	Ground Level (m)	Co-Ordinates	
Client: Medmerry Park Ltd.				Sheet: 1 of 1

Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
							MADE GROUND: Turf over firm consistency brown slightly sandy gravelly clayey topsoil. Gravel is subrounded fine to medium of flint, chert and quartz. Sand is fine to coarse.
				0.30			Firm consistency orange brown slightly sandy gravelly CLAY. Gravel is subrounded fine to coarse of flint, chert and quartz. Sand is fine to coarse.
				0.70			Firm consistency grey orange brown slightly gravelly sandy CLAY. Gravel is subrounded fine to medium of chert and quartz. Sand is fine to coarse.
				1.80			Green grey/orange brown slightly gravelly silty fine to medium SAND. Gravel is subangular fine to medium of shell fragments.
				2.50			Trial Pit completed at 2.50m.
				{2.60}			

Depth scale: 0, 1, 2

General Remarks

Dimensions: 2.00x0.30x2.50
1. Machine excavated trial pit using a JCB 3CX to 2.50m begl due to reaching required depth.
2. Groundwater was not encountered.
3. Log completed inaccordance with BS5930:2015.
4. Trial pit was backfilled with arisings upon completion of soakaway testing.
5. Coordinates and levels were not obtained.

All dimensions in metres Scale 1:16.25		Logged By RM

1.1 ENZYGO TP LOG SHF.245.002 LOGS ATTEMPT 4.GPJ GINT STD AGS 3_1 ENZYGO.GPJ 26/3/19

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Site				
Medmerry Park Holiday Village				**SA08**
Job No: SHF.245.002	Dates: Start 26-02-19, Finish 27-02-19	Ground Level (m)	Co-Ordinates	
Client: Medmerry Park Ltd.				Sheet: 1 of 1

Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
							MADE GROUND: Turf over firm consistency pale brown slightly gravelly sandy clayey topsoil. Gravel is subrounded fine to medium of chert. Sand is fine to coarse.
				0.20			Firm consistency orange brown slightly gravelly sandy CLAY. Gravel is subrounded fine to coarse of chert and quartz. Sand is fine to coarse.
				0.70			Firm consistency orange brown slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of flint and chert. Sand is fine to coarse.
				1.10			Firm consistency green/orange brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of flint. Sand is fine to coarse.
▽				2.30			Water seepage. Trial Pit completed at 2.30m.
				{2.60}			

0
1
2

General Remarks

Dimensions: 2.50x0.30x2.30
1. Machine excavated trial pit using a JCB 3CX to 2.30m begl due to groundwater.
2. Groundwater seepage was encountered at 2.30m begl.
3. Log completed inaccordance with BS5930:2015.
4. Trial pit was backfilled with arisings upon completion of soakaway testing.
5. Coordinates and levels were not obtained.

All dimensions in metres Scale 1:16.25		Logged By RM

1.1 ENZYGO TP LOG SHF.245.002 LOGS ATTEMPT 4.GPJ GINT STD AGS 3_1 ENZYGO.GPJ 26/3/19

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Site				
Medmerry Park Holiday Village				**WS01**
Job No: SHF.245.002	Dates: Start 27-02-19, Finish 27-02-19	Ground Level (m)	Co-Ordinates	
Client: Medmerry Park Ltd.				Sheet: 1 of 1

Well	Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
					0.30			MADE GROUND: Firm consistency brown slightly sandy slightly gravelly clayey topsoil. Gravel is subrounded fine to medium of chert. Sand is fine to coarse. 0.00 - 0.30 Many rootlets.
					0.60			MADE GROUND: Firm consistency brown slightly sandy gravelly clay. Gravel is subangular to subrounded fine to coarse of chert, flint and brick. Sand is fine to coarse.
		1.00 - 1.45	C	N 11	1.40			Firm grey/orange brown slightly gravelly sandy CLAY. Gravel is subrounded fine to coarse of flint. Sand is fine to coarse.
		2.00 - 2.45	C	N 7				Soft green/orange brown very sandy CLAY. Sand is fine to coarse. 1.40 - 3.50 Pockets of clayey fine to medium sand. 2.00 - 3.00 Locally blue green.
		3.00 - 3.45	C	N 7	3.50			
		4.00 - 4.45	C	N 12	4.45 {4.45}			3.50 - 4.00 Pockets of sand. Firm dark grey silty CLAY. Borehole completed at 4.45m.

Depth scale: 0, 1, 2, 3, 4

General Remarks

1. Dynamic sampling using a tracked percussive sampling rig to 4.45m due to reaching required depth.
2. Groundwater was not encountered.
3. Log completed inaccordance with BS5930:2015.
4. Borehole was installed with 1.00m plain pipe and 3.0m slotted pipe.
5. Coordinates and levels were not obtained.

Groundwater

Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)

All dimensions in metres
Scale 1:27.8125

Logged By: RM

1.0 ENZYGO BH LOG SHF.245.002 LOGS ATTEMPT 4.GPJ GINT STD AGS 3_1 ENZYGO.GPJ 26/3/19

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Site				
Medmerry Park Holiday Village				**WS02**
Job No: SHF.245.002	Dates: Start 27-02-19, Finish 27-02-19	Ground Level (m)	Co-Ordinates	
Client: Medmerry Park Ltd.				Sheet: 1 of 1

Well	Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
					0.30			MADE GROUND: Soft consistency brown slightly gravelly slightly sandy clayey topsoil. Gravel is subangular to subrounded fine to coarse of flint. Sand is fine to coarse. 0.00 - 0.30 Many rootlets.
								Soft consistency pale brown/orange brown slightly gravelly slightly sandy CLAY. Gravel is subangular to subrounded fine to coarse of flint. Sand is fine to coarse.
		1.00 - 1.45	C	N 4	1.00			Soft grey brown/orange brown slightly sandy CLAY. Sand is fine to coarse. 1.00 - 3.45 Locally very sandy.
		2.00 - 2.45	C	N 8				
		3.00 - 3.45	C	N 6				
					3.45			Borehole completed at 3.45m.
					{4.45}			

Depth scale: 0, 1, 2, 3, 4

General Remarks

1. Dynamic sampling using a tracked percussive sampling rig to 3.45m due to collapse.
2. Groundwater was not encountered.
3. Log completed inaccordance with BS5930:2015.
4. Borehole was backfilled with arisings.
5. Coordinates and levels were not obtained.

Groundwater

Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)

All dimensions in metres
Scale 1:27.8125

Logged By: RM

1.0 ENZYGO BH LOG SHF.245.002 LOGS ATTEMPT 4.GPJ GINT STD AGS 3_1 ENZYGO.GPJ 26/3/19

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Site				
Medmerry Park Holiday Village				**WS03**
Job No: SHF.245.002	Dates: Start 27-02-19, Finish 27-02-19	Ground Level (m)	Co-Ordinates	
Client: Medmerry Park Ltd.				Sheet: 1 of 1

Well	Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
					0.25			MADE GROUND: Soft consistency brown slightly sandy clayey topsoil. Sand is fine to coarse. 0.00 - 0.25 Many rootlets.
		1.00 - 1.45	C	N 8	1.50			Soft pale brown/orange brown slightly gravelly slightly sandy CLAY. Gravel is subangular fine to coarse of flint. Sand is fine to coarse.
		2.00 - 2.45	C	N 9	2.00			Soft consistency green grey/orange brown slightly gravelly sandy CLAY with a low cobble content of flint. Gravel is subangular to subrounded fine to coarse of flint. Sand is fine to coarse.
		3.00 - 3.45	C	N 21	3.45			Loose to medium dense green grey/orange brown very silty fine to medium SAND.
					{4.45}			Borehole completed at 3.45m.

0 1 2 3 4

General Remarks

1. Dynamic sampling using a tracked percussive sampling rig to 3.45m due to collapse.
2. Groundwater was not encountered.
3. Log completed inaccordance with BS5930:2015.
4. Borehole was backfilled with arisings.
5. Coordinates and levels were not obtained.

Groundwater

Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)

All dimensions in metres
Scale 1:27.8125

Logged By: RM

Enzygo Ltd
Tel: 01454 269237
Fax: 01454 269760
Web: www.enzygo.com

Site				
Medmerry Park Holiday Village				**WS04**
Job No: SHF.245.002	Dates: Start 27-02-19, Finish 27-02-19	Ground Level (m)	Co-Ordinates	
Client: Medmerry Park Ltd.				Sheet: 1 of 1

Well	Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
					0.50			MADE GROUND: Orange brown slightly clayey very sandy gravel. Gravel is subrounded fine to coarse of chert. Sand is fine to coarse.
		1.00 - 1.45	C	N 3	1.40			Very soft pale brown/orange brown sandy CLAY. Sand is fine to coarse.
		2.00 - 2.45	C	N 9	2.00			Soft consistency dark grey/blue grey very sandy CLAY. Sand is fine to coarse. 1.40 - 2.00 Occasional decaying organic fragments.
		3.00 - 3.45	C	N 17	3.45			Loose to meduim dense pale brown/orange brown very clayey fine to medium SAND. 2.00 - 3.45 Pockets of firm thinly laminated sandy clay.
					{4.45}			Borehole completed at 3.45m.

0 1 2 3 4

General Remarks

1. Dynamic sampling using a tracked percussive sampling rig to 3.45m due to collapse.
2. Groundwater was not encountered.
3. Log completed inaccordance with BS5930:2015.
4. Borehole was backfilled with arisings.
5. Coordinates and levels were not obtained.

Groundwater

Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)

All dimensions in metres
Scale 1:27.8125

Logged By: RM

1.0 ENZYGO BH LOG SHF.245.002 LOGS ATTEMPT 4.GPJ GINT STD AGS 3_1 ENZYGO.GPJ 26/3/19

Enzygo Ltd
Tel: 01454 269237
Fax: 01454 269760
Web: www.enzygo.com

Site				
Medmerry Park Holiday Village				**WS05**
Job No: SHF.245.002	Dates: Start 27-02-19, Finish 27-02-19	Ground Level (m)	Co-Ordinates	
Client: Medmerry Park Ltd.				Sheet: 1 of 1

Well	Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
					0.30			MADE GROUND: Firm consistency brown slightly gravelly sandy clayey topsoil. Gravel is subangular to subrounded fine to coarse of flint and chert. Sand is fine to coarse.
					0.80			MADE GROUND: Firm consistency pale brown slightly sandy gravelly clay. Gravel is subangular fine to coarse of flint. Sand is fine to coarse.
		1.00 - 1.45	C	N 15	1.00			Firm consistency dark grey slightly sandy silty CLAY. Sand is fine to coarse. 0.80 - 1.00 Occasional pockets of green sand.
		2.00 - 2.45	C	N 12				Firm grey green/orange brown slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of flint and chert. Sand is fine to coarse.
		3.00 - 3.45	C	N 17				
					3.45			Borehole completed at 3.45m.
					{4.45}			

0 1 2 3 4

General Remarks

1. Dynamic sampling using a tracked percussive sampling rig to 3.45m due to collapse.
2. Groundwater was not encountered.
3. Log completed inaccordance with BS5930:2015.
4. Borehole was backfilled with arisings.
5. Coordinates and levels were not obtained.

Groundwater

Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)

All dimensions in metres
Scale 1:27.8125

Logged By: RM

1.0 ENZYGO BH LOG SHF.245.002 LOGS ATTEMPT 4.GPJ GINT STD AGS 3_1 ENZYGO.GPJ 26/3/19

Enzygo Ltd
Tel: 01454 269237
Fax: 01454 269760
Web: www.enzygo.com

Site				
Medmerry Park Holiday Village				**WS06**
Job No: SHF.245.002	Dates: Start 27-02-19, Finish 27-02-19	Ground Level (m)	Co-Ordinates	
Client: Medmerry Park Ltd.				Sheet: 1 of 1

Well	Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
					0.20			MADE GROUND: Firm consistency brown slightly gravelly sandy clayey topsoil. Gravel is subangular to subrounded fine to medium of flint. Sand is fine to coarse.
		1.00 - 1.45	C	N 8				Soft pale brown/orange brown slightly sandy CLAY. Sand is fine to coarse. 0.20 - 2.00 Occasional pockets of clayey sand.
		2.00 - 2.45	C	N 9	2.00			Soft to firm pale brown/orange brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded of flint. Sand is fine to coarse.
		3.00 - 3.45	C	N 10				
	▽				3.30			3.30 Strata becomes very wet. Medium Dense green grey/orange brown slightly gravelly very clayey fine to medium SAND. Gravel is subangular to subrounded fine to coarse of flint.
		4.00 - 4.45	C	N 17				
					4.45 {4.45}			Borehole completed at 4.45m.

Depth scale: 0, 1, 2, 3, 4

General Remarks

1. Dynamic sampling using a tracked percussive sampling rig to 4.45m due to reaching required depth.
2. Wet strata encountered at 3.30m begl.
3. Log completed inaccordance with BS5930:2015.
4. Borehole was backfilled with arisings.
5. Coordinates and levels were not obtained.

Groundwater

Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)
27/02/19	3.30		

All dimensions in metres
Scale 1:27.8125

Logged By: RM

1.0 ENZYGO BH LOG SHF.245.002 LOGS ATTEMPT 4.GPJ GINT STD AGS 3_1 ENZYGO.GPJ 26/3/19

enzygo	**Site:**	**Medmerry Park**	Trial pit: SA01
	Job Number :	**SHF.245.002**	Pit Length: 1.80
	Date:	**25-26/02/2019**	Pit Width: 0.30
			Pit Depth: 2.50
	SOIL INFILTRATION RATE TEST		Gravel Void Ratio: 0.30
	BRE Digest 365, DG365, February 2016		*(Gravel used = 0.30, No Gravel = 1.00)*

Remarks: -
Geology
See SA01 exploratory hole log.

Weather
Overcast, light breeze, feeling cold, slightly wet underfoot.

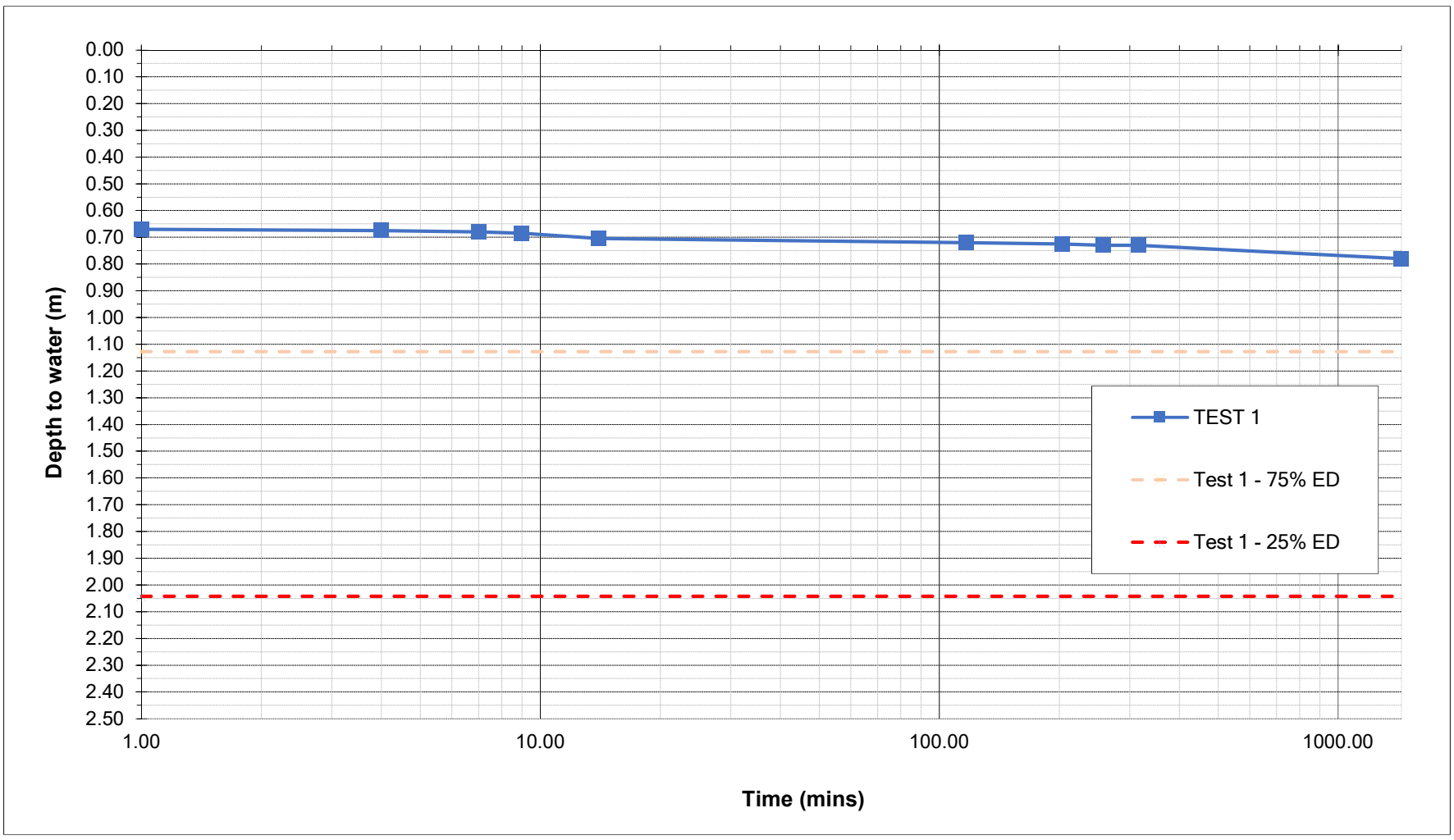
Groundwater
None encountered.

Timescales
Test Started - 1134, 25/02/19.
Test Finished - 0830, 26/02/19.

TEST 1		TEST 2		TEST 3	
Time (min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
0.00	0.67				
1.00	0.67				
4.00	0.68				
7.00	0.68				
9.00	0.69				
14.00	0.71				
117.00	0.72				
203.00	0.73				
257.00	0.73				
316.00	0.73				
1440.00	0.78				

Effective Depth	m	1.83
75% Effective Depth	m	1.37
(i.e. depth below GL)	m	**1.13**
50% Effective depth	m	0.92
(i.e. depth below GL)	m	**1.59**
25% Effective Depth	m	0.46
(i.e. depth below GL)	m	**2.04**
Effective Storage Depth 75%-25%	m	0.92
Time to fall to 75% effective depth	mins	**n/a**
Time to fall to 25% effective depth	mins	**n/a**
Vp (75%-25%)	m^3	0.15
ap50 (50%)	m^2	4.38
tp(75%-25%)	mins	**n/a**
SOIL INFILTRATION RATE	m/s	**n/a**

DESIGN SOIL INFILTRATION RATE, f m/s **n/a**



Compiled By:	Date:	Approved By:	Date
D Leedle	05/03/2019	N. Brook	26/03/2019

enzygo	**Site:**	**Medmerry Park**	Trial pit: SA02
	Job Number :	**SHF.245.002**	Pit Length: 1.80
	Date:	**25-26/02/2019**	Pit Width: 0.30
			Pit Depth: 2.20
	SOIL INFILTRATION RATE TEST		Gravel Void Ratio: 1.00
	BRE Digest 365, DG365, February 2016		*(Gravel used = 0.30, No Gravel = 1.00)*

Remarks: -
Geology
See SA02 exploratory hole log.

Weather
Overcast, light breeze, feeling cold, slightly wet underfoot.

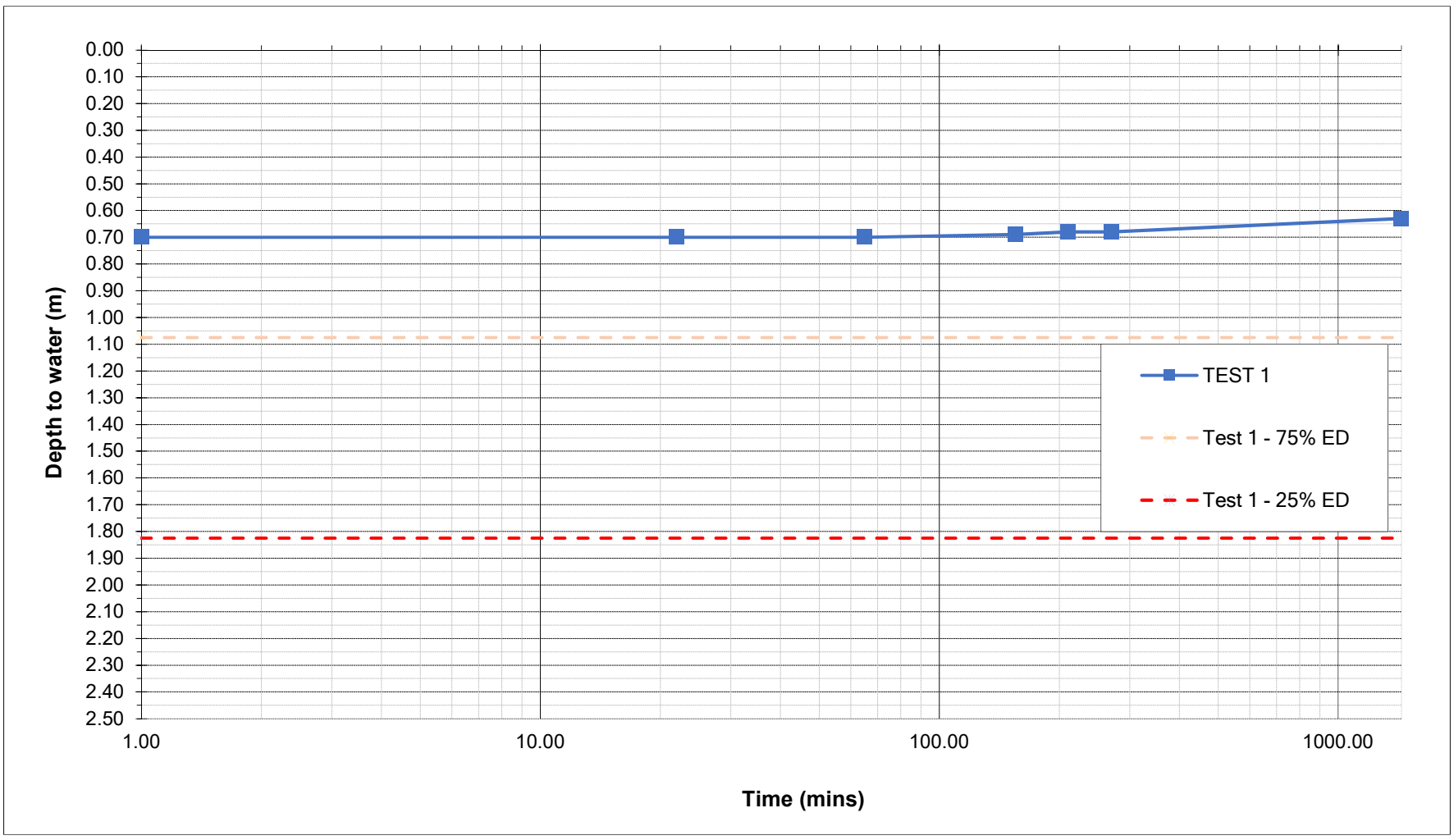
Groundwater
Water Seepage at 2.20m begl.

Timescales
Test Started - 1235, 25/02/19.
Test Finished - 0835, 26/02/19.

TEST 1		TEST 2		TEST 3	
Time (min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
0.00	0.70				
1.00	0.70				
22.00	0.70				
65.00	0.70				
155.00	0.69				
210.00	0.68				
270.00	0.68				
1440.00	0.63				

Effective Depth	m	1.50			
75% Effective Depth	m	1.13			
(i.e. depth below GL)	m	**1.08**			
50% Effective depth	m	0.75			
(i.e. depth below GL)	m	**1.45**			
25% Effective Depth	m	0.38			
(i.e. depth below GL)	m	**1.83**			
Effective Storage Depth 75%-25%	m	0.75			
Time to fall to 75% effective depth	mins	**n/a**			
Time to fall to 25% effective depth	mins	**n/a**			
Vp (75%-25%)	m^3	0.41			
ap50 (50%)	m^2	3.69			
tp(75%-25%)	mins	**n/a**			
SOIL INFILTRATION RATE	m/s	**n/a**			

DESIGN SOIL INFILTRATION RATE, f m/s **n/a**



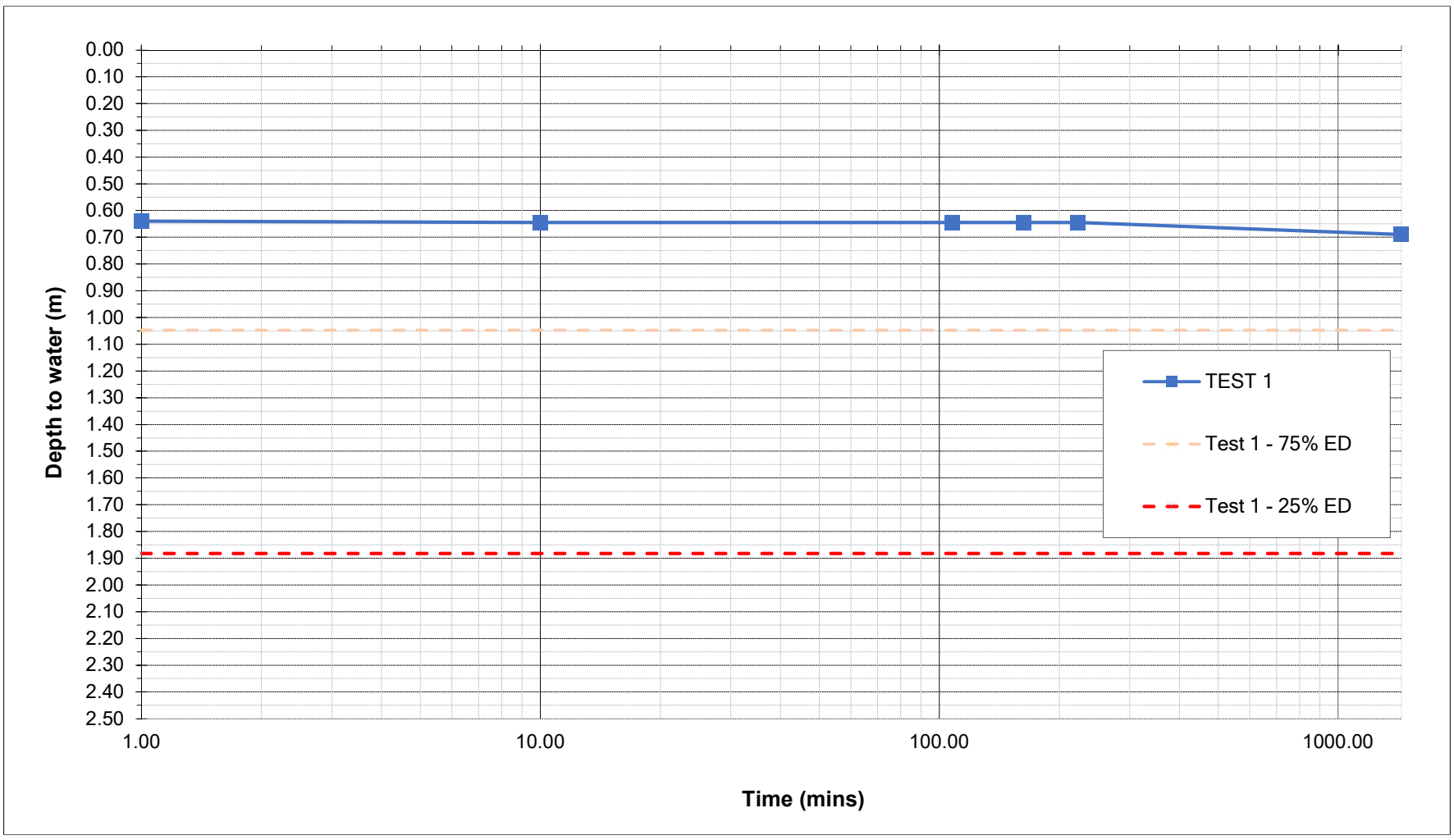
Compiled By:	Date:	Approved By:	Date
D.Leedle	05/03/2019	N. Brook	26/03/2019

enzygo	**Site:**	**Medmerry Park**	Trial pit: SA03
	Job Number :	**SHF.245.002**	Pit Length: 2.40
	Date:	**25-26/02/2019**	Pit Width: 0.30
			Pit Depth: 2.30
	SOIL INFILTRATION RATE TEST		Gravel Void Ratio: 1.00
	BRE Digest 365, DG365, February 2016		*(Gravel used = 0.30, No Gravel = 1.00)*

Remarks: -	TEST 1		TEST 2		TEST 3	
Geology	Time (min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
See SA03 exploratory hole log.	0.00	0.63				
	1.00	0.64				
Weather	10.00	0.65				
Overcast, light breeze, feeling cold, slightly wet	108.00	0.65				
underfoot.	163.00	0.65				
	223.00	0.65				
Groundwater	1440.00	0.69				
Water seepage at 2.30m.						
Timescales						
Test Started - 1317, 25/02/19.						
Test Finished - 0840, 26/02/19.						

Effective Depth	m	1.67		
75% Effective Depth	m	1.25		
(i.e. depth below GL)	m	**1.05**		
50% Effective depth	m	0.84		
(i.e. depth below GL)	m	**1.47**		
25% Effective Depth	m	0.42		
(i.e. depth below GL)	m	**1.88**		
Effective Storage Depth 75%-25%	m	0.84		
Time to fall to 75% effective depth	mins	**n/a**		
Time to fall to 25% effective depth	mins	**n/a**		
Vp (75%-25%)	m^3	0.60		
ap50 (50%)	m^2	5.23		
tp(75%-25%)	mins	**n/a**		
SOIL INFILTRATION RATE	m/s	**n/a**		

DESIGN SOIL INFILTRATION RATE, f m/s	**n/a**



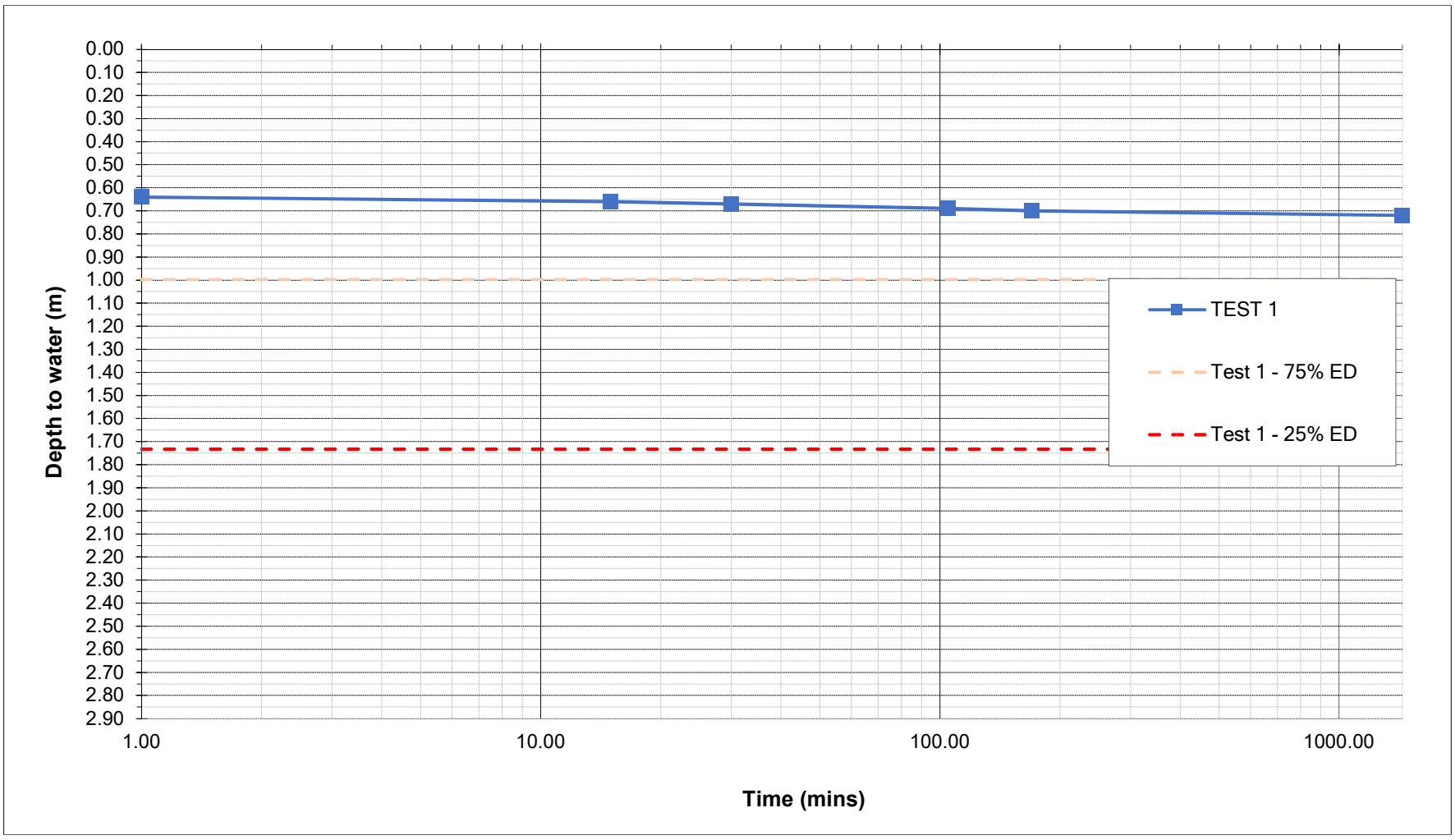
Compiled By:	Date:	Approved By:	Date
D.Leedle	05/03/2019	N. Brook	26/03/2019

enzygo	**Site:**	**Medmerry Park**	Trial pit: SA04
	Job Number :	**SHF.245.002**	Pit Length: 2.20
	Date:	**25-26/02/2019**	Pit Width: 0.30
			Pit Depth: 2.10
	SOIL INFILTRATION RATE TEST		Gravel Void Ratio: 1.00
	BRE Digest 365, DG365, February 2016		*(Gravel used = 0.30, No Gravel = 1.00)*

Remarks: -	TEST 1		TEST 2		TEST 3	
Geology	Time (min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
See SA04 exploratory hole log.	0.00	0.63				
	1.00	0.64				
Weather	15.00	0.66				
Overcast, light breeze, feeling cold, slightly wet	30.00	0.67				
underfoot.	105.00	0.69				
	170.00	0.70				
Groundwater	1440.00	0.72				
Water seepage at 2.10m.						
Timescales						
Test Started - 1420, 25/02/19.						
Test Finished - 0845, 26/02/19.						

Effective Depth	m	1.47		
75% Effective Depth	m	1.10		
(i.e. depth below GL)	m	**1.00**		
50% Effective depth	m	0.74		
(i.e. depth below GL)	m	**1.37**		
25% Effective Depth	m	0.37		
(i.e. depth below GL)	m	**1.73**		
Effective Storage Depth 75%-25%	m	0.74		
Time to fall to 75% effective depth	mins	**n/a**		
Time to fall to 25% effective depth	mins	**n/a**		
Vp (75%-25%)	m^3	0.49		
ap50 (50%)	m^2	4.34		
tp(75%-25%)	mins	**n/a**		
SOIL INFILTRATION RATE	m/s	**n/a**		

DESIGN SOIL INFILTRATION RATE, f m/s	**n/a**



Compiled By:	Date:	Approved By:	Date
D.Leedle	05/03/2019	N. Brook	26/03/2019

enzygo	**Site:**	**Medmerry Park**	Trial pit: SA05
	Job Number :	**SHF.245.002**	Pit Length: 1.60
	Date:	**26-27/02/2019**	Pit Width: 0.30
			Pit Depth: 2.00
	SOIL INFILTRATION RATE TEST		Gravel Void Ratio: 1.00
	BRE Digest 365, DG365, February 2016		*(Gravel used = 0.30, No Gravel = 1.00)*

Remarks: -
Geology
See SA05 exploratory hole log.

Weather
Overcast, light breeze, feeling cold, slightly wet underfoot.

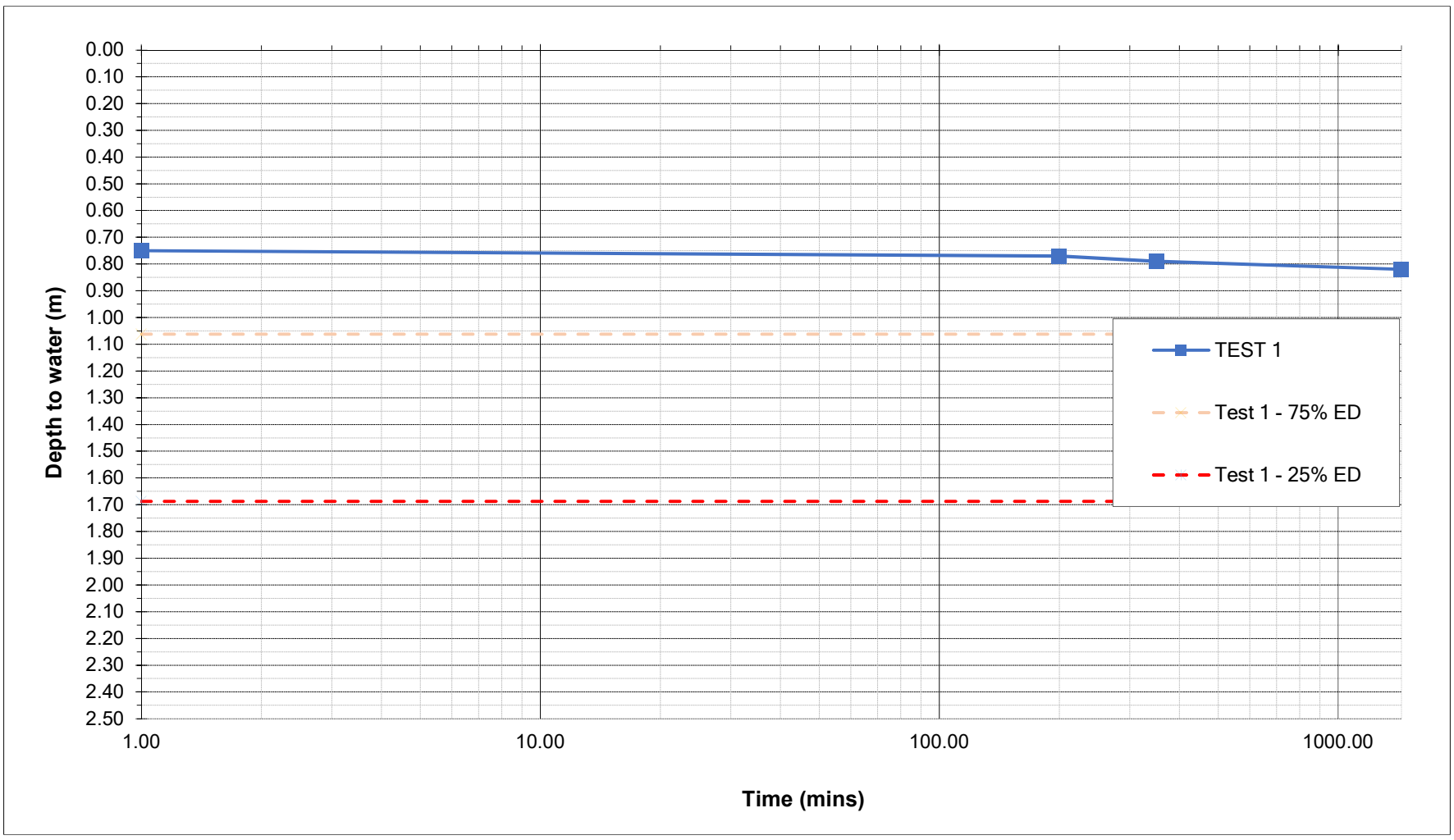
Groundwater
Water seepage at 1.90m.

Timescales
Test Started - 0945, 26/02/19.
Test Finished - 0839, 27/02/19.

TEST 1		TEST 2		TEST 3	
Time (min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
0.00	0.75				
1.00	0.75				
200.00	0.77				
350.00	0.79				
1440.00	0.82				

Effective Depth	m	1.25
75% Effective Depth	m	0.94
(i.e. depth below GL)	m	**1.06**
50% Effective depth	m	0.63
(i.e. depth below GL)	m	**1.38**
25% Effective Depth	m	0.31
(i.e. depth below GL)	m	**1.69**
Effective Storage Depth 75%-25%	m	0.63
Time to fall to 75% effective depth	mins	**n/a**
Time to fall to 25% effective depth	mins	**n/a**
Vp (75%-25%)	m^3	0.30
ap50 (50%)	m^2	2.86
tp(75%-25%)	mins	**n/a**
SOIL INFILTRATION RATE	m/s	**n/a**

DESIGN SOIL INFILTRATION RATE, f m/s **n/a**



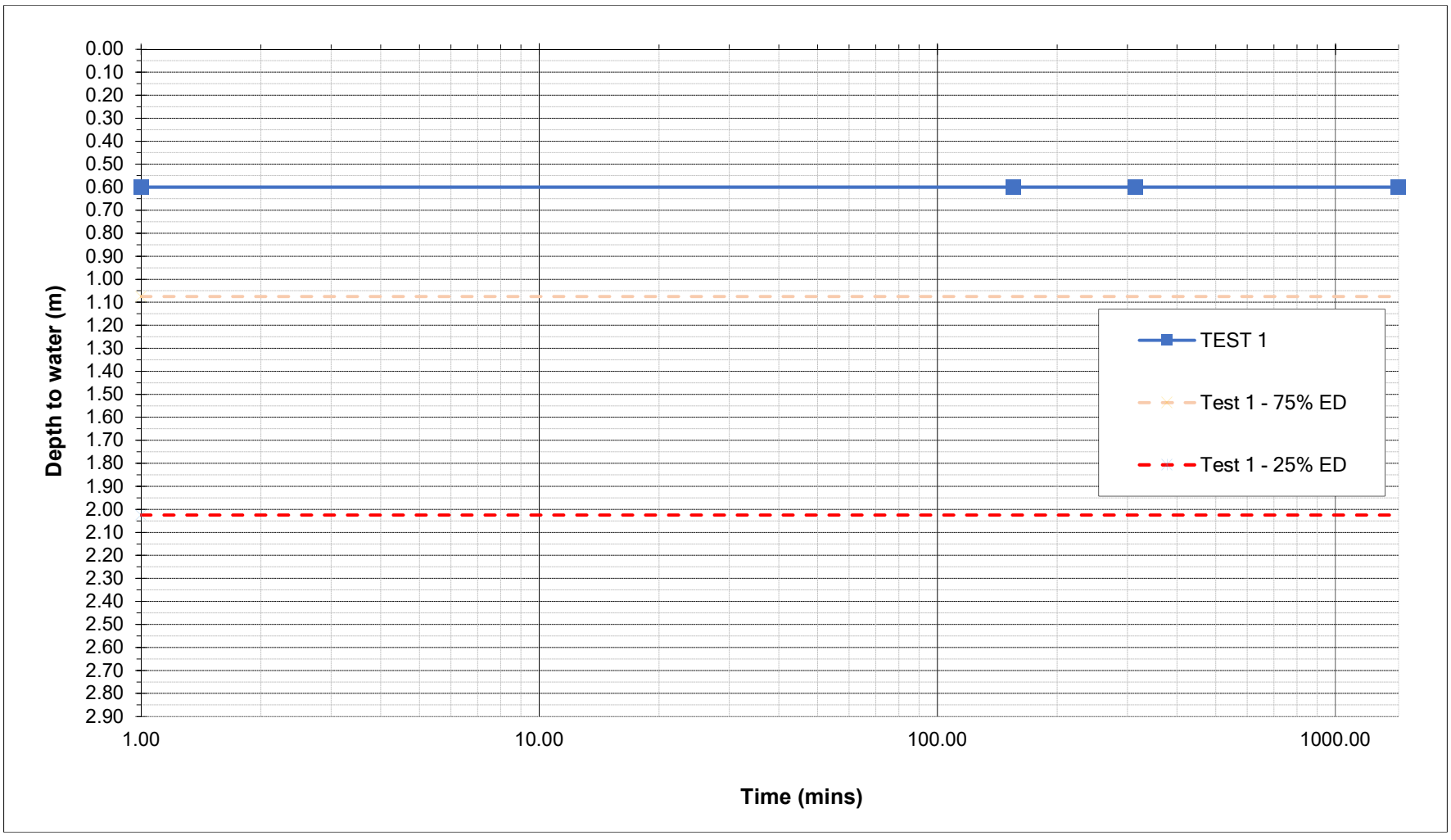
Compiled By:	Date:	Approved By:	Date
D.Leedle	05/03/2019	N. Brook	26/03/2019

Site:	**Medmerry Park**	Trial pit SA06
Job Number :	**SHF.245.002**	Pit Length 1.80
Date:	**26-27/02/2019**	Pit Width 0.30
		Pit Depth 2.50
SOIL INFILTRATION RATE TEST		Gravel Void Ratio 1.00
BRE Digest 365, DG365, February 2016		*(Gravel used = 0.30, No Gravel = 1.00)*

Remarks: -	TEST 1		TEST 2		TEST 3	
Geology	Time (min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
See SA06 exploratory hole log.	0.00	0.60				
	1.00	0.60				
Weather	155.00	0.60				
Overcast, light breeze, feeling cold, slightly wet	315.00	0.60				
underfoot.	1440.00	0.60				
Groundwater						
None encountered.						
Timescales						
Test Started - 1035, 26/02/19.						
Test Finished - 0835, 27/02/19.						

Effective Depth	m	1.90		
75% Effective Depth	m	1.43		
(i.e. depth below GL)	m	**1.08**		
50% Effective depth	m	0.95		
(i.e. depth below GL)	m	**1.55**		
25% Effective Depth	m	0.48		
(i.e. depth below GL)	m	**2.03**		
Effective Storage Depth 75%-25%	m	0.95		
Time to fall to 75% effective depth	mins	**n/a**		
Time to fall to 25% effective depth	mins	**n/a**		
Vp (75%-25%)	m^3	0.51		
ap50 (50%)	m^2	4.53		
tp(75%-25%)	mins	**n/a**		
SOIL INFILTRATION RATE	m/s	**n/a**		

DESIGN SOIL INFILTRATION RATE, f m/s	**n/a**



Compiled By:	Date:	Approved By:	Date
D.Leedle	05/03/2019	N. Brook	26/03/2019

Site:	**Medmerry Park**	Trial pit SA07
Job Number :	**SHF.245.002**	Pit Length 2.00
Date:	**26-27/02/2019**	Pit Width 0.30
		Pit Depth 2.50
SOIL INFILTRATION RATE TEST		Gravel Void Ratio 1.00
BRE Digest 365, DG365, February 2016		*(Gravel used = 0.30, No Gravel = 1.00)*

Remarks: -
Geology
See SA07 exploratory hole log.

Weather
Overcast, light breeze, feeling cold, slightly wet underfoot.

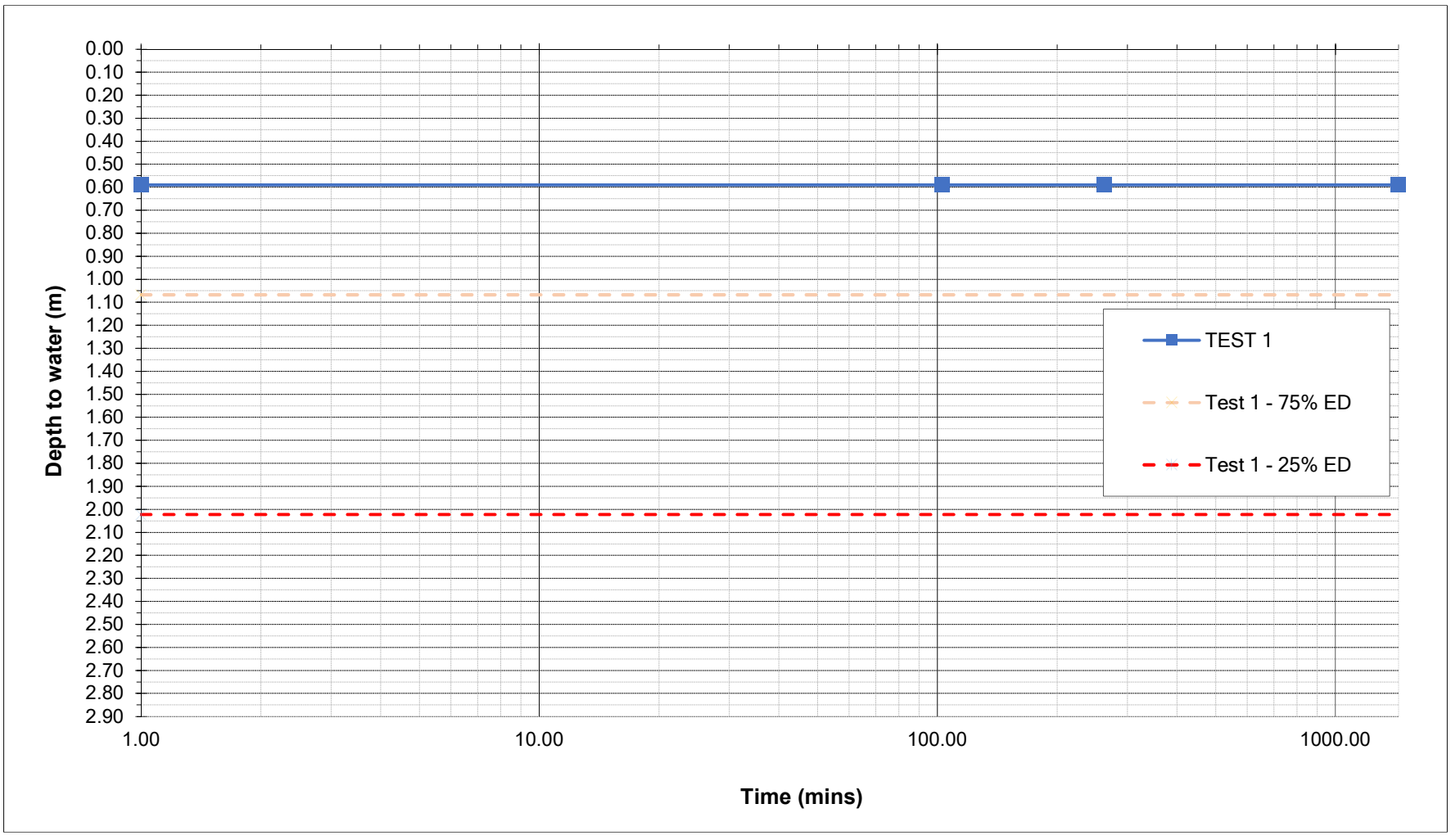
Groundwater
None encountered.

Timescales
Test Started - 1132, 26/02/19.
Test Finished - 0840, 27/02/19.

TEST 1		TEST 2		TEST 3	
Time (min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
0.00	0.59				
1.00	0.59				
103.00	0.59				
263.00	0.59				
1440.00	0.59				

Effective Depth	m	1.91		
75% Effective Depth	m	1.43		
(i.e. depth below GL)	m	**1.07**		
50% Effective depth	m	0.96		
(i.e. depth below GL)	m	**1.55**		
25% Effective Depth	m	0.48		
(i.e. depth below GL)	m	**2.02**		
Effective Storage Depth 75%-25%	m	0.96		
Time to fall to 75% effective depth	mins	**n/a**		
Time to fall to 25% effective depth	mins	**n/a**		
Vp (75%-25%)	m^3	0.57		
ap50 (50%)	m^2	4.99		
tp(75%-25%)	mins	**n/a**		
SOIL INFILTRATION RATE	m/s	**n/a**		

DESIGN SOIL INFILTRATION RATE, f m/s **n/a**



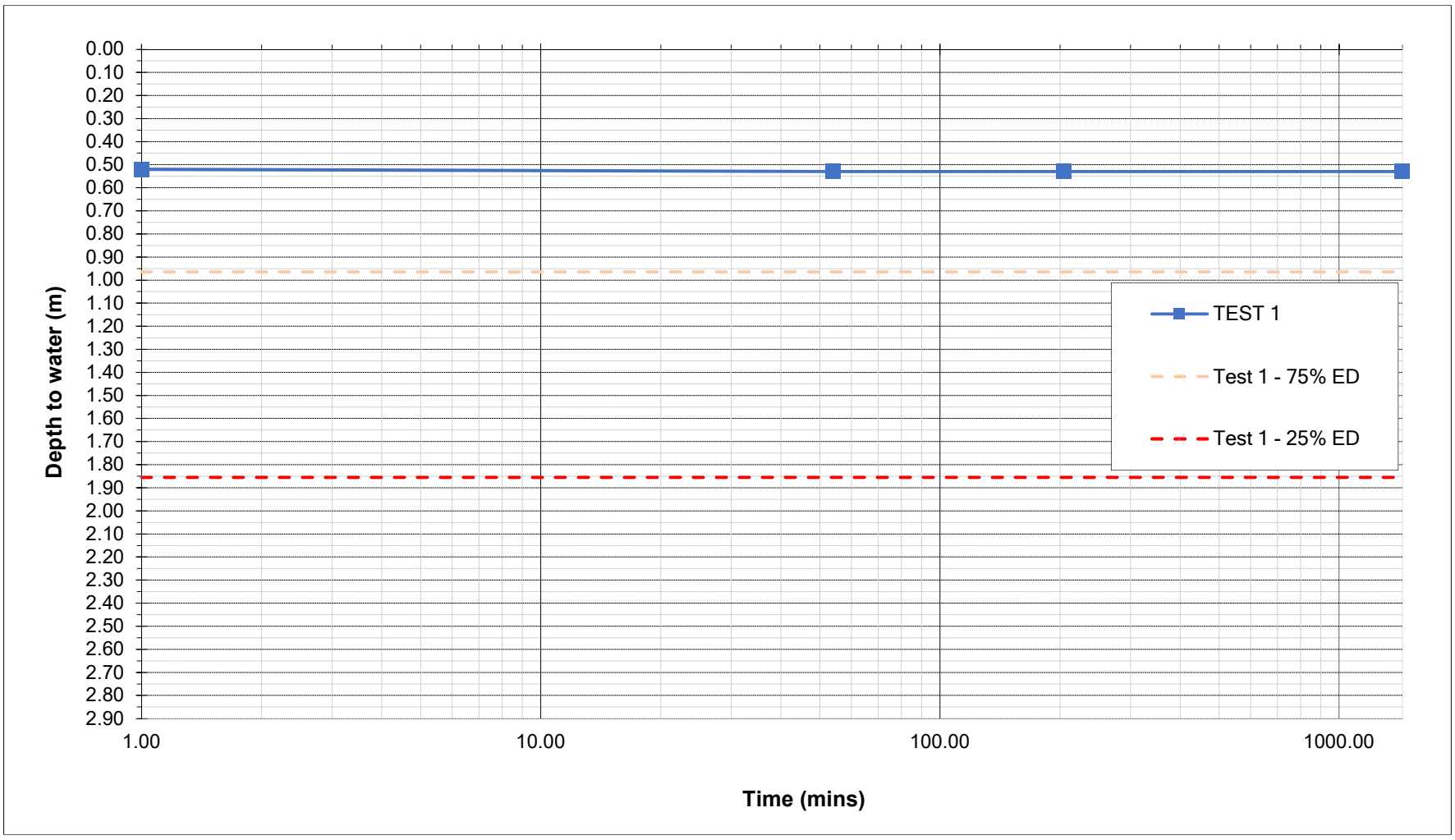
Compiled By:	Date:	Approved By:	Date
D.Leedle	05/03/2019	N. Brook	26/03/2019

Site:	**Medmerry Park**	Trial pit SA08
Job Number :	**SHF.245.002**	Pit Length 2.50
Date:	**26-27/02/2019**	Pit Width 0.30
		Pit Depth 2.30
SOIL INFILTRATION RATE TEST		Gravel Void Ratio 1.00
BRE Digest 365, DG365, February 2016		*(Gravel used = 0.30, No Gravel = 1.00)*

Remarks: -	TEST 1		TEST 2		TEST 3	
Geology	Time (min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
See SA08 exploratory hole log.	0.00	0.52				
	1.00	0.52				
Weather	54.00	0.53				
Overcast, light breeze, feeling cold, slightly wet	204.00	0.53				
underfoot.	1440.00	0.53				
Groundwater						
Water seepage at 2.30m.						
Timescales						
Test Started - 1236, 26/02/19.						
Test Finished - 0845, 27/02/19.						

Effective Depth	m	1.78
75% Effective Depth	m	1.34
(i.e. depth below GL)	m	**0.97**
50% Effective depth	m	0.89
(i.e. depth below GL)	m	**1.41**
25% Effective Depth	m	0.45
(i.e. depth below GL)	m	**1.86**
Effective Storage Depth 75%-25%	m	0.89
Time to fall to 75% effective depth	mins	**n/a**
Time to fall to 25% effective depth	mins	**n/a**
Vp (75%-25%)	m^3	0.67
ap50 (50%)	m^2	5.73
tp(75%-25%)	mins	**n/a**
SOIL INFILTRATION RATE	m/s	**n/a**

DESIGN SOIL INFILTRATION RATE, f m/s **n/a**



Compiled By:	Date:	Approved By:	Date
D.Leedle	05/03/2019	N. Brook	26/03/2019

enzygo
environmental consultants

Samuel House, 5 Fox Valley Way
Stocksbridge, Sheffield, S36 2AA

Tel: 0114 321 51 51
www.enzygo.com

Our Ref: SHF.245.002.GE.L.002.A
Date: 12th June 2019

F.A.O Ken Brown
Medmerry Park Limited
29-30 Watling Street
Top Floor
Canterbury
Kent
CT1 2UD

Dear Ken,

MEDMERRY PARK HOLIDAY VILLAGE –GROUND WATER LEVEL ASSESSMENT

Enzygo Ltd. [Enzygo] were employed by Medmerry Park Ltd. [the Client] to undertake groundwater monitoring at the site of a proposed development for additional holiday lodges at Medmerry Park Holiday Village. This letter report provides an assessment of the encountered groundwater conditions and results of monitoring undertaken and should be read in conjunction with SHF.245.002.GE.L.001.A – Soakaway Letter Report.

Geology

With reference to the British Geological Survey (BGS) website[1], the south and west of site is indicated to be underlain by River Terrace deposits (Sand, Silt and Clay) and Raised Beach deposits (Sand and Gravel) with Raised Marine deposits (Clay, Silt, Sand and Gravel) present in the northwest/southeast . The underlying solid strata across majority of site is the Earnley Sand Formation (Sand, Silt and Clay) with the Wittering Formation (Sand, Silt and Clay) located to the north onsite.

With reference to the aquifer designation, taken from Magic.gov.uk website[2], the superficial deposits are all classified as Secondary A aquifers.

Ground Investigation

The ground investigation was undertaken between the 25th to 27th February 2019 comprised six window sample boreholes (WS01 – WS06), one of which (WS01) was installed with a data logger, taking hourly readings for three months of the groundwater levels.

The window sample boreholes were positioned around site to provide coverage with an install in the approximate centre of site for groundwater monitoring.

The exploratory hole locations are shown on the exploratory hole location plan referenced, SHF.245.002.GE.DR.001, which is appended to this report.

Ground Conditions

Typical ground and groundwater conditions have been assessed by Enzygo using the available data and are summarised below. Full details of the ground and groundwater conditions encountered during the works are given on the exploratory hole records appended to this letter report and are summarised in further detail in the section below.

[1] *The British Geological Survey, www.bgs.ac.uk (Date accessed June 2019)*

[2] *The Magic website, www.magic.gov.uk (Date accessed June 2019)*

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Table 1: Summary of Ground and Groundwater Conditions

Strata	Summary Description	Depth (m)
Made Ground	Topsoil	0.00 to 0.30
	Firm consistency pale brown sandy gravelly clay	0.30 to 0.60
Superficial	Very soft to stiff consistency grey green/grey brown/orange brown sandy gravelly clay	0.20 to 3.45
	Green grey/orange brown silty clayey fine to medium sand	2.00 to 4.45
Groundwater	Noted in WS06	3.30

Made Ground

Made Ground was encountered across the site from ground level to typically 0.30m below existing ground level (begl) comprising topsoil underlain by reworked clayey deposits from 0.30 to 0.60m begl.

Superficial Deposits

Natural deposits were generally consistent with the published BGS information and varied in thickness across site and comprised of interbedded cohesive and granular strata to a maximum depth of 4.45m begl.

Bedrock

Bedrock was not encountered.

Groundwater

Groundwater seepage was encountered at a depth of 3.30m begl (WS06).

Groundwater Monitoring Results

The groundwater monitoring was undertaken between the 8th March and 7th June 2019 using a data level logger and the groundwater levels were recorded hourly.

The monitoring showed an approximate 0.35m change in level over the three months ranging from 0.85m begl to 1.20m begl. (Refer to groundwater level graph, which is appended.)

Conclusions

The results of the groundwater monitoring confirm the findings of the soakaway testing, reported in our letter report, SHF.245.002.GE.L.001.A. Groundwater levels are too shallow for viable soakaway drainage and alternative methods of drainage should be utilised.

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If you have any queries, or require further information, please do not hesitate to contact the undersigned.

Yours sincerely,

Deanna Leedle – BSc, (Hons), FGS.
Graduate Geo-Environmental Engineer

Reviewed by,

Nick Brook – BSc (Hons), FGS
Senior Consultant

ENCL.
SHF.245.002.GE.DR.001 – Exploratory Hole Location Plan
Borehole Logs
Ground Water Level Over Three Months Graph

NOTES

1. Do not scale from this drawing.
2. All dimensions are in meters.
3. This drawing is to be read in conjunction with all relevant documentation.
4. All surveyed information including levels and layout is provided by others.
5. All existing and proposed dimensions, levels and locations to be checked and verified by the main contractor on site prior to the commencement of the works and any anomalies reported to the engineer.

Key:

Site Boundary

WS* Window Sample location with Installation

WS Window Sample Location

TP Soakaway Pit location

REV:	DATE:	DETAIL:	DES:	CHK:	APP:
P02	25/03/19	Ammendments	NB	SD	SD
P01	06/02/19	First Issue	NB	SD	SD

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Samuel House, 5 Fox Valley Way, Stocksbridge, Sheffield, S36 2AA

CLIENT: Medmerry Park Limited

PROJECT: Medmerry Park

DRAWING TITLE: Exploratory Hole Location Plan

DRAWN:	DESIGNED:	CHECKED:	APPROVED:
NB	NB	SD	SD

DATE:	SCALE @ A3:
06/02/19	Not to Scale

PROJECT NO.:	DRAWING NO.:
SHF.245.002	001

DRAWING STATUS:	ISSUE:
FOR INFORMATION	P02

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Site				
Medmerry Park Holiday Village				**WS01**
Job No: SHF.245.002	Dates: Start 27-02-19, Finish 27-02-19	Ground Level (m)	Co-Ordinates	
Client: Medmerry Park Ltd.				Sheet: 1 of 1

Well	Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
					0.30			MADE GROUND: Firm consistency brown slightly sandy slightly gravelly clayey topsoil. Gravel is subrounded fine to medium of chert. Sand is fine to coarse. 0.00 - 0.30 Many rootlets.
					0.60			MADE GROUND: Firm consistency brown slightly sandy gravelly clay. Gravel is subangular to subrounded fine to coarse of chert, flint and brick. Sand is fine to coarse.
		1.00 - 1.45	C	N 11	1.40			Firm grey/orange brown slightly gravelly sandy CLAY. Gravel is subrounded fine to coarse of flint. Sand is fine to coarse.
		2.00 - 2.45	C	N 7				Soft green/orange brown very sandy CLAY. Sand is fine to coarse. 1.40 - 3.50 Pockets of clayey fine to medium sand. 2.00 - 3.00 Locally blue green.
		3.00 - 3.45	C	N 7	3.50			
		4.00 - 4.45	C	N 12	4.45 {4.45}			3.50 - 4.00 Pockets of sand. Firm dark grey silty CLAY. Borehole completed at 4.45m.

Depth scale: 0, 1, 2, 3, 4

General Remarks

1. Dynamic sampling using a tracked percussive sampling rig to 4.45m due to reaching required depth.
2. Groundwater was not encountered.
3. Log completed inaccordance with BS5930:2015.
4. Borehole was installed with 1.00m plain pipe and 3.0m slotted pipe.
5. Coordinates and levels were not obtained.

Groundwater

Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)

All dimensions in metres
Scale 1:27.8125

Logged By: RM

1.0 ENZYGO BH LOG SHF.245.002 LOGS ATTEMPT 4.GPJ GINT STD AGS 3_1 ENZYGO.GPJ 26/3/19

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Site				
Medmerry Park Holiday Village				**WS02**
Job No: SHF.245.002	Dates: Start 27-02-19, Finish 27-02-19	Ground Level (m)	Co-Ordinates	
Client: Medmerry Park Ltd.				Sheet: 1 of 1

Well	Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
					0.30			MADE GROUND: Soft consistency brown slightly gravelly slightly sandy clayey topsoil. Gravel is subangular to subrounded fine to coarse of flint. Sand is fine to coarse. 0.00 - 0.30 Many rootlets.
								Soft consistency pale brown/orange brown slightly gravelly slightly sandy CLAY. Gravel is subangular to subrounded fine to coarse of flint. Sand is fine to coarse.
		1.00 - 1.45	C	N 4	1.00			Soft grey brown/orange brown slightly sandy CLAY. Sand is fine to coarse. 1.00 - 3.45 Locally very sandy.
		2.00 - 2.45	C	N 8				
		3.00 - 3.45	C	N 6				
					3.45			Borehole completed at 3.45m.
					{4.45}			

Depth scale: 0, 1, 2, 3, 4

General Remarks

1. Dynamic sampling using a tracked percussive sampling rig to 3.45m due to collapse.
2. Groundwater was not encountered.
3. Log completed inaccordance with BS5930:2015.
4. Borehole was backfilled with arisings.
5. Coordinates and levels were not obtained.

Groundwater

Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)

All dimensions in metres
Scale 1:27.8125

Logged By: RM

1.0 ENZYGO BH LOG SHF.245.002 LOGS ATTEMPT 4.GPJ GINT STD AGS 3_1 ENZYGO.GPJ 26/3/19

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Site				
Medmerry Park Holiday Village				**WS03**
Job No: SHF.245.002	Dates: Start 27-02-19, Finish 27-02-19	Ground Level (m)	Co-Ordinates	
Client: Medmerry Park Ltd.				Sheet: 1 of 1

Well	Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
					0.25			MADE GROUND: Soft consistency brown slightly sandy clayey topsoil. Sand is fine to coarse. 0.00 - 0.25 Many rootlets.
		1.00 - 1.45	C	N 8	1.50			Soft pale brown/orange brown slightly gravelly slightly sandy CLAY. Gravel is subangular fine to coarse of flint. Sand is fine to coarse.
		2.00 - 2.45	C	N 9	2.00			Soft consistency green grey/orange brown slightly gravelly sandy CLAY with a low cobble content of flint. Gravel is subangular to subrounded fine to coarse of flint. Sand is fine to coarse.
		3.00 - 3.45	C	N 21	3.45			Loose to medium dense green grey/orange brown very silty fine to medium SAND.
					{4.45}			Borehole completed at 3.45m.

0 1 2 3 4

General Remarks

1. Dynamic sampling using a tracked percussive sampling rig to 3.45m due to collapse.
2. Groundwater was not encountered.
3. Log completed inaccordance with BS5930:2015.
4. Borehole was backfilled with arisings.
5. Coordinates and levels were not obtained.

Groundwater

Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)

All dimensions in metres
Scale 1:27.8125

Logged By: RM

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Site				
Medmerry Park Holiday Village				**WS04**
Job No: SHF.245.002	Dates: Start 27-02-19, Finish 27-02-19	Ground Level (m)	Co-Ordinates	
Client: Medmerry Park Ltd.				Sheet: 1 of 1

Well	Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
					0.50			MADE GROUND: Orange brown slightly clayey very sandy gravel. Gravel is subrounded fine to coarse of chert. Sand is fine to coarse.
		1.00 - 1.45	C	N 3	1.40			Very soft pale brown/orange brown sandy CLAY. Sand is fine to coarse.
		2.00 - 2.45	C	N 9	2.00			Soft consistency dark grey/blue grey very sandy CLAY. Sand is fine to coarse. 1.40 - 2.00 Occasional decaying organic fragments.
		3.00 - 3.45	C	N 17	3.45			Loose to meduim dense pale brown/orange brown very clayey fine to medium SAND. 2.00 - 3.45 Pockets of firm thinly laminated sandy clay.
					{4.45}			Borehole completed at 3.45m.

0 1 2 3 4

General Remarks

1. Dynamic sampling using a tracked percussive sampling rig to 3.45m due to collapse.
2. Groundwater was not encountered.
3. Log completed inaccordance with BS5930:2015.
4. Borehole was backfilled with arisings.
5. Coordinates and levels were not obtained.

Groundwater

Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)

All dimensions in metres
Scale 1:27.8125

Logged By: RM

1.0 ENZYGO BH LOG SHF.245.002 LOGS ATTEMPT 4.GPJ GINT STD AGS 3_1 ENZYGO.GPJ 26/3/19

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Site				
Medmerry Park Holiday Village				**WS05**
Job No: SHF.245.002	Dates: Start 27-02-19, Finish 27-02-19	Ground Level (m)	Co-Ordinates	
Client: Medmerry Park Ltd.				Sheet: 1 of 1

Well	Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
					0.30			MADE GROUND: Firm consistency brown slightly gravelly sandy clayey topsoil. Gravel is subangular to subrounded fine to coarse of flint and chert. Sand is fine to coarse.
					0.80			MADE GROUND: Firm consistency pale brown slightly sandy gravelly clay. Gravel is subangular fine to coarse of flint. Sand is fine to coarse.
		1.00 - 1.45	C	N 15	1.00			Firm consistency dark grey slightly sandy silty CLAY. Sand is fine to coarse. 0.80 - 1.00 Occasional pockets of green sand.
		2.00 - 2.45	C	N 12				Firm grey green/orange brown slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of flint and chert. Sand is fine to coarse.
		3.00 - 3.45	C	N 17				
					3.45			Borehole completed at 3.45m.
					{4.45}			

0 1 2 3 4

General Remarks

1. Dynamic sampling using a tracked percussive sampling rig to 3.45m due to collapse.
2. Groundwater was not encountered.
3. Log completed inaccordance with BS5930:2015.
4. Borehole was backfilled with arisings.
5. Coordinates and levels were not obtained.

Groundwater

Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)

All dimensions in metres
Scale 1:27.8125

Logged By: RM

1.0 ENZYGO BH LOG SHF.245.002 LOGS ATTEMPT 4.GPJ GINT STD AGS 3_1 ENZYGO.GPJ 26/3/19

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Site				
Medmerry Park Holiday Village				**WS06**
Job No: SHF.245.002	Dates: Start 27-02-19, Finish 27-02-19	Ground Level (m)	Co-Ordinates	
Client: Medmerry Park Ltd.				Sheet: 1 of 1

Well	Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
					0.20			MADE GROUND: Firm consistency brown slightly gravelly sandy clayey topsoil. Gravel is subangular to subrounded fine to medium of flint. Sand is fine to coarse.
		1.00 - 1.45	C	N 8				Soft pale brown/orange brown slightly sandy CLAY. Sand is fine to coarse. 0.20 - 2.00 Occasional pockets of clayey sand.
		2.00 - 2.45	C	N 9	2.00			Soft to firm pale brown/orange brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded of flint. Sand is fine to coarse.
		3.00 - 3.45	C	N 10				
	▽				3.30			3.30 Strata becomes very wet. Medium Dense green grey/orange brown slightly gravelly very clayey fine to medium SAND. Gravel is subangular to subrounded fine to coarse of flint.
		4.00 - 4.45	C	N 17				
					4.45 {4.45}			Borehole completed at 4.45m.

Depth scale: 0, 1, 2, 3, 4

General Remarks

1. Dynamic sampling using a tracked percussive sampling rig to 4.45m due to reaching required depth.
2. Wet strata encountered at 3.30m begl.
3. Log completed inaccordance with BS5930:2015.
4. Borehole was backfilled with arisings.
5. Coordinates and levels were not obtained.

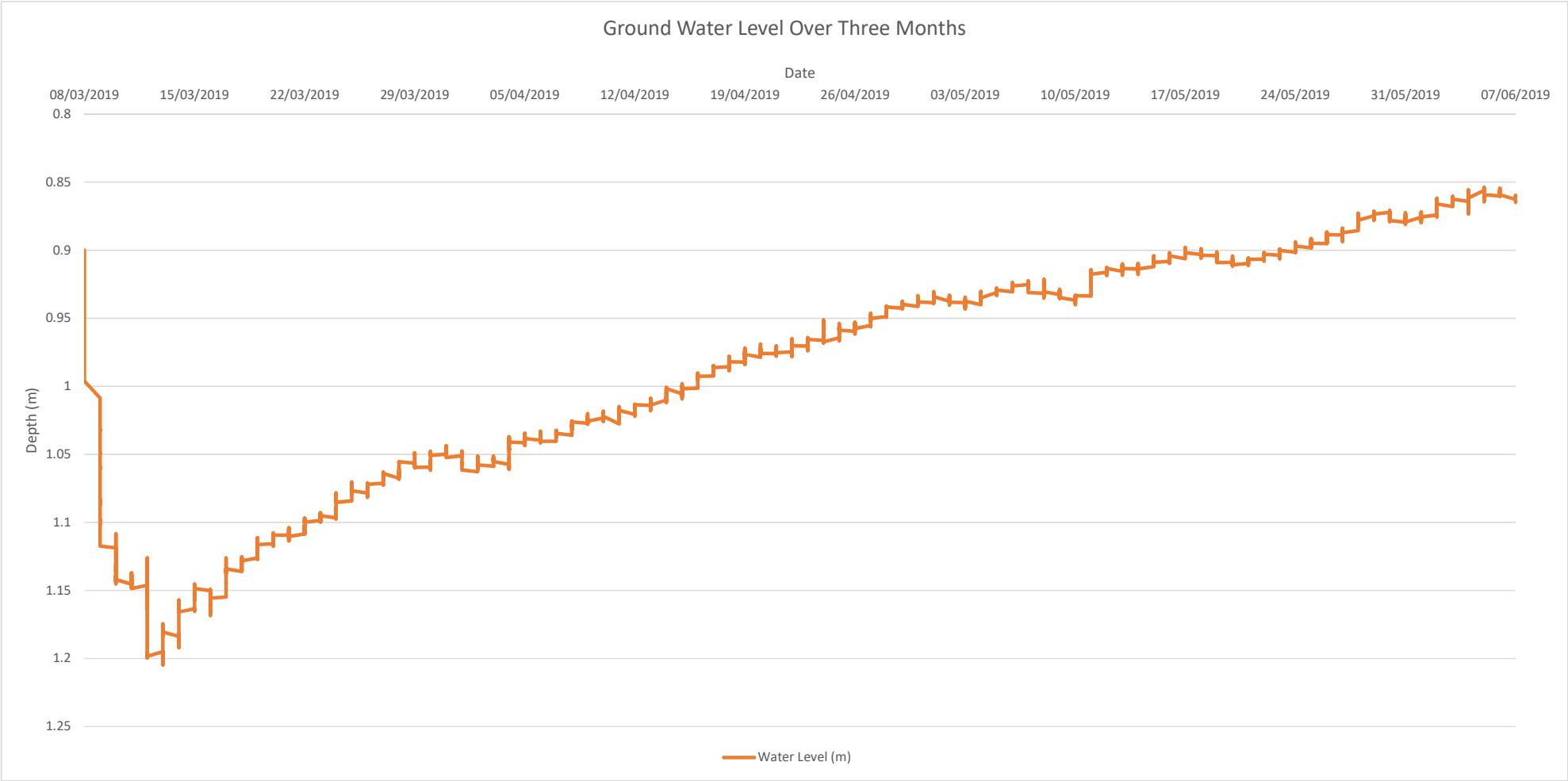
Groundwater

Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)
27/02/19	3.30		

All dimensions in metres
Scale 1:27.8125

Logged By: RM

1.0 ENZYGO BH LOG SHF.245.002 LOGS ATTEMPT 4.GPJ GINT STD AGS 3_1 ENZYGO.GPJ 26/3/19


Ground Water Level Over Three Months
Date
08/03/2019
15/03/2019
22/03/2019
29/03/2019
05/04/2019
12/04/2019
19/04/2019
26/04/2019
03/05/2019
10/05/2019
17/05/2019
24/05/2019
31/05/2019
07/06/2019
Depth (m)
0.8
0.85
0.9
0.95
1
1.05
1.1
1.15
1.2
1.25
Water Level (m)

Appendix A.4 – Surface Water Management Calculations

Design Settings

Rainfall Methodology	FEH-13	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	100	Maximum Rainfall (mm/hr)	250.0	Include Intermediate Ground	x
Additional Flow (%)	45	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
5	0.258	5.00	4.000	1200	481964.444	96013.872	0.500
6			4.000	1200	481924.511	96016.258	1.500
7			3.300	1200	481925.145	95995.165	0.970
1	0.250	5.00	4.000	1200	481801.876	96012.305	0.500
2	0.262	5.00	4.000	1200	481883.335	96012.968	0.600
3			4.000	1350	481843.119	96012.023	1.500
4			3.500	1200	481843.956	95994.090	1.300
9	1.393	5.00	2.400	1200	481889.557	95957.414	0.550
10			2.400	1200	481855.504	95907.782	0.560
Existing road	0.390	5.00	4.000	1500	481825.705	95915.517	2.000
13			3.000	1500	481849.604	95899.379	1.263
9_OUT			2.200	1350	481847.645	95896.658	0.497

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
3.000	5	6	40.004	0.600	3.500	3.400	0.100	400.0	450	5.66	145.4
3.001	6	7	17.000	0.600	2.500	2.330	0.170	100.0	150	5.94	144.6
1.002	7	9	2.000	0.600	2.330	2.200	0.130	15.4	150	5.96	144.1
1.000	1	3	41.244	0.600	3.500	3.400	0.100	412.4	450	5.69	144.8
2.000	2	3	40.227	0.600	3.400	3.300	0.100	402.3	450	5.67	145.3
1.001	3	4	13.000	0.600	2.500	2.200	0.300	43.3	150	5.83	149.0
2.002	4	9	2.000	0.600	2.200	2.180	0.020	100.0	150	5.87	149.5
1.003	9	10	1.000	0.600	1.850	1.840	0.010	100.0	150	5.97	128.5
1.004	10	13	10.267	0.600	1.840	1.737	0.103	99.7	225	6.10	130.5
4.000	Existing road	13	28.837	0.600	2.000	1.737	0.263	109.6	525	5.22	155.2
1.005	13	9_OUT	3.353	0.600	1.737	1.703	0.034	100.0	450	6.13	147.2

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
3.000	1.010	160.6	196.6	0.050	0.150	0.258	0.0	450	1.023
3.001	1.005	17.8	195.5	1.350	0.820	0.258	0.0	150	1.023
1.002	2.581	45.6	194.8	0.820	0.050	0.258	0.0	150	2.629
1.000	0.995	158.2	189.7	0.050	0.150	0.250	0.0	450	1.007
2.000	1.007	160.2	199.5	0.150	0.250	0.262	0.0	450	1.020
1.001	1.533	27.1	399.8	1.350	1.150	0.512	0.0	150	1.561
2.002	1.005	17.8	401.1	1.150	0.070	0.512	0.0	150	1.023
1.003	1.005	17.8	1456.6	0.400	0.410	2.163	0.0	150	1.023
1.004	1.309	52.1	1479.3	0.335	1.038	2.163	0.0	225	1.333
4.000	2.138	462.9	317.2	1.475	0.738	0.390	0.0	320	2.295
1.005	2.033	323.3	1969.1	0.813	0.047	2.553	0.0	450	2.059

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
3.000	40.004	400.0	450	Circular	4.000	3.500	0.050	4.000	3.400	0.150
3.001	17.000	100.0	150	Circular	4.000	2.500	1.350	3.300	2.330	0.820
1.002	2.000	15.4	150	Circular	3.300	2.330	0.820	2.400	2.200	0.050
1.000	41.244	412.4	450	Circular	4.000	3.500	0.050	4.000	3.400	0.150
2.000	40.227	402.3	450	Circular	4.000	3.400	0.150	4.000	3.300	0.250
1.001	13.000	43.3	150	Circular	4.000	2.500	1.350	3.500	2.200	1.150
2.002	2.000	100.0	150	Circular	3.500	2.200	1.150	2.400	2.180	0.070
1.003	1.000	100.0	150	Circular	2.400	1.850	0.400	2.400	1.840	0.410
1.004	10.267	99.7	225	Circular	2.400	1.840	0.335	3.000	1.737	1.038
4.000	28.837	109.6	525	Circular	4.000	2.000	1.475	3.000	1.737	0.738
1.005	3.353	100.0	450	Circular	3.000	1.737	0.813	2.200	1.703	0.047

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
3.000	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
3.001	6	1200	Manhole	Adoptable	7	1200	Manhole	Adoptable
1.002	7	1200	Manhole	Adoptable	9	1200	Manhole	Adoptable
1.000	1	1200	Manhole	Adoptable	3	1350	Manhole	Adoptable
2.000	2	1200	Manhole	Adoptable	3	1350	Manhole	Adoptable
1.001	3	1350	Manhole	Adoptable	4	1200	Manhole	Adoptable
2.002	4	1200	Manhole	Adoptable	9	1200	Manhole	Adoptable
1.003	9	1200	Manhole	Adoptable	10	1200	Manhole	Adoptable
1.004	10	1200	Manhole	Adoptable	13	1500	Manhole	Adoptable
4.000	Existing road	1500	Manhole	Adoptable	13	1500	Manhole	Adoptable
1.005	13	1500	Manhole	Adoptable	9_OUT	1350	Manhole	Adoptable

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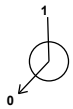
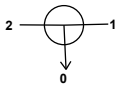
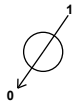
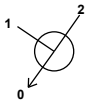
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
5	481964.444	96013.872	4.000	0.500	1200		0	3.000	3.500	450
6	481924.511	96016.258	4.000	1.500	1200		1	3.000	3.400	450
							0	3.001	2.500	150
7	481925.145	95995.165	3.300	0.970	1200		1	3.001	2.330	150
							0	1.002	2.330	150
1	481801.876	96012.305	4.000	0.500	1200		0	1.000	3.500	450
2	481883.335	96012.968	4.000	0.600	1200		0	2.000	3.400	450
3	481843.119	96012.023	4.000	1.500	1350		1	2.000	3.300	450
							2	1.000	3.400	450
							0	1.001	2.500	150
4	481843.956	95994.090	3.500	1.300	1200		1	1.001	2.200	150
							0	2.002	2.200	150
9	481889.557	95957.414	2.400	0.550	1200		1	2.002	2.180	150
							2	1.002	2.200	150
							0	1.003	1.850	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
10	481855.504	95907.782	2.400	0.560	1200		1	1.003	1.840	150
							0	1.004	1.840	225
Existing road	481825.705	95915.517	4.000	2.000	1500		0	4.000	2.000	525
13	481849.604	95899.379	3.000	1.263	1500		1	4.000	1.737	525
							2	1.004	1.737	225
							0	1.005	1.737	450
9_OUT	481847.645	95896.658	2.200	0.497	1350		1	1.005	1.703	450

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0	30 year (l/s)	14.9
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	✓	100 year (l/s)	19.8
Winter CV	1.000	Drain Down Time (mins)	2000	2 year (l/s)	5.5	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	0	0	0
30	0	0	0	100	45	10	0

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Pre-development Discharge Rate

Site Makeup	Greenfield	BFIHost	0.682	Growth Factor 100 year	3.19	Q 30 year (l/s)	14.9
Greenfield Method	FEH	Region	7	Betterment (%)	0	Q 100 year (l/s)	19.8
Positively Drained Area (ha)	3.984	QBar/QMed conversion factor	1.136	QMed	5.5		
SAAR (mm)	675	Growth Factor 2 year	0.88	QBar	6.2		
Host	1	Growth Factor 30 year	2.40	Q 2 year (l/s)	5.5		

Node 10 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	1.840	Product Number	CTL-SHE-0186-1600-0500-1600
Design Depth (m)	0.500	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	16.0	Min Node Diameter (mm)	1200

Node 3 Online Orifice Control

Flap Valve	x	Invert Level (m)	2.500	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.050		

Node 6 Online Orifice Control

Flap Valve	x	Invert Level (m)	2.500	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.025		

Node 1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	85.000	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.600	Length (m)	10.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	488	Slope (1:X)	1000.0		

Node 2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	89.000	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.600	Length (m)	10.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	488	Slope (1:X)	1000.0		

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Node 5 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	86.000	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.600	Length (m)	10.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	1080	Slope (1:X)	1000.0		

Node 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	3.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	608

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	480.0	0.0	0.500	771.0	0.0

Node 6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	3.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	1455

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	450.0	0.0	0.500	729.0	0.0

Node 9 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.850
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	1560

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	6618.0	0.0	0.550	7880.0	0.0

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	5	13	3.625	0.125	46.5	6.7034	0.0000	OK
240 minute winter	6	232	3.580	1.080	10.3	39.4084	0.0000	SURCHARGED
240 minute winter	7	232	2.349	0.019	1.3	0.0216	0.0000	OK
15 minute summer	1	13	3.624	0.124	45.0	6.3090	0.0000	OK
240 minute summer	2	172	3.597	0.197	15.8	1.9389	0.0000	OK
240 minute summer	3	172	3.597	1.097	29.7	50.8656	0.0000	SURCHARGED
240 minute summer	4	172	2.265	0.065	5.4	0.0736	0.0000	OK
10080 minute summer	9	5760	1.943	0.093	10.2	628.5383	0.0000	OK
10080 minute summer	10	5760	1.934	0.094	5.9	0.1068	0.0000	OK
15 minute summer	Existing road	10	2.143	0.143	70.2	0.8099	0.0000	OK
15 minute summer	13	10	1.906	0.169	69.5	0.2979	0.0000	OK
15 minute summer	9_OUT	10	1.841	0.138	68.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	5	3.000	6	26.2	0.771	0.163	1.3742	
240 minute winter	6	Orifice	7	1.3				
240 minute winter	7	1.002	9	1.3	1.093	0.030	0.0025	
15 minute summer	1	1.000	3	26.1	0.697	0.165	1.5945	
240 minute summer	2	2.000	3	15.0	0.419	0.093	3.5661	
240 minute summer	3	Orifice	4	5.4				
240 minute summer	4	2.002	9	5.4	0.807	0.304	0.0134	
10080 minute summer	9	1.003	10	5.9	0.511	0.332	0.0116	
10080 minute summer	10	Hydro-Brake®	13	5.9				
15 minute summer	Existing road	4.000	13	69.5	1.298	0.150	1.5466	
15 minute summer	13	1.005	9_OUT	68.2	1.436	0.211	0.1595	89.8

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	5	21	3.686	0.186	103.5	22.9272	0.0000	OK
360 minute winter	6	352	3.665	1.165	14.5	83.3510	0.0000	SURCHARGED
360 minute winter	7	352	2.349	0.019	1.4	0.0220	0.0000	OK
180 minute winter	1	176	3.696	0.196	25.2	25.4559	0.0000	OK
180 minute winter	2	176	3.696	0.296	26.4	27.2814	0.0000	OK
180 minute winter	3	176	3.696	1.196	41.1	107.3779	0.0000	SURCHARGED
180 minute winter	4	176	2.267	0.067	5.6	0.0755	0.0000	OK
2880 minute summer	9	1920	1.985	0.135	28.7	921.1096	0.0000	OK
2880 minute summer	10	1920	1.972	0.132	10.2	0.1490	0.0000	OK
15 minute summer	Existing road	10	2.245	0.245	172.6	1.3888	0.0000	OK
15 minute summer	13	10	2.018	0.281	170.9	0.4965	0.0000	OK
15 minute summer	9_OUT	10	1.925	0.222	164.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	5	3.000	6	54.8	0.976	0.341	2.2497	
360 minute winter	6	Orifice	7	1.4				
360 minute winter	7	1.002	9	1.4	1.104	0.031	0.0025	
180 minute winter	1	1.000	3	19.2	0.464	0.121	3.6511	
180 minute winter	2	2.000	3	22.5	0.446	0.140	5.1992	
180 minute winter	3	Orifice	4	5.6				
180 minute winter	4	2.002	9	5.6	0.816	0.318	0.0139	
2880 minute summer	9	1.003	10	10.2	0.615	0.573	0.0165	
2880 minute summer	10	Hydro-Brake®	13	10.2				
15 minute summer	Existing road	4.000	13	170.9	1.580	0.369	3.1199	
15 minute summer	13	1.005	9_OUT	164.6	1.806	0.509	0.3052	279.0

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	5	21	3.713	0.213	130.7	30.2347	0.0000	OK
360 minute winter	6	352	3.701	1.201	15.6	103.5522	0.0000	FLOOD RISK
360 minute winter	7	352	2.350	0.020	1.4	0.0222	0.0000	OK
240 minute winter	1	236	3.742	0.242	25.4	37.7554	0.0000	OK
240 minute winter	2	236	3.742	0.342	26.6	40.0691	0.0000	OK
240 minute winter	3	236	3.742	1.242	35.5	135.5134	0.0000	FLOOD RISK
240 minute winter	4	236	2.268	0.068	5.8	0.0764	0.0000	OK
2160 minute winter	9	1680	2.004	0.154	29.1	1055.2210	0.0000	SURCHARGED
2160 minute winter	10	1680	1.988	0.148	12.0	0.1670	0.0000	OK
15 minute summer	Existing road	10	2.286	0.286	217.0	1.6205	0.0000	OK
15 minute summer	13	10	2.061	0.324	214.9	0.5718	0.0000	OK
15 minute summer	9_OUT	10	1.957	0.254	205.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	5	3.000	6	69.9	1.044	0.435	2.6797	
360 minute winter	6	Orifice	7	1.4				
360 minute winter	7	1.002	9	1.4	1.109	0.031	0.0026	
240 minute winter	1	1.000	3	17.2	0.468	0.109	4.4650	
240 minute winter	2	2.000	3	18.4	0.445	0.115	5.7783	
240 minute winter	3	Orifice	4	5.8				
240 minute winter	4	2.002	9	5.8	0.820	0.324	0.0141	
2160 minute winter	9	1.003	10	12.0	0.683	0.677	0.0176	
2160 minute winter	10	Hydro-Brake®	13	12.0				
15 minute summer	Existing road	4.000	13	214.9	1.653	0.464	3.7465	
15 minute summer	13	1.005	9_OUT	205.6	1.913	0.636	0.3592	368.7

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Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	5	585	3.813	0.313	19.6	57.6902	0.0000	OK
600 minute winter	6	600	3.813	1.313	13.7	170.1786	0.0000	FLOOD RISK
600 minute winter	7	600	2.350	0.020	1.5	0.0227	0.0000	OK
360 minute winter	1	352	3.883	0.383	29.4	75.6659	0.0000	OK
360 minute winter	2	352	3.883	0.483	30.8	79.5506	0.0000	FLOOD RISK
360 minute winter	3	352	3.883	1.383	34.5	229.0875	0.0000	FLOOD RISK
360 minute winter	4	352	2.270	0.070	6.1	0.0788	0.0000	OK
1440 minute winter	9	1350	2.071	0.221	57.5	1528.3610	0.0000	SURCHARGED
1440 minute winter	10	1350	2.042	0.202	15.7	0.2284	0.0000	OK
15 minute summer	Existing road	10	2.412	0.412	346.1	2.4934	0.0000	OK
15 minute summer	13	11	2.234	0.497	340.4	0.8775	0.0000	SURCHARGED
15 minute summer	9_OUT	11	2.055	0.352	321.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute winter	5	3.000	6	13.7	0.380	0.085	5.4069	
600 minute winter	6	Orifice	7	1.5				
600 minute winter	7	1.002	9	1.5	1.123	0.033	0.0027	
360 minute winter	1	1.000	3	16.8	0.455	0.106	6.2353	
360 minute winter	2	2.000	3	17.7	0.395	0.110	6.3737	
360 minute winter	3	Orifice	4	6.1				
360 minute winter	4	2.002	9	6.1	0.831	0.343	0.0146	
1440 minute winter	9	1.003	10	15.7	0.892	0.884	0.0176	
1440 minute winter	10	Hydro-Brake®	13	15.7				
15 minute summer	Existing road	4.000	13	340.4	1.780	0.735	5.6487	
15 minute summer	13	1.005	9_OUT	321.5	2.089	0.995	0.4887	639.7

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Design Settings

Rainfall Methodology	FEH-13	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	100	Maximum Rainfall (mm/hr)	250.0	Include Intermediate Ground	x
Additional Flow (%)	45	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
5	0.258	5.00	4.000	1200	481964.444	96013.872	0.500
6			4.000	1200	481924.511	96016.258	1.500
7			3.300	1200	481925.145	95995.165	0.970
1	0.250	5.00	4.000	1200	481801.876	96012.305	0.500
2	0.262	5.00	4.000	1200	481883.335	96012.968	0.600
3			4.000	1350	481843.119	96012.023	1.500
4			3.500	1200	481843.956	95994.090	1.300
9	1.393	5.00	2.400	1200	481889.557	95957.414	0.550
10			2.400	1200	481855.504	95907.782	0.560
Existing road	0.390	5.00	4.000	1500	481825.705	95915.517	2.000
13			3.000	1500	481849.604	95899.379	1.263
9_OUT			2.200	1350	481847.645	95896.658	0.497

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
3.000	5	6	40.004	0.600	3.500	3.400	0.100	400.0	450	5.66	145.4
3.001	6	7	17.000	0.600	2.500	2.330	0.170	100.0	150	5.94	144.6
1.002	7	9	2.000	0.600	2.330	2.200	0.130	15.4	150	5.96	144.1
1.000	1	3	41.244	0.600	3.500	3.400	0.100	412.4	450	5.69	144.8
2.000	2	3	40.227	0.600	3.400	3.300	0.100	402.3	450	5.67	145.3
1.001	3	4	13.000	0.600	2.500	2.200	0.300	43.3	150	5.83	149.0
2.002	4	9	2.000	0.600	2.200	2.180	0.020	100.0	150	5.87	149.5
1.003	9	10	1.000	0.600	1.850	1.840	0.010	100.0	150	5.97	128.5
1.004	10	13	10.267	0.600	1.840	1.737	0.103	99.7	225	6.10	130.5
4.000	Existing road	13	28.837	0.600	2.000	1.737	0.263	109.6	525	5.22	155.2
1.005	13	9_OUT	3.353	0.600	1.737	1.703	0.034	100.0	450	6.13	147.2

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
3.000	1.010	160.6	196.6	0.050	0.150	0.258	0.0	450	1.023
3.001	1.005	17.8	195.5	1.350	0.820	0.258	0.0	150	1.023
1.002	2.581	45.6	194.8	0.820	0.050	0.258	0.0	150	2.629
1.000	0.995	158.2	189.7	0.050	0.150	0.250	0.0	450	1.007
2.000	1.007	160.2	199.5	0.150	0.250	0.262	0.0	450	1.020
1.001	1.533	27.1	399.8	1.350	1.150	0.512	0.0	150	1.561
2.002	1.005	17.8	401.1	1.150	0.070	0.512	0.0	150	1.023
1.003	1.005	17.8	1456.6	0.400	0.410	2.163	0.0	150	1.023
1.004	1.309	52.1	1479.3	0.335	1.038	2.163	0.0	225	1.333
4.000	2.138	462.9	317.2	1.475	0.738	0.390	0.0	320	2.295
1.005	2.033	323.3	1969.1	0.813	0.047	2.553	0.0	450	2.059

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
3.000	40.004	400.0	450	Circular	4.000	3.500	0.050	4.000	3.400	0.150
3.001	17.000	100.0	150	Circular	4.000	2.500	1.350	3.300	2.330	0.820
1.002	2.000	15.4	150	Circular	3.300	2.330	0.820	2.400	2.200	0.050
1.000	41.244	412.4	450	Circular	4.000	3.500	0.050	4.000	3.400	0.150
2.000	40.227	402.3	450	Circular	4.000	3.400	0.150	4.000	3.300	0.250
1.001	13.000	43.3	150	Circular	4.000	2.500	1.350	3.500	2.200	1.150
2.002	2.000	100.0	150	Circular	3.500	2.200	1.150	2.400	2.180	0.070
1.003	1.000	100.0	150	Circular	2.400	1.850	0.400	2.400	1.840	0.410
1.004	10.267	99.7	225	Circular	2.400	1.840	0.335	3.000	1.737	1.038
4.000	28.837	109.6	525	Circular	4.000	2.000	1.475	3.000	1.737	0.738
1.005	3.353	100.0	450	Circular	3.000	1.737	0.813	2.200	1.703	0.047

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
3.000	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
3.001	6	1200	Manhole	Adoptable	7	1200	Manhole	Adoptable
1.002	7	1200	Manhole	Adoptable	9	1200	Manhole	Adoptable
1.000	1	1200	Manhole	Adoptable	3	1350	Manhole	Adoptable
2.000	2	1200	Manhole	Adoptable	3	1350	Manhole	Adoptable
1.001	3	1350	Manhole	Adoptable	4	1200	Manhole	Adoptable
2.002	4	1200	Manhole	Adoptable	9	1200	Manhole	Adoptable
1.003	9	1200	Manhole	Adoptable	10	1200	Manhole	Adoptable
1.004	10	1200	Manhole	Adoptable	13	1500	Manhole	Adoptable
4.000	Existing road	1500	Manhole	Adoptable	13	1500	Manhole	Adoptable
1.005	13	1500	Manhole	Adoptable	9_OUT	1350	Manhole	Adoptable

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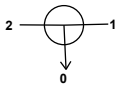
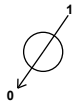
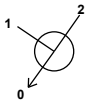
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
5	481964.444	96013.872	4.000	0.500	1200		0	3.000	3.500	450
6	481924.511	96016.258	4.000	1.500	1200		1	3.000	3.400	450
							0	3.001	2.500	150
7	481925.145	95995.165	3.300	0.970	1200		1	3.001	2.330	150
							0	1.002	2.330	150
1	481801.876	96012.305	4.000	0.500	1200		0	1.000	3.500	450
2	481883.335	96012.968	4.000	0.600	1200		0	2.000	3.400	450
3	481843.119	96012.023	4.000	1.500	1350		1	2.000	3.300	450
							2	1.000	3.400	450
							0	1.001	2.500	150
4	481843.956	95994.090	3.500	1.300	1200		1	1.001	2.200	150
							0	2.002	2.200	150
9	481889.557	95957.414	2.400	0.550	1200		1	2.002	2.180	150
							2	1.002	2.200	150
							0	1.003	1.850	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
10	481855.504	95907.782	2.400	0.560	1200		1	1.003	1.840	150
							0	1.004	1.840	225
Existing road	481825.705	95915.517	4.000	2.000	1500		0	4.000	2.000	525
13	481849.604	95899.379	3.000	1.263	1500		1	4.000	1.737	525
							2	1.004	1.737	225
							0	1.005	1.737	450
9_OUT	481847.645	95896.658	2.200	0.497	1350		1	1.005	1.703	450

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0	30 year (l/s)	14.9
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	✓	100 year (l/s)	19.8
Winter CV	1.000	Drain Down Time (mins)	2000	2 year (l/s)	5.5	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	0	0	0
30	0	0	0	100	45	10	0

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Pre-development Discharge Rate

Site Makeup	Greenfield	BFIHost	0.682	Growth Factor 100 year	3.19	Q 30 year (l/s)	14.9
Greenfield Method	FEH	Region	7	Betterment (%)	0	Q 100 year (l/s)	19.8
Positively Drained Area (ha)	3.984	QBar/QMed conversion factor	1.136	QMed	5.5		
SAAR (mm)	675	Growth Factor 2 year	0.88	QBar	6.2		
Host	1	Growth Factor 30 year	2.40	Q 2 year (l/s)	5.5		

Node 9_OUT Surcharged Outfall

Overrides Design Area	x	Depression Storage Area (m²)	0	Evapo-transpiration (mm/day)	0
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	0		

Applies to All storms

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	0.000	110	0.000	220	0.570	330	0.600	440	0.200	550	0.150	660	0.000	770	0.000	880	0.000
10	0.000	120	0.000	230	0.630	340	0.500	450	0.200	560	0.100	670	0.000	780	0.000	890	0.000
20	0.000	130	0.000	240	0.650	350	0.500	460	0.200	570	0.100	680	0.000	790	0.000	900	0.000
30	0.000	140	0.000	250	0.660	360	0.500	470	0.200	580	0.100	690	0.000	800	0.000	910	0.000
40	0.000	150	0.000	260	0.650	370	0.450	480	0.200	590	0.100	700	0.000	810	0.000	920	0.000
50	0.000	160	0.000	270	0.640	380	0.400	490	0.200	600	0.100	710	0.000	820	0.000	930	0.000
60	0.000	170	0.000	280	0.640	390	0.300	500	0.200	610	0.100	720	0.000	830	0.000	940	0.000
70	0.000	180	0.000	290	0.630	400	0.280	510	0.200	620	0.100	730	0.000	840	0.000	950	0.000
80	0.000	190	0.000	300	0.610	410	0.250	520	0.200	630	0.100	740	0.000	850	0.000	960	0.000
90	0.000	200	0.300	310	0.600	420	0.230	530	0.200	640	0.100	750	0.000	860	0.000		
100	0.000	210	0.430	320	0.600	430	0.200	540	0.150	650	0.000	760	0.000	870	0.000		

Node 10 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	1.840	Product Number	CTL-SHE-0186-1600-0500-1600
Design Depth (m)	0.500	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	16.0	Min Node Diameter (mm)	1200

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Node 3 Online Orifice Control

Flap Valve	x	Invert Level (m)	2.500	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.050		

Node 6 Online Orifice Control

Flap Valve	x	Invert Level (m)	2.500	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.025		

Node 1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	85.000	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.600	Length (m)	10.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	488	Slope (1:X)	1000.0		

Node 2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	89.000	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.600	Length (m)	10.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	488	Slope (1:X)	1000.0		

Node 5 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	86.000	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.600	Length (m)	10.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	1080	Slope (1:X)	1000.0		

Node 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	3.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	608

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	480.0	0.0	0.500	771.0	0.0

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Node 6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	3.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	1455

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	450.0	0.0	0.500	729.0	0.0

Node 9 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.850
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	1665

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	6618.0	0.0	0.550	7880.0	0.0

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	5	13	3.625	0.125	46.5	6.7034	0.0000	OK
240 minute winter	6	232	3.580	1.080	10.3	39.4084	0.0000	SURCHARGED
240 minute winter	7	232	2.349	0.019	1.3	0.0216	0.0000	OK
15 minute summer	1	13	3.624	0.124	45.0	6.3090	0.0000	OK
240 minute summer	2	172	3.597	0.197	15.8	1.9389	0.0000	OK
240 minute summer	3	172	3.597	1.097	29.7	50.8656	0.0000	SURCHARGED
240 minute summer	4	172	2.265	0.065	5.4	0.0736	0.0000	OK
600 minute summer	9	615	1.944	0.094	59.6	639.0671	0.0000	OK
480 minute summer	10	248	1.976	0.136	14.0	0.1534	0.0000	OK
15 minute summer	Existing road	10	2.143	0.143	70.2	0.8099	0.0000	OK
480 minute summer	13	248	2.143	0.406	14.0	0.7174	0.0000	OK
120 minute summer	9_OUT	250	2.363	0.660	35.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	5	3.000	6	26.2	0.771	0.163	1.3742	
240 minute winter	6	Orifice	7	1.3				
240 minute winter	7	1.002	9	1.3	1.093	0.030	0.0025	
15 minute summer	1	1.000	3	26.1	0.697	0.165	1.5945	
240 minute summer	2	2.000	3	15.0	0.419	0.093	3.5661	
240 minute summer	3	Orifice	4	5.4				
240 minute summer	4	2.002	9	5.4	0.807	0.304	0.0134	
600 minute summer	9	1.003	10	-11.6	-1.163	-0.654	0.0118	
480 minute summer	10	Hydro-Brake®	13	5.9				
15 minute summer	Existing road	4.000	13	69.5	1.298	0.150	1.5466	
480 minute summer	13	1.005	9_OUT	8.5	0.739	0.026	0.5180	424.8

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	5	21	3.686	0.186	103.5	22.9272	0.0000	OK
360 minute winter	6	352	3.665	1.165	14.5	83.3510	0.0000	SURCHARGED
360 minute winter	7	352	2.349	0.019	1.4	0.0220	0.0000	OK
180 minute winter	1	176	3.696	0.196	25.2	25.4559	0.0000	OK
180 minute winter	2	176	3.696	0.296	26.4	27.2814	0.0000	OK
180 minute winter	3	176	3.696	1.196	41.1	107.3779	0.0000	SURCHARGED
180 minute winter	4	176	2.267	0.067	5.6	0.0755	0.0000	OK
600 minute winter	9	585	2.001	0.151	75.4	1036.1830	0.0000	SURCHARGED
480 minute summer	10	288	2.004	0.164	16.0	0.1852	0.0000	OK
480 minute summer	Existing road	248	2.362	0.362	27.4	2.0515	0.0000	OK
480 minute summer	13	248	2.361	0.624	27.3	1.1030	0.0000	SURCHARGED
30 minute summer	9_OUT	250	2.363	0.660	151.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	5	3.000	6	54.8	0.976	0.341	2.2497	
360 minute winter	6	Orifice	7	1.4				
360 minute winter	7	1.002	9	1.4	1.104	0.031	0.0025	
180 minute winter	1	1.000	3	19.2	0.464	0.121	3.6511	
180 minute winter	2	2.000	3	22.5	0.446	0.140	5.1992	
180 minute winter	3	Orifice	4	5.6				
180 minute winter	4	2.002	9	5.6	0.816	0.318	0.0139	
600 minute winter	9	1.003	10	-14.9	-1.158	-0.839	0.0176	
480 minute summer	10	Hydro-Brake®	13	11.5				
480 minute summer	Existing road	4.000	13	27.3	0.789	0.059	5.4046	
480 minute summer	13	1.005	9_OUT	11.9	0.894	0.037	0.5313	940.8

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	5	21	3.713	0.213	130.7	30.2347	0.0000	OK
360 minute winter	6	352	3.701	1.201	15.6	103.5522	0.0000	FLOOD RISK
360 minute winter	7	352	2.350	0.020	1.4	0.0222	0.0000	OK
240 minute winter	1	236	3.742	0.242	25.4	37.7554	0.0000	OK
240 minute winter	2	236	3.742	0.342	26.6	40.0691	0.0000	OK
240 minute winter	3	236	3.742	1.242	35.5	135.5134	0.0000	FLOOD RISK
240 minute winter	4	236	2.268	0.068	5.8	0.0764	0.0000	OK
600 minute winter	9	585	2.027	0.177	89.0	1216.7970	0.0000	SURCHARGED
480 minute winter	10	312	2.019	0.179	16.0	0.2026	0.0000	OK
480 minute summer	Existing road	248	2.363	0.363	33.9	2.0547	0.0000	OK
480 minute summer	13	248	2.361	0.624	33.7	1.1034	0.0000	SURCHARGED
30 minute summer	9_OUT	250	2.363	0.660	190.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	5	3.000	6	69.9	1.044	0.435	2.6797	
360 minute winter	6	Orifice	7	1.4				
360 minute winter	7	1.002	9	1.4	1.109	0.031	0.0026	
240 minute winter	1	1.000	3	17.2	0.468	0.109	4.4650	
240 minute winter	2	2.000	3	18.4	0.445	0.115	5.7783	
240 minute winter	3	Orifice	4	5.8				
240 minute winter	4	2.002	9	5.8	0.820	0.324	0.0141	
600 minute winter	9	1.003	10	-15.9	-1.208	-0.897	0.0176	
480 minute winter	10	Hydro-Brake®	13	13.6				
480 minute summer	Existing road	4.000	13	33.7	0.828	0.073	5.4085	
480 minute summer	13	1.005	9_OUT	18.4	0.954	0.057	0.5313	1193.0

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Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	5	585	3.813	0.313	19.6	57.6902	0.0000	OK
600 minute winter	6	600	3.813	1.313	13.7	170.1786	0.0000	FLOOD RISK
600 minute winter	7	600	2.350	0.020	1.5	0.0227	0.0000	OK
360 minute winter	1	352	3.883	0.383	29.4	75.6659	0.0000	OK
360 minute winter	2	352	3.883	0.483	30.8	79.5506	0.0000	FLOOD RISK
360 minute winter	3	352	3.883	1.383	34.5	229.0875	0.0000	FLOOD RISK
360 minute winter	4	352	2.270	0.070	6.1	0.0788	0.0000	OK
600 minute winter	9	585	2.099	0.249	128.7	1736.0260	0.0000	SURCHARGED
480 minute winter	10	328	2.090	0.250	16.0	0.2825	0.0000	SURCHARGED
15 minute summer	Existing road	10	2.412	0.412	346.1	2.4934	0.0000	OK
480 minute summer	13	248	2.363	0.626	53.8	1.1060	0.0000	SURCHARGED
30 minute winter	9_OUT	250	2.363	0.660	242.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute winter	5	3.000	6	13.7	0.380	0.085	5.4069	
600 minute winter	6	Orifice	7	1.5				
600 minute winter	7	1.002	9	1.5	1.123	0.033	0.0027	
360 minute winter	1	1.000	3	16.8	0.455	0.106	6.2353	
360 minute winter	2	2.000	3	17.7	0.395	0.110	6.3737	
360 minute winter	3	Orifice	4	6.1				
360 minute winter	4	2.002	9	6.1	0.831	0.343	0.0146	
600 minute winter	9	1.003	10	-16.0	-1.268	-0.899	0.0176	
480 minute winter	10	Hydro-Brake®	13	15.9				
15 minute summer	Existing road	4.000	13	340.4	1.780	0.735	5.6487	
480 minute summer	13	1.005	9_OUT	38.1	1.083	0.118	0.5313	1896.4

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Design Settings

Rainfall Methodology	FEH-13	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	100	Maximum Rainfall (mm/hr)	250.0	Include Intermediate Ground	✓
Additional Flow (%)	45	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Swale		5.00	4.000		481750.000	95794.000	0.500
PP	1.353	5.00	4.000	1350	481806.000	95782.700	1.000
Rife accomodation	0.181	5.00	2.500	1200	481857.000	95848.000	0.400
Road	0.124	5.00	3.000	1200	481845.520	95807.775	1.000
5			3.122	1350	481846.900	95799.700	1.322
5_OUT			2.100	1350	481890.000	95853.000	0.429
1			2.160	1350	481877.600	95827.000	0.460
2_OUT			2.100	1200	481870.410	95861.441	0.400

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	Swale	PP	10.000	0.600	3.500	3.400	0.100	100.0	450	5.08	156.5
1.001	PP	5	94.000	0.600	3.000	1.800	1.200	78.3	225	6.14	147.1
3.000	Rife accomodation	2_OUT	18.987	0.600	2.100	1.700	0.400	47.5	300	5.14	156.0
2.000	Road	5	8.192	0.600	2.000	1.950	0.050	163.8	225	5.13	156.0
1.002	5	1	41.083	0.600	1.800	1.700	0.100	410.8	375	6.91	140.5
1.003	1	5_OUT	28.806	0.600	1.700	1.671	0.029	993.3	375	7.76	133.9

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	2.033	323.3	0.0	0.050	0.150	0.000	0.0	0	0.000
1.001	1.479	58.8	1042.6	0.775	1.097	1.353	0.0	225	1.506
3.000	2.287	161.7	147.9	0.100	0.100	0.181	0.0	227	2.580
2.000	1.018	40.5	101.4	0.775	0.947	0.124	0.0	225	1.037
1.002	0.887	98.0	1087.0	0.947	0.085	1.477	0.0	375	0.899
1.003	0.567	62.6	1036.0	0.085	0.054	1.477	0.0	375	0.574

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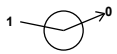
Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	10.000	100.0	450	Circular	4.000	3.500	0.050	4.000	3.400	0.150
1.001	94.000	78.3	225	Circular	4.000	3.000	0.775	3.122	1.800	1.097
3.000	18.987	47.5	300	Circular	2.500	2.100	0.100	2.100	1.700	0.100
2.000	8.192	163.8	225	Circular	3.000	2.000	0.775	3.122	1.950	0.947
1.002	41.083	410.8	375	Circular	3.122	1.800	0.947	2.160	1.700	0.085
1.003	28.806	993.3	375	Circular	2.160	1.700	0.085	2.100	1.671	0.054

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	Swale		Junction		PP	1350	Manhole	Adoptable
1.001	PP	1350	Manhole	Adoptable	5	1350	Manhole	Adoptable
3.000	Rife accomodation	1200	Manhole	Adoptable	2_OUT	1200	Manhole	Adoptable
2.000	Road	1200	Manhole	Adoptable	5	1350	Manhole	Adoptable
1.002	5	1350	Manhole	Adoptable	1	1350	Manhole	Adoptable
1.003	1	1350	Manhole	Adoptable	5_OUT	1350	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
Swale	481750.000	95794.000	4.000	0.500			0	1.000	3.500	450
PP	481806.000	95782.700	4.000	1.000	1350		1	1.000	3.400	450
							0	1.001	3.000	225

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
Rife accomodation	481857.000	95848.000	2.500	0.400	1200		0	3.000	2.100	300
Road	481845.520	95807.775	3.000	1.000	1200		0	2.000	2.000	225
5	481846.900	95799.700	3.122	1.322	1350		1	2.000	1.950	225
							2	1.001	1.800	225
							0	1.002	1.800	375
5_OUT	481890.000	95853.000	2.100	0.429	1350		1	1.003	1.671	375
1	481877.600	95827.000	2.160	0.460	1350		1	1.002	1.700	375
							0	1.003	1.700	375
2_OUT	481870.410	95861.441	2.100	0.400	1200		1	3.000	1.700	300

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0	30 year (l/s)	8.7
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	✓	100 year (l/s)	11.0
Winter CV	1.000	Drain Down Time (mins)	240	2 year (l/s)	3.9	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	0	0	0
30	0	0	0	100	45	10	0

Pre-development Discharge Rate

Site Makeup	Greenfield	BFIHost	0.682	Growth Factor 100 year	2.48	Q 30 year (l/s)	8.7
Greenfield Method	FEH	Region	7	Betterment (%)	0	Q 100 year (l/s)	11.0
Positively Drained Area (ha)	2.857	QBar/QMed conversion factor	1.136	QMed	3.9		
SAAR (mm)	675	Growth Factor 2 year	0.88	QBar	4.4		
Host	1	Growth Factor 30 year	1.95	Q 2 year (l/s)	3.9		

Node PP Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	3.000	Product Number	CTL-SHE-0156-1100-0700-1100
Design Depth (m)	0.700	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	11.0	Min Node Diameter (mm)	1200

Node Road Online Orifice Control

Flap Valve	x	Invert Level (m)	2.000	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.040		

Node PP Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	515.800	Depth (m)	0.600
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.300	Length (m)	10.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	1000.0		

Node Swale Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	3.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

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Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	800.0	0.0	0.500	1110.0	0.0

Node Road Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	4.500	Depth (m)	0.400
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.500	Length (m)	276.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	228	Slope (1:X)	1000.0		

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.64%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Swale	1	3.500	0.000	0.0	0.0000	0.0000	OK
180 minute winter	PP	172	3.411	0.411	64.8	175.4426	0.0000	SURCHARGED
15 minute summer	Rife accomodation	10	2.196	0.096	32.6	0.9731	0.0000	OK
120 minute summer	Road	82	2.610	0.610	11.0	10.3849	0.0000	SURCHARGED
15 minute summer	5	12	1.892	0.092	13.3	0.1315	0.0000	OK
15 minute summer	5_OUT	13	1.753	0.082	13.3	0.0000	0.0000	OK
15 minute summer	1	13	1.815	0.115	13.3	0.1647	0.0000	OK
15 minute summer	2_OUT	10	1.790	0.090	32.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Swale	1.000	PP	0.0	0.000	0.000	0.0000	
180 minute winter	PP	Hydro-Brake®	5	11.0				
15 minute summer	Rife accomodation	3.000	2_OUT	32.1	1.735	0.198	0.3512	14.1
120 minute summer	Road	Orifice	5	2.6				
15 minute summer	5	1.002	1	13.3	0.679	0.136	1.0173	
15 minute summer	1	1.003	5_OUT	13.3	0.578	0.213	0.6677	114.3

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.64%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	Swale	248	3.572	0.072	12.2	58.8751	0.0000	OK
180 minute winter	PP	172	3.580	0.580	136.5	441.4434	0.0000	SURCHARGED
15 minute summer	Rife accomodation	10	2.263	0.163	80.0	1.6561	0.0000	OK
120 minute winter	Road	114	2.709	0.709	16.9	32.1103	0.0000	FLOOD RISK
15 minute winter	5	5	1.892	0.092	13.3	0.1316	0.0000	OK
30 minute winter	5_OUT	14	1.753	0.082	13.3	0.0000	0.0000	OK
30 minute winter	1	14	1.815	0.115	13.3	0.1647	0.0000	OK
15 minute summer	2_OUT	10	1.847	0.147	79.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	Swale	1.000	PP	16.9	0.500	0.052	0.3608	
180 minute winter	PP	Hydro-Brake®	5	11.0				
15 minute summer	Rife accomodation	3.000	2_OUT	79.1	2.161	0.489	0.6946	34.6
120 minute winter	Road	Orifice	5	2.8				
15 minute winter	5	1.002	1	13.3	0.736	0.136	1.0170	
30 minute winter	1	1.003	5_OUT	13.3	0.578	0.213	0.6675	194.1

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.64%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	Swale	240	3.634	0.134	43.6	113.2062	0.0000	OK
240 minute winter	PP	236	3.634	0.634	137.4	527.6255	0.0000	SURCHARGED
15 minute summer	Rife accomodation	10	2.290	0.190	100.5	1.9333	0.0000	OK
120 minute winter	Road	116	2.747	0.747	21.2	43.8182	0.0000	FLOOD RISK
15 minute winter	5	4	1.892	0.092	13.3	0.1321	0.0000	OK
240 minute winter	5_OUT	236	1.753	0.082	13.3	0.0000	0.0000	OK
240 minute winter	1	236	1.815	0.115	13.3	0.1647	0.0000	OK
15 minute summer	2_OUT	10	1.868	0.168	99.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	Swale	1.000	PP	43.7	-1.174	0.135	0.6155	
240 minute winter	PP	Hydro-Brake®	5	11.0				
15 minute summer	Rife accomodation	3.000	2_OUT	99.4	2.268	0.615	0.8320	43.5
120 minute winter	Road	Orifice	5	2.8				
15 minute winter	5	1.002	1	13.3	0.746	0.136	1.0168	
240 minute winter	1	1.003	5_OUT	13.3	0.578	0.213	0.6679	362.3

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Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.64%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	Swale	352	3.826	0.326	76.3	293.5652	0.0000	OK
360 minute winter	PP	352	3.826	0.826	158.9	831.6416	0.0000	FLOOD RISK
15 minute summer	Rife accomodation	11	2.430	0.330	160.4	3.6597	0.0000	FLOOD RISK
180 minute winter	Road	176	2.844	0.844	24.9	79.9735	0.0000	FLOOD RISK
360 minute winter	5	352	1.897	0.097	14.9	0.1390	0.0000	OK
360 minute winter	5_OUT	352	1.757	0.086	14.9	0.0000	0.0000	OK
360 minute winter	1	352	1.821	0.121	14.9	0.1735	0.0000	OK
15 minute summer	2_OUT	10	1.928	0.228	152.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	Swale	1.000	PP	-76.3	-1.398	-0.236	1.3908	
360 minute winter	PP	Hydro-Brake®	5	11.9				
15 minute summer	Rife accomodation	3.000	2_OUT	152.4	2.392	0.942	1.2119	69.7
180 minute winter	Road	Orifice	5	3.0				
360 minute winter	5	1.002	1	14.9	0.559	0.152	1.0967	
360 minute winter	1	1.003	5_OUT	14.9	0.600	0.238	0.7193	492.3

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Design Settings

Rainfall Methodology	FEH-13	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	100	Maximum Rainfall (mm/hr)	250.0	Include Intermediate Ground	✓
Additional Flow (%)	45	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.086	5.00	3.723	1200	482143.934	95905.193	0.550
2			3.657	1200	482125.178	95901.616	0.625
3	0.074	5.00	3.432	1200	482056.532	95883.472	0.625
4	0.088	5.00	3.477	1200	481978.619	95941.374	0.599
5	0.051	5.00	3.057	1200	481949.973	95893.615	0.550
6	0.058	5.00	3.000	1200	482012.203	95845.603	0.650
7	0.047	5.00	3.060	1200	482017.926	95848.806	0.712
10	0.260	5.00	4.276	1200	482241.253	95820.221	0.644
11			4.182	1200	482236.348	95819.801	0.560
12	0.019	5.00	4.029	1200	482210.005	95831.971	0.465
13			3.940	1200	482204.271	95832.482	0.388
14	0.049	5.00	3.621	1200	482191.535	95772.610	0.550
15	0.111	5.00	3.400	1200	482107.574	95737.940	0.511
16	1.051	5.00	3.400	1200	482013.970	95910.583	0.500
17	1.294	5.00	3.400	1200	482087.381	95847.723	0.500
19			3.400	1200	482084.000	95770.000	1.100
9	0.089	5.00	2.700	1200	482050.733	95806.542	0.600
8	0.074	5.00	3.400	1200	482063.263	95804.261	0.550
18	0.725	5.00	2.300	1500	482066.689	95747.543	0.500
18_OUT			1.900	1200	482081.019	95617.480	0.300
Existing Road	0.188	5.00	3.600	1350	482218.964	95748.466	1.650
21_OUT			3.600	1350	482211.860	95686.112	1.804

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	19.094	0.600	3.173	3.107	0.066	289.3	225	5.42	153.5
1.001	2	3	71.003	0.600	3.032	2.807	0.225	315.6	225	7.04	139.4
1.002	3	7	51.886	0.600	2.807	2.435	0.372	139.5	225	7.82	133.4
2.000	4	5	55.691	0.600	2.878	2.507	0.371	150.1	150	6.14	147.1
2.001	5	6	78.599	0.600	2.507	2.350	0.157	500.0	225	8.40	129.3
2.002	6	7	1.000	0.600	2.350	2.348	0.002	500.0	225	8.43	129.1
1.003	7	18	88.000	0.600	2.435	1.950	0.485	181.4	300	9.69	120.9
3.000	10	11	4.923	0.600	3.632	3.622	0.010	500.0	225	5.14	155.9
3.001	11	12	29.018	0.600	3.622	3.564	0.058	500.0	225	5.98	148.5
3.002	12	13	5.757	0.600	3.564	3.552	0.012	500.0	225	6.14	147.1
3.003	13	14	61.212	0.600	3.552	3.071	0.481	127.3	225	7.03	139.5
3.004	14	15	90.838	0.600	3.071	2.889	0.182	500.0	225	9.65	121.2
3.005	15	18	12.000	0.600	2.889	2.050	0.839	14.3	225	9.70	120.9
4.000	16	17	60.000	0.600	2.900	2.900	0.000	0.0	225	6.00	148.3

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.763	30.4	69.5	0.325	0.325	0.086	0.0	225	0.778
1.001	0.730	29.0	63.1	0.400	0.400	0.086	0.0	225	0.744
1.002	1.105	43.9	112.4	0.400	0.400	0.161	0.0	225	1.125
2.000	0.818	14.4	67.5	0.449	0.400	0.088	0.0	150	0.833
2.001	0.578	23.0	93.8	0.325	0.425	0.139	0.0	225	0.589
2.002	0.578	23.0	132.6	0.425	0.487	0.196	0.0	225	0.589
1.003	1.164	82.3	256.1	0.325	0.050	0.404	0.0	300	1.179
3.000	0.578	23.0	212.5	0.419	0.335	0.260	0.0	225	0.589
3.001	0.578	23.0	202.3	0.335	0.240	0.260	0.0	225	0.589
3.002	0.578	23.0	214.8	0.240	0.163	0.279	0.0	225	0.589
3.003	1.157	46.0	203.8	0.163	0.325	0.279	0.0	225	1.179
3.004	0.578	23.0	208.4	0.325	0.286	0.328	0.0	225	0.589
3.005	3.477	138.3	278.0	0.286	0.025	0.439	0.0	225	3.541
4.000	1.000	39.8	816.4	0.275	0.275	1.051	0.0	0	∞

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
4.001	17	19	3.000	0.600	2.900	2.870	0.030	100.0	225	6.04	148.0
4.002	19	18	28.355	0.600	2.300	2.000	0.300	94.5	225	6.39	145.0
5.000	9	18	61.119	0.600	2.100	1.978	0.122	500.0	225	6.76	141.8
6.000	8	18	56.821	0.600	2.850	2.000	0.850	66.8	225	5.59	151.9
1.004	18	18_OUT	25.000	0.600	1.800	1.600	0.200	125.0	150	10.17	118.1
7.000	Existing Road	21_OUT	62.757	0.600	1.950	1.796	0.154	407.5	450	6.05	147.9

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
4.001	1.307	52.0	1817.9	0.275	0.305	2.345	0.0	225	1.331
4.002	1.345	53.5	1780.9	0.875	0.075	2.345	0.0	225	1.370
5.000	0.578	23.0	66.4	0.375	0.097	0.089	0.0	225	0.589
6.000	1.602	63.7	58.9	0.325	0.075	0.074	0.0	172	1.811
1.004	0.897	15.9	2523.2	0.350	0.150	4.076	0.0	150	0.914
7.000	1.001	159.1	145.7	1.200	1.354	0.188	0.0	341	1.128

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	19.094	289.3	225	Circular	3.723	3.173	0.325	3.657	3.107	0.325
1.001	71.003	315.6	225	Circular	3.657	3.032	0.400	3.432	2.807	0.400
1.002	51.886	139.5	225	Circular	3.432	2.807	0.400	3.060	2.435	0.400
2.000	55.691	150.1	150	Circular	3.477	2.878	0.449	3.057	2.507	0.400

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.001	2	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	7	1200	Manhole	Adoptable
2.000	4	1200	Manhole	Adoptable	5	1200	Manhole	Adoptable

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.001	78.599	500.0	225	Circular	3.057	2.507	0.325	3.000	2.350	0.425
2.002	1.000	500.0	225	Circular	3.000	2.350	0.425	3.060	2.348	0.487
1.003	88.000	181.4	300	Circular	3.060	2.435	0.325	2.300	1.950	0.050
3.000	4.923	500.0	225	Circular	4.276	3.632	0.419	4.182	3.622	0.335
3.001	29.018	500.0	225	Circular	4.182	3.622	0.335	4.029	3.564	0.240
3.002	5.757	500.0	225	Circular	4.029	3.564	0.240	3.940	3.552	0.163
3.003	61.212	127.3	225	Circular	3.940	3.552	0.163	3.621	3.071	0.325
3.004	90.838	500.0	225	Circular	3.621	3.071	0.325	3.400	2.889	0.286
3.005	12.000	14.3	225	Circular	3.400	2.889	0.286	2.300	2.050	0.025
4.000	60.000	0.0	225	Circular	3.400	2.900	0.275	3.400	2.900	0.275
4.001	3.000	100.0	225	Circular	3.400	2.900	0.275	3.400	2.870	0.305
4.002	28.355	94.5	225	Circular	3.400	2.300	0.875	2.300	2.000	0.075
5.000	61.119	500.0	225	Circular	2.700	2.100	0.375	2.300	1.978	0.097
6.000	56.821	66.8	225	Circular	3.400	2.850	0.325	2.300	2.000	0.075
1.004	25.000	125.0	150	Circular	2.300	1.800	0.350	1.900	1.600	0.150

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.001	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
2.002	6	1200	Manhole	Adoptable	7	1200	Manhole	Adoptable
1.003	7	1200	Manhole	Adoptable	18	1500	Manhole	Adoptable
3.000	10	1200	Manhole	Adoptable	11	1200	Manhole	Adoptable
3.001	11	1200	Manhole	Adoptable	12	1200	Manhole	Adoptable
3.002	12	1200	Manhole	Adoptable	13	1200	Manhole	Adoptable
3.003	13	1200	Manhole	Adoptable	14	1200	Manhole	Adoptable
3.004	14	1200	Manhole	Adoptable	15	1200	Manhole	Adoptable
3.005	15	1200	Manhole	Adoptable	18	1500	Manhole	Adoptable
4.000	16	1200	Manhole	Adoptable	17	1200	Manhole	Adoptable
4.001	17	1200	Manhole	Adoptable	19	1200	Manhole	Adoptable
4.002	19	1200	Manhole	Adoptable	18	1500	Manhole	Adoptable
5.000	9	1200	Manhole	Adoptable	18	1500	Manhole	Adoptable
6.000	8	1200	Manhole	Adoptable	18	1500	Manhole	Adoptable
1.004	18	1500	Manhole	Adoptable	18_OUT	1200	Manhole	Adoptable

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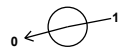
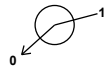
Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
7.000	62.757	407.5	450	Circular	3.600	1.950	1.200	3.600	1.796	1.354

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
7.000	Existing Road	1350	Manhole	Adoptable	21_OUT	1350	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections		Link	IL (m)	Dia (mm)	Link Type
1	482143.934	95905.193	3.723	0.550	1200	Manhole	Adoptable		0	1.000	3.173	225	Circular
2	482125.178	95901.616	3.657	0.625	1200	Manhole	Adoptable		1	1.000	3.107	225	Circular
									0	1.001	3.032	225	Circular
3	482056.532	95883.472	3.432	0.625	1200	Manhole	Adoptable		1	1.001	2.807	225	Circular
									0	1.002	2.807	225	Circular
4	481978.619	95941.374	3.477	0.599	1200	Manhole	Adoptable		0	2.000	2.878	150	Circular
5	481949.973	95893.615	3.057	0.550	1200	Manhole	Adoptable		1	2.000	2.507	150	Circular
									0	2.001	2.507	225	Circular

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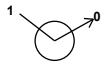
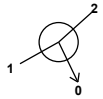
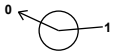
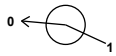
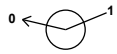
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections		Link	IL (m)	Dia (mm)	Link Type
6	482012.203	95845.603	3.000	0.650	1200	Manhole	Adoptable		1	2.001	2.350	225	Circular
									0	2.002	2.350	225	Circular
7	482017.926	95848.806	3.060	0.712	1200	Manhole	Adoptable		1	2.002	2.348	225	Circular
									2	1.002	2.435	225	Circular
									0	1.003	2.435	300	Circular
10	482241.253	95820.221	4.276	0.644	1200	Manhole	Adoptable		0	3.000	3.632	225	Circular
11	482236.348	95819.801	4.182	0.560	1200	Manhole	Adoptable		1	3.000	3.622	225	Circular
									0	3.001	3.622	225	Circular
12	482210.005	95831.971	4.029	0.465	1200	Manhole	Adoptable		1	3.001	3.564	225	Circular
									0	3.002	3.564	225	Circular
13	482204.271	95832.482	3.940	0.388	1200	Manhole	Adoptable		1	3.002	3.552	225	Circular
									0	3.003	3.552	225	Circular
14	482191.535	95772.610	3.621	0.550	1200	Manhole	Adoptable		1	3.003	3.071	225	Circular
									0	3.004	3.071	225	Circular
15	482107.574	95737.940	3.400	0.511	1200	Manhole	Adoptable		1	3.004	2.889	225	Circular
									0	3.005	2.889	225	Circular

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections	Link	IL (m)	Dia (mm)	Link Type
16	482013.970	95910.583	3.400	0.500	1200	Manhole	Adoptable					
								0	4.000	2.900	225	Circular
17	482087.381	95847.723	3.400	0.500	1200	Manhole	Adoptable	1	4.000	2.900	225	Circular
								0	4.001	2.900	225	Circular
19	482084.000	95770.000	3.400	1.100	1200	Manhole	Adoptable	1	4.001	2.870	225	Circular
								0	4.002	2.300	225	Circular
9	482050.733	95806.542	2.700	0.600	1200	Manhole	Adoptable					
								0	5.000	2.100	225	Circular
8	482063.263	95804.261	3.400	0.550	1200	Manhole	Adoptable					
								0	6.000	2.850	225	Circular
18	482066.689	95747.543	2.300	0.500	1500	Manhole	Adoptable	1	6.000	2.000	225	Circular
								2	5.000	1.978	225	Circular
								3	4.002	2.000	225	Circular
								4	3.005	2.050	225	Circular
								5	1.003	1.950	300	Circular
								0	1.004	1.800	150	Circular
18_OUT	482081.019	95617.480	1.900	0.300	1200	Manhole	Adoptable	1	1.004	1.600	150	Circular

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections		Link	IL (m)	Dia (mm)	Link Type
Existing Road	482218.964	95748.466	3.600	1.650	1350	Manhole	Adoptable		0	7.000	1.950	450	Circular
21_OUT	482211.860	95686.112	3.600	1.804	1350	Manhole	Adoptable		1	7.000	1.796	450	Circular

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0	30 year (l/s)	24.3
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	✓	100 year (l/s)	32.3
Winter CV	1.000	Drain Down Time (mins)	10080	2 year (l/s)	8.9	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	0	0	0
30	0	0	0	100	45	10	0

Pre-development Discharge Rate

Site Makeup	Greenfield	BFIHost	0.682	Growth Factor 100 year	3.19	Q 30 year (l/s)	24.3
Greenfield Method	FEH	Region	7	Betterment (%)	0	Q 100 year (l/s)	32.3
Positively Drained Area (ha)	6.500	QBar/QMed conversion factor	1.136	QMed	8.9		
SAAR (mm)	675	Growth Factor 2 year	0.88	QBar	10.1		
Host	1	Growth Factor 30 year	2.40	Q 2 year (l/s)	8.9		

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Node 19 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	2.300	Product Number	CTL-SHE-0118-6000-0800-6000
Design Depth (m)	0.800	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	6.0	Min Node Diameter (mm)	1200

Node 1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	7.600	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.323	Length (m)	110.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	9	Slope (1:X)	150.0		

Node 6 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	6.400	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.610	Length (m)	83.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	21	Slope (1:X)	1000.0		

Node 3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	9.360	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.032	Length (m)	70.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	14	Slope (1:X)	300.0		

Node 4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	7.470	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.077	Length (m)	89.500	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	34	Slope (1:X)	700.0		

Node 5 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	7.200	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.657	Length (m)	56.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	27	Slope (1:X)	130.0		

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Node 7 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	8.440	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.660	Length (m)	52.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	13	Slope (1:X)	180.0		

Node 8 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	9.400	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.000	Length (m)	66.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	0	Slope (1:X)	1000.0		

Node 9 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	9.760	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.300	Length (m)	92.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	7	Slope (1:X)	200.0		

Node 10 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	41.800	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.876	Length (m)	41.800	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	45	Slope (1:X)	1000.0		

Node 12 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	6.400	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.629	Length (m)	25.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	55	Slope (1:X)	120.0		

Node 14 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	8.100	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.221	Length (m)	63.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	57	Slope (1:X)	180.0		

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Node 15 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	10.300	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.000	Length (m)	94.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	2	Slope (1:X)	400.0		

Node 16 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	6060

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	6321.0	0.0	0.500	7622.0	0.0

Node 17 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	5760

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	7500.0	0.0	0.500	8614.0	0.0

Node 18 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	1500

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	7010.0	0.0	0.500	7605.0	0.0

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	11	3.289	0.116	15.6	0.4970	0.0000	OK
15 minute summer	2	11	3.145	0.113	15.2	0.1274	0.0000	OK
15 minute summer	3	11	2.931	0.124	27.7	0.4352	0.0000	OK
15 minute summer	4	12	3.012	0.134	15.8	0.5412	0.0000	OK
15 minute summer	5	13	2.712	0.205	23.7	0.9174	0.0000	OK
15 minute summer	6	13	2.626	0.276	27.6	1.0502	0.0000	SURCHARGED
15 minute summer	7	12	2.615	0.267	57.2	0.6578	0.0000	OK
15 minute summer	10	12	3.895	0.263	46.8	4.7452	0.0000	SURCHARGED
15 minute summer	11	13	3.861	0.239	31.6	0.2703	0.0000	SURCHARGED
15 minute summer	12	14	3.749	0.185	34.7	2.0239	0.0000	OK
15 minute summer	13	14	3.689	0.137	32.1	0.1548	0.0000	OK
30 minute summer	14	25	3.356	0.285	37.6	4.2578	0.0000	FLOOD RISK
15 minute summer	15	11	2.981	0.092	42.5	0.5033	0.0000	OK
10080 minute summer	16	6240	2.975	0.075	5.0	484.4755	0.0000	OK
10080 minute summer	17	5820	2.951	0.051	6.9	391.7203	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	15.2	0.797	0.499	0.3632	
15 minute summer	2	1.001	3	14.9	0.703	0.512	1.5012	
15 minute summer	3	1.002	7	26.3	0.959	0.598	1.4657	
15 minute summer	4	2.000	5	14.5	0.862	1.005	0.9513	
15 minute summer	5	2.001	6	17.4	0.465	0.756	3.0576	
15 minute summer	6	2.002	7	24.7	0.622	1.076	0.0398	
15 minute summer	7	1.003	18	54.1	1.250	0.657	3.8083	
15 minute summer	10	3.000	11	31.6	0.794	1.375	0.1958	
15 minute summer	11	3.001	12	31.5	0.871	1.370	1.0838	
15 minute summer	12	3.002	13	32.1	1.060	1.396	0.1733	
15 minute summer	13	3.003	14	32.1	0.932	0.697	1.9906	
30 minute summer	14	3.004	15	27.4	1.035	1.193	2.4914	
15 minute summer	15	3.005	18	41.6	2.888	0.301	0.1728	
10080 minute summer	16	4.000	17	1.7	0.192	0.043	0.5465	
10080 minute summer	17	4.001	19	4.9	0.769	0.094	0.0190	

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
10080 minute summer	19	5820	2.415	0.115	4.9	0.1301	0.0000	OK
15 minute summer	9	11	2.234	0.134	16.1	0.5500	0.0000	OK
15 minute summer	8	11	2.919	0.069	13.3	0.2645	0.0000	OK
10080 minute summer	18	5820	1.884	0.084	11.7	592.6329	0.0000	OK
10080 minute summer	18_OUT	5820	1.681	0.081	9.0	0.0000	0.0000	OK
15 minute summer	Existing Road	10	2.093	0.143	33.9	0.5290	0.0000	OK
15 minute summer	21_OUT	11	1.920	0.124	33.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
10080 minute summer	19	Hydro-Brake®	18	4.9				
15 minute summer	9	5.000	18	14.0	0.684	0.611	1.2536	
15 minute summer	8	6.000	18	12.9	1.256	0.202	0.5822	
10080 minute summer	18	1.004	18_OUT	9.0	0.914	0.569	0.2467	2541.1
15 minute summer	Existing Road	7.000	21_OUT	33.3	0.851	0.209	2.4565	14.6

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	12	3.422	0.249	38.2	1.7510	0.0000	SURCHARGED
15 minute summer	2	12	3.347	0.315	34.2	0.3559	0.0000	SURCHARGED
15 minute summer	3	13	3.107	0.300	60.3	3.4435	0.0000	SURCHARGED
30 minute summer	4	22	3.166	0.288	35.1	7.4207	0.0000	SURCHARGED
30 minute summer	5	22	2.852	0.345	33.6	4.7535	0.0000	FLOOD RISK
30 minute summer	6	23	2.700	0.350	43.5	8.7755	0.0000	FLOOD RISK
30 minute summer	7	21	2.684	0.336	81.9	0.9621	0.0000	OK
30 minute summer	10	23	3.944	0.312	104.3	27.3733	0.0000	SURCHARGED
30 minute summer	11	23	3.906	0.284	33.0	0.3210	0.0000	FLOOD RISK
30 minute summer	12	21	3.774	0.210	39.3	2.8524	0.0000	OK
60 minute summer	13	43	3.706	0.154	36.2	0.1741	0.0000	OK
60 minute winter	14	58	3.494	0.423	45.4	15.2054	0.0000	FLOOD RISK
15 minute summer	15	11	3.024	0.135	78.1	1.1126	0.0000	OK
10080 minute summer	16	6120	3.002	0.102	7.6	664.5595	0.0000	OK
10080 minute summer	17	6360	2.988	0.088	11.3	676.9169	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	34.2	0.993	1.127	0.7594	
15 minute summer	2	1.001	3	29.0	0.764	0.999	2.8239	
15 minute summer	3	1.002	7	44.3	1.163	1.007	2.0636	
30 minute summer	4	2.000	5	14.6	0.838	1.012	0.9804	
30 minute summer	5	2.001	6	22.6	0.585	0.985	3.1260	
30 minute summer	6	2.002	7	45.0	1.133	1.960	0.0398	
30 minute summer	7	1.003	18	80.4	1.357	0.977	5.2039	
30 minute summer	10	3.000	11	33.0	0.829	1.434	0.1958	
30 minute summer	11	3.001	12	33.0	0.834	1.435	1.1377	
30 minute summer	12	3.002	13	37.0	1.085	1.611	0.1941	
60 minute summer	13	3.003	14	36.1	0.975	0.785	2.1030	
60 minute winter	14	3.004	15	32.9	1.043	1.431	2.6686	
15 minute summer	15	3.005	18	76.4	3.306	0.552	0.2771	
10080 minute summer	16	4.000	17	3.0	0.199	0.074	0.9585	
10080 minute summer	17	4.001	19	8.3	0.818	0.159	0.0562	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
10080 minute summer	19	6600	2.997	0.697	8.3	0.7887	0.0000	SURCHARGED
15 minute summer	9	12	2.365	0.265	39.6	1.9049	0.0000	SURCHARGED
15 minute summer	8	11	2.965	0.115	32.8	0.4378	0.0000	OK
720 minute winter	18	690	1.917	0.117	62.0	830.7664	0.0000	OK
720 minute winter	18_OUT	690	1.710	0.110	14.2	0.0000	0.0000	OK
15 minute summer	Existing Road	10	2.186	0.236	83.1	0.8744	0.0000	OK
15 minute summer	21_OUT	10	1.994	0.198	81.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
10080 minute summer	19	Hydro-Brake®	18	5.8				
15 minute summer	9	5.000	18	31.4	0.846	1.365	2.0639	
15 minute summer	8	6.000	18	31.9	1.596	0.501	1.1354	
720 minute winter	18	1.004	18_OUT	14.2	0.995	0.898	0.3576	1919.9
15 minute summer	Existing Road	7.000	21_OUT	81.8	1.093	0.514	4.7449	36.0

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	12	3.504	0.331	48.1	3.7342	0.0000	FLOOD RISK
15 minute summer	2	13	3.419	0.387	35.6	0.4375	0.0000	FLOOD RISK
30 minute summer	3	22	3.143	0.336	67.3	6.3921	0.0000	FLOOD RISK
30 minute summer	4	23	3.192	0.314	44.3	11.5606	0.0000	FLOOD RISK
30 minute summer	5	22	2.892	0.385	38.6	6.5618	0.0000	FLOOD RISK
30 minute summer	6	23	2.722	0.372	50.9	12.3598	0.0000	FLOOD RISK
30 minute summer	7	22	2.703	0.355	87.7	1.3093	0.0000	OK
30 minute summer	10	24	3.967	0.335	131.6	39.7778	0.0000	SURCHARGED
30 minute summer	11	24	3.928	0.306	33.4	0.3458	0.0000	FLOOD RISK
60 minute summer	12	43	3.790	0.226	39.0	3.4232	0.0000	FLOOD RISK
60 minute summer	13	47	3.739	0.187	36.9	0.2114	0.0000	OK
60 minute winter	14	60	3.523	0.452	49.4	18.4327	0.0000	FLOOD RISK
15 minute summer	15	11	3.040	0.151	92.3	1.8062	0.0000	OK
10080 minute summer	16	6300	3.016	0.116	8.7	756.7676	0.0000	OK
10080 minute summer	17	6420	3.009	0.109	13.2	835.8315	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	35.6	0.999	1.172	0.7594	
15 minute summer	2	1.001	3	31.1	0.781	1.069	2.8239	
30 minute summer	3	1.002	7	45.0	1.131	1.024	2.0636	
30 minute summer	4	2.000	5	15.4	0.874	1.065	0.9804	
30 minute summer	5	2.001	6	23.5	0.601	1.023	3.1260	
30 minute summer	6	2.002	7	48.6	1.222	2.115	0.0398	
30 minute summer	7	1.003	18	84.8	1.364	1.030	5.4446	
30 minute summer	10	3.000	11	33.4	0.840	1.453	0.1958	
30 minute summer	11	3.001	12	33.4	0.840	1.453	1.1537	
60 minute summer	12	3.002	13	36.9	1.084	1.604	0.2159	
60 minute summer	13	3.003	14	36.4	0.977	0.791	2.2968	
60 minute winter	14	3.004	15	34.0	1.077	1.479	2.7754	
15 minute summer	15	3.005	18	88.4	3.395	0.639	0.3120	
10080 minute summer	16	4.000	17	3.3	0.201	0.083	1.1897	
10080 minute summer	17	4.001	19	8.5	0.815	0.163	0.0669	

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	19	585	3.010	0.710	9.1	0.8031	0.0000	SURCHARGED
15 minute summer	9	12	2.411	0.311	49.7	3.6256	0.0000	FLOOD RISK
15 minute summer	8	10	2.982	0.132	41.2	0.5058	0.0000	OK
600 minute winter	18	585	1.941	0.141	88.2	1006.8620	0.0000	OK
600 minute winter	18_OUT	585	1.718	0.118	16.3	0.0000	0.0000	OK
15 minute summer	Existing Road	10	2.221	0.271	104.6	1.0060	0.0000	OK
15 minute summer	21_OUT	10	2.019	0.223	102.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute summer	19	Hydro-Brake®	18	5.9				
15 minute summer	9	5.000	18	34.2	0.912	1.488	2.1065	
15 minute summer	8	6.000	18	40.1	1.683	0.630	1.3548	
600 minute winter	18	1.004	18_OUT	16.3	1.014	1.030	0.4013	2352.4
15 minute summer	Existing Road	7.000	21_OUT	102.9	1.165	0.646	5.5923	45.2

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Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	13	3.680	0.507	76.7	11.2952	0.0000	FLOOD RISK
15 minute summer	2	13	3.569	0.537	37.9	0.6077	0.0000	FLOOD RISK
30 minute summer	3	24	3.228	0.421	93.1	17.7272	0.0000	FLOOD RISK
60 minute summer	4	43	3.257	0.379	53.8	24.9707	0.0000	FLOOD RISK
30 minute summer	5	23	2.990	0.483	53.3	12.4241	0.0000	FLOOD RISK
30 minute summer	6	24	2.790	0.440	70.9	23.4392	0.0000	FLOOD RISK
30 minute summer	7	23	2.767	0.419	101.5	3.6872	0.0000	FLOOD RISK
60 minute summer	10	45	4.045	0.413	160.0	81.7600	0.0000	FLOOD RISK
60 minute summer	11	45	4.010	0.388	32.9	0.4385	0.0000	FLOOD RISK
60 minute summer	12	49	3.882	0.318	44.2	7.8177	0.0000	FLOOD RISK
60 minute winter	13	51	3.841	0.289	36.7	0.3267	0.0000	FLOOD RISK
60 minute winter	14	58	3.572	0.501	57.3	24.6843	0.0000	FLOOD RISK
15 minute summer	15	12	3.082	0.193	131.6	5.3501	0.0000	OK
10080 minute summer	16	6900	3.097	0.197	13.9	1304.8490	0.0000	OK
10080 minute summer	17	6900	3.095	0.195	21.1	1519.4820	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	37.9	1.012	1.249	0.7594	
15 minute summer	2	1.001	3	35.1	0.882	1.207	2.8239	
30 minute summer	3	1.002	7	46.2	1.161	1.051	2.0636	
60 minute summer	4	2.000	5	16.7	0.947	1.153	0.9804	
30 minute summer	5	2.001	6	25.4	0.638	1.103	3.1260	
30 minute summer	6	2.002	7	56.8	1.428	2.472	0.0398	
30 minute summer	7	1.003	18	90.8	1.369	1.104	5.6996	
60 minute summer	10	3.000	11	32.9	0.828	1.433	0.1958	
60 minute summer	11	3.001	12	32.7	0.821	1.422	1.1541	
60 minute summer	12	3.002	13	37.7	1.084	1.639	0.2290	
60 minute winter	13	3.003	14	35.8	0.968	0.778	2.4345	
60 minute winter	14	3.004	15	37.3	1.120	1.623	3.0453	
15 minute summer	15	3.005	18	115.9	3.506	0.839	0.3948	
10080 minute summer	16	4.000	17	4.0	0.207	0.101	2.2052	
10080 minute summer	17	4.001	19	9.1	0.815	0.175	0.1146	

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Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
10080 minute summer	19	6900	3.095	0.795	9.1	0.8988	0.0000	SURCHARGED
15 minute summer	9	13	2.515	0.415	79.3	10.6350	0.0000	FLOOD RISK
15 minute summer	8	11	3.026	0.176	65.7	1.6755	0.0000	OK
720 minute winter	18	705	2.029	0.229	118.4	1642.9920	0.0000	FLOOD RISK
720 minute winter	18_OUT	705	1.727	0.127	19.1	0.0000	0.0000	OK
15 minute summer	Existing Road	10	2.327	0.377	166.7	1.4862	0.0000	OK
15 minute summer	21_OUT	10	2.080	0.284	163.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
10080 minute summer	19	Hydro-Brake®	18	6.0				
15 minute summer	9	5.000	18	40.2	1.048	1.751	2.1888	
15 minute summer	8	6.000	18	58.2	1.796	0.914	1.8445	
720 minute winter	18	1.004	18_OUT	19.1	1.091	1.202	0.4184	4030.0
15 minute summer	Existing Road	7.000	21_OUT	163.4	1.319	1.027	7.7646	72.1

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Design Settings

Rainfall Methodology	FEH-13	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	100	Maximum Rainfall (mm/hr)	250.0	Include Intermediate Ground	✓
Additional Flow (%)	45	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.086	5.00	3.723	1200	482143.934	95905.193	0.550
2			3.657	1200	482125.178	95901.616	0.625
3	0.074	5.00	3.432	1200	482056.532	95883.472	0.625
4	0.088	5.00	3.477	1200	481978.619	95941.374	0.599
5	0.051	5.00	3.057	1200	481949.973	95893.615	0.550
6	0.058	5.00	3.000	1200	482012.203	95845.603	0.650
7	0.047	5.00	3.060	1200	482017.926	95848.806	0.712
10	0.260	5.00	4.276	1200	482241.253	95820.221	0.644
11			4.182	1200	482236.348	95819.801	0.560
12	0.019	5.00	4.029	1200	482210.005	95831.971	0.465
13			3.940	1200	482204.271	95832.482	0.388
14	0.049	5.00	3.621	1200	482191.535	95772.610	0.550
15	0.111	5.00	3.400	1200	482107.574	95737.940	0.511
16	1.051	5.00	3.400	1200	482013.970	95910.583	0.500
17	1.294	5.00	3.400	1200	482087.381	95847.723	0.500
19			3.400	1200	482084.000	95770.000	1.100
9	0.089	5.00	2.700	1200	482050.733	95806.542	0.600
8	0.074	5.00	3.400	1200	482063.263	95804.261	0.550
18	0.725	5.00	2.300	1500	482066.689	95747.543	0.500
18_OUT			1.900	1200	482081.019	95617.480	0.300
Existing Road	0.188	5.00	3.600	1350	482218.964	95748.466	1.650
21_OUT			3.600	1350	482211.860	95686.112	1.804

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	19.094	0.600	3.173	3.107	0.066	289.3	225	5.42	153.5
1.001	2	3	71.003	0.600	3.032	2.807	0.225	315.6	225	7.04	139.4
1.002	3	7	51.886	0.600	2.807	2.435	0.372	139.5	225	7.82	133.4
2.000	4	5	55.691	0.600	2.878	2.507	0.371	150.1	150	6.14	147.1
2.001	5	6	78.599	0.600	2.507	2.350	0.157	500.0	225	8.40	129.3
2.002	6	7	1.000	0.600	2.350	2.348	0.002	500.0	225	8.43	129.1
1.003	7	18	88.000	0.600	2.435	1.950	0.485	181.4	300	9.69	120.9
3.000	10	11	4.923	0.600	3.632	3.622	0.010	500.0	225	5.14	155.9
3.001	11	12	29.018	0.600	3.622	3.564	0.058	500.0	225	5.98	148.5
3.002	12	13	5.757	0.600	3.564	3.552	0.012	500.0	225	6.14	147.1
3.003	13	14	61.212	0.600	3.552	3.071	0.481	127.3	225	7.03	139.5
3.004	14	15	90.838	0.600	3.071	2.889	0.182	500.0	225	9.65	121.2
3.005	15	18	12.000	0.600	2.889	2.050	0.839	14.3	225	9.70	120.9
4.000	16	17	60.000	0.600	2.900	2.900	0.000	0.0	225	6.00	148.3

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.763	30.4	69.5	0.325	0.325	0.086	0.0	225	0.778
1.001	0.730	29.0	63.1	0.400	0.400	0.086	0.0	225	0.744
1.002	1.105	43.9	112.4	0.400	0.400	0.161	0.0	225	1.125
2.000	0.818	14.4	67.5	0.449	0.400	0.088	0.0	150	0.833
2.001	0.578	23.0	93.8	0.325	0.425	0.139	0.0	225	0.589
2.002	0.578	23.0	132.6	0.425	0.487	0.196	0.0	225	0.589
1.003	1.164	82.3	256.1	0.325	0.050	0.404	0.0	300	1.179
3.000	0.578	23.0	212.5	0.419	0.335	0.260	0.0	225	0.589
3.001	0.578	23.0	202.3	0.335	0.240	0.260	0.0	225	0.589
3.002	0.578	23.0	214.8	0.240	0.163	0.279	0.0	225	0.589
3.003	1.157	46.0	203.8	0.163	0.325	0.279	0.0	225	1.179
3.004	0.578	23.0	208.4	0.325	0.286	0.328	0.0	225	0.589
3.005	3.477	138.3	278.0	0.286	0.025	0.439	0.0	225	3.541
4.000	1.000	39.8	816.4	0.275	0.275	1.051	0.0	0	∞

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
4.001	17	19	3.000	0.600	2.900	2.870	0.030	100.0	225	6.04	148.0
4.002	19	18	28.355	0.600	2.300	2.000	0.300	94.5	225	6.39	145.0
5.000	9	18	61.119	0.600	2.100	1.978	0.122	500.0	225	6.76	141.8
6.000	8	18	56.821	0.600	2.850	2.000	0.850	66.8	225	5.59	151.9
1.004	18	18_OUT	25.000	0.600	1.800	1.600	0.200	125.0	150	10.17	118.1
7.000	Existing Road	21_OUT	62.757	0.600	1.950	1.796	0.154	407.5	450	6.05	147.9

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
4.001	1.307	52.0	1817.9	0.275	0.305	2.345	0.0	225	1.331
4.002	1.345	53.5	1780.9	0.875	0.075	2.345	0.0	225	1.370
5.000	0.578	23.0	66.4	0.375	0.097	0.089	0.0	225	0.589
6.000	1.602	63.7	58.9	0.325	0.075	0.074	0.0	172	1.811
1.004	0.897	15.9	2523.2	0.350	0.150	4.076	0.0	150	0.914
7.000	1.001	159.1	145.7	1.200	1.354	0.188	0.0	341	1.128

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	19.094	289.3	225	Circular	3.723	3.173	0.325	3.657	3.107	0.325
1.001	71.003	315.6	225	Circular	3.657	3.032	0.400	3.432	2.807	0.400
1.002	51.886	139.5	225	Circular	3.432	2.807	0.400	3.060	2.435	0.400
2.000	55.691	150.1	150	Circular	3.477	2.878	0.449	3.057	2.507	0.400

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.001	2	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	7	1200	Manhole	Adoptable
2.000	4	1200	Manhole	Adoptable	5	1200	Manhole	Adoptable

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.001	78.599	500.0	225	Circular	3.057	2.507	0.325	3.000	2.350	0.425
2.002	1.000	500.0	225	Circular	3.000	2.350	0.425	3.060	2.348	0.487
1.003	88.000	181.4	300	Circular	3.060	2.435	0.325	2.300	1.950	0.050
3.000	4.923	500.0	225	Circular	4.276	3.632	0.419	4.182	3.622	0.335
3.001	29.018	500.0	225	Circular	4.182	3.622	0.335	4.029	3.564	0.240
3.002	5.757	500.0	225	Circular	4.029	3.564	0.240	3.940	3.552	0.163
3.003	61.212	127.3	225	Circular	3.940	3.552	0.163	3.621	3.071	0.325
3.004	90.838	500.0	225	Circular	3.621	3.071	0.325	3.400	2.889	0.286
3.005	12.000	14.3	225	Circular	3.400	2.889	0.286	2.300	2.050	0.025
4.000	60.000	0.0	225	Circular	3.400	2.900	0.275	3.400	2.900	0.275
4.001	3.000	100.0	225	Circular	3.400	2.900	0.275	3.400	2.870	0.305
4.002	28.355	94.5	225	Circular	3.400	2.300	0.875	2.300	2.000	0.075
5.000	61.119	500.0	225	Circular	2.700	2.100	0.375	2.300	1.978	0.097
6.000	56.821	66.8	225	Circular	3.400	2.850	0.325	2.300	2.000	0.075
1.004	25.000	125.0	150	Circular	2.300	1.800	0.350	1.900	1.600	0.150

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.001	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
2.002	6	1200	Manhole	Adoptable	7	1200	Manhole	Adoptable
1.003	7	1200	Manhole	Adoptable	18	1500	Manhole	Adoptable
3.000	10	1200	Manhole	Adoptable	11	1200	Manhole	Adoptable
3.001	11	1200	Manhole	Adoptable	12	1200	Manhole	Adoptable
3.002	12	1200	Manhole	Adoptable	13	1200	Manhole	Adoptable
3.003	13	1200	Manhole	Adoptable	14	1200	Manhole	Adoptable
3.004	14	1200	Manhole	Adoptable	15	1200	Manhole	Adoptable
3.005	15	1200	Manhole	Adoptable	18	1500	Manhole	Adoptable
4.000	16	1200	Manhole	Adoptable	17	1200	Manhole	Adoptable
4.001	17	1200	Manhole	Adoptable	19	1200	Manhole	Adoptable
4.002	19	1200	Manhole	Adoptable	18	1500	Manhole	Adoptable
5.000	9	1200	Manhole	Adoptable	18	1500	Manhole	Adoptable
6.000	8	1200	Manhole	Adoptable	18	1500	Manhole	Adoptable
1.004	18	1500	Manhole	Adoptable	18_OUT	1200	Manhole	Adoptable

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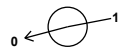
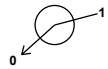
Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
7.000	62.757	407.5	450	Circular	3.600	1.950	1.200	3.600	1.796	1.354

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
7.000	Existing Road	1350	Manhole	Adoptable	21_OUT	1350	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections		Link	IL (m)	Dia (mm)	Link Type
1	482143.934	95905.193	3.723	0.550	1200	Manhole	Adoptable		0	1.000	3.173	225	Circular
2	482125.178	95901.616	3.657	0.625	1200	Manhole	Adoptable		1	1.000	3.107	225	Circular
									0	1.001	3.032	225	Circular
3	482056.532	95883.472	3.432	0.625	1200	Manhole	Adoptable		1	1.001	2.807	225	Circular
									0	1.002	2.807	225	Circular
4	481978.619	95941.374	3.477	0.599	1200	Manhole	Adoptable		0	2.000	2.878	150	Circular
5	481949.973	95893.615	3.057	0.550	1200	Manhole	Adoptable		1	2.000	2.507	150	Circular
									0	2.001	2.507	225	Circular

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections	Link	IL (m)	Dia (mm)	Link Type
6	482012.203	95845.603	3.000	0.650	1200	Manhole	Adoptable	1	2.001	2.350	225	Circular
								0	2.002	2.350	225	Circular
7	482017.926	95848.806	3.060	0.712	1200	Manhole	Adoptable	1	2.002	2.348	225	Circular
								2	1.002	2.435	225	Circular
								0	1.003	2.435	300	Circular
10	482241.253	95820.221	4.276	0.644	1200	Manhole	Adoptable	0	3.000	3.632	225	Circular
11	482236.348	95819.801	4.182	0.560	1200	Manhole	Adoptable	1	3.000	3.622	225	Circular
								0	3.001	3.622	225	Circular
12	482210.005	95831.971	4.029	0.465	1200	Manhole	Adoptable	1	3.001	3.564	225	Circular
								0	3.002	3.564	225	Circular
13	482204.271	95832.482	3.940	0.388	1200	Manhole	Adoptable	1	3.002	3.552	225	Circular
								0	3.003	3.552	225	Circular
14	482191.535	95772.610	3.621	0.550	1200	Manhole	Adoptable	1	3.003	3.071	225	Circular
								0	3.004	3.071	225	Circular
15	482107.574	95737.940	3.400	0.511	1200	Manhole	Adoptable	1	3.004	2.889	225	Circular
								0	3.005	2.889	225	Circular

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections	Link	IL (m)	Dia (mm)	Link Type
16	482013.970	95910.583	3.400	0.500	1200	Manhole	Adoptable	0	4.000	2.900	225	Circular
17	482087.381	95847.723	3.400	0.500	1200	Manhole	Adoptable	1	4.000	2.900	225	Circular
								0	4.001	2.900	225	Circular
19	482084.000	95770.000	3.400	1.100	1200	Manhole	Adoptable	1	4.001	2.870	225	Circular
								0	4.002	2.300	225	Circular
9	482050.733	95806.542	2.700	0.600	1200	Manhole	Adoptable	0	5.000	2.100	225	Circular
8	482063.263	95804.261	3.400	0.550	1200	Manhole	Adoptable	0	6.000	2.850	225	Circular
18	482066.689	95747.543	2.300	0.500	1500	Manhole	Adoptable	1	6.000	2.000	225	Circular
								2	5.000	1.978	225	Circular
								3	4.002	2.000	225	Circular
								4	3.005	2.050	225	Circular
								5	1.003	1.950	300	Circular
								0	1.004	1.800	150	Circular
18_OUT	482081.019	95617.480	1.900	0.300	1200	Manhole	Adoptable	1	1.004	1.600	150	Circular

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections		Link	IL (m)	Dia (mm)	Link Type
Existing Road	482218.964	95748.466	3.600	1.650	1350	Manhole	Adoptable		0	7.000	1.950	450	Circular
21_OUT	482211.860	95686.112	3.600	1.804	1350	Manhole	Adoptable		1	7.000	1.796	450	Circular

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0	30 year (l/s)	24.3
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	✓	100 year (l/s)	32.3
Winter CV	1.000	Drain Down Time (mins)	10080	2 year (l/s)	8.9	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	0	0	0
30	0	0	0	100	45	10	0

Pre-development Discharge Rate

Site Makeup	Greenfield	BFIHost	0.682	Growth Factor 100 year	3.19	Q 30 year (l/s)	24.3
Greenfield Method	FEH	Region	7	Betterment (%)	0	Q 100 year (l/s)	32.3
Positively Drained Area (ha)	6.500	QBar/QMed conversion factor	1.136	QMed	8.9		
SAAR (mm)	675	Growth Factor 2 year	0.88	QBar	10.1		
Host	1	Growth Factor 30 year	2.40	Q 2 year (l/s)	8.9		

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Node 18_OUT Surcharged Outfall

Overrides Design Area	x	Depression Storage Area (m²)	0	Evapo-transpiration (mm/day)	0
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	0		

Applies to All storms

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	0.000	80	0.000	160	0.000	240	0.300	320	0.330	400	0.020	480	0.000	560	0.000	640	0.000
10	0.000	90	0.000	170	0.000	250	0.400	330	0.250	410	0.000	490	0.000	570	0.000		
20	0.000	100	0.000	180	0.000	260	0.400	340	0.180	420	0.000	500	0.000	580	0.000		
30	0.000	110	0.000	190	0.000	270	0.400	350	0.110	430	0.000	510	0.000	590	0.000		
40	0.000	120	0.000	200	0.000	280	0.400	360	0.070	440	0.000	520	0.000	600	0.000		
50	0.000	130	0.000	210	0.000	290	0.400	370	0.050	450	0.000	530	0.000	610	0.000		
60	0.000	140	0.000	220	0.000	300	0.400	380	0.040	460	0.000	540	0.000	620	0.000		
70	0.000	150	0.000	230	0.000	310	0.400	390	0.040	470	0.000	550	0.000	630	0.000		

Node 19 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	2.300	Product Number	CTL-SHE-0118-6000-0800-6000
Design Depth (m)	0.800	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	6.0	Min Node Diameter (mm)	1200

Node 1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	7.600	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.323	Length (m)	110.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	9	Slope (1:X)	150.0		

Node 6 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	6.400	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.610	Length (m)	83.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	21	Slope (1:X)	1000.0		

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Node 3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	9.360	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.032	Length (m)	70.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	14	Slope (1:X)	300.0		

Node 4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	7.470	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.077	Length (m)	89.500	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	34	Slope (1:X)	700.0		

Node 5 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	7.200	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.657	Length (m)	56.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	27	Slope (1:X)	130.0		

Node 7 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	8.440	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.660	Length (m)	52.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	13	Slope (1:X)	180.0		

Node 8 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	9.400	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.000	Length (m)	66.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	0	Slope (1:X)	1000.0		

Node 9 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	9.760	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.300	Length (m)	92.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	7	Slope (1:X)	200.0		

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Node 10 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	41.800	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.876	Length (m)	41.800	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	45	Slope (1:X)	1000.0		

Node 12 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	6.400	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.629	Length (m)	25.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	55	Slope (1:X)	120.0		

Node 14 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	8.100	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.221	Length (m)	63.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	57	Slope (1:X)	180.0		

Node 15 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	10.300	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.000	Length (m)	94.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	2	Slope (1:X)	400.0		

Node 16 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	6060

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	6321.0	0.0	0.500	7622.0	0.0

Node 17 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	5760

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	7500.0	0.0	0.500	8614.0	0.0

Node 18 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	1560

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	7010.0	0.0	0.500	7605.0	0.0

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	11	3.289	0.116	15.6	0.4970	0.0000	OK
15 minute summer	2	11	3.145	0.113	15.2	0.1274	0.0000	OK
15 minute summer	3	11	2.931	0.124	27.7	0.4352	0.0000	OK
15 minute summer	4	12	3.012	0.134	15.8	0.5412	0.0000	OK
15 minute summer	5	13	2.712	0.205	23.7	0.9174	0.0000	OK
15 minute summer	6	13	2.626	0.276	27.6	1.0502	0.0000	SURCHARGED
15 minute summer	7	12	2.615	0.267	57.2	0.6578	0.0000	OK
15 minute summer	10	12	3.895	0.263	46.8	4.7452	0.0000	SURCHARGED
15 minute summer	11	13	3.861	0.239	31.6	0.2703	0.0000	SURCHARGED
15 minute summer	12	14	3.749	0.185	34.7	2.0239	0.0000	OK
15 minute summer	13	14	3.689	0.137	32.1	0.1548	0.0000	OK
30 minute summer	14	25	3.356	0.285	37.6	4.2578	0.0000	FLOOD RISK
15 minute summer	15	11	2.981	0.092	42.5	0.5033	0.0000	OK
10080 minute summer	16	6240	2.975	0.075	5.0	484.4755	0.0000	OK
10080 minute summer	17	5820	2.951	0.051	6.9	391.7203	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	15.2	0.797	0.499	0.3632	
15 minute summer	2	1.001	3	14.9	0.703	0.512	1.5012	
15 minute summer	3	1.002	7	26.3	0.959	0.598	1.4657	
15 minute summer	4	2.000	5	14.5	0.862	1.005	0.9513	
15 minute summer	5	2.001	6	17.4	0.465	0.756	3.0576	
15 minute summer	6	2.002	7	24.7	0.622	1.076	0.0398	
15 minute summer	7	1.003	18	54.1	1.250	0.657	3.8083	
15 minute summer	10	3.000	11	31.6	0.794	1.375	0.1958	
15 minute summer	11	3.001	12	31.5	0.871	1.370	1.0838	
15 minute summer	12	3.002	13	32.1	1.060	1.396	0.1733	
15 minute summer	13	3.003	14	32.1	0.932	0.697	1.9906	
30 minute summer	14	3.004	15	27.4	1.035	1.193	2.4914	
15 minute summer	15	3.005	18	41.6	2.888	0.301	0.1728	
10080 minute summer	16	4.000	17	1.7	0.192	0.043	0.5465	
10080 minute summer	17	4.001	19	4.9	0.769	0.094	0.0190	

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
10080 minute summer	19	5820	2.415	0.115	4.9	0.1301	0.0000	OK
15 minute summer	9	11	2.234	0.134	16.1	0.5500	0.0000	OK
15 minute summer	8	11	2.919	0.069	13.3	0.2645	0.0000	OK
10080 minute summer	18	5820	1.884	0.084	11.7	592.6327	0.0000	OK
15 minute summer	18_OUT	251	2.000	0.400	0.5	0.0000	0.0000	OK
15 minute summer	Existing Road	10	2.093	0.143	33.9	0.5290	0.0000	OK
15 minute summer	21_OUT	11	1.920	0.124	33.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
10080 minute summer	19	Hydro-Brake®	18	4.9				
15 minute summer	9	5.000	18	14.0	0.684	0.611	1.2536	
15 minute summer	8	6.000	18	12.9	1.256	0.202	0.5822	
10080 minute summer	18	1.004	18_OUT	9.0	0.914	0.569	0.2467	2541.1
15 minute summer	Existing Road	7.000	21_OUT	33.3	0.851	0.209	2.4565	14.6

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	12	3.422	0.249	38.2	1.7510	0.0000	SURCHARGED
15 minute summer	2	12	3.347	0.315	34.2	0.3559	0.0000	SURCHARGED
15 minute summer	3	13	3.107	0.300	60.3	3.4435	0.0000	SURCHARGED
30 minute summer	4	22	3.166	0.288	35.1	7.4207	0.0000	SURCHARGED
30 minute summer	5	22	2.852	0.345	33.6	4.7535	0.0000	FLOOD RISK
30 minute summer	6	23	2.700	0.350	43.5	8.7755	0.0000	FLOOD RISK
30 minute summer	7	21	2.684	0.336	81.9	0.9621	0.0000	OK
30 minute summer	10	23	3.944	0.312	104.3	27.3733	0.0000	SURCHARGED
30 minute summer	11	23	3.906	0.284	33.0	0.3210	0.0000	FLOOD RISK
30 minute summer	12	21	3.774	0.210	39.3	2.8524	0.0000	OK
60 minute summer	13	43	3.706	0.154	36.2	0.1741	0.0000	OK
60 minute winter	14	58	3.494	0.423	45.4	15.2054	0.0000	FLOOD RISK
15 minute summer	15	11	3.024	0.135	78.1	1.1126	0.0000	OK
10080 minute summer	16	6120	3.002	0.102	7.6	664.5595	0.0000	OK
10080 minute summer	17	6360	2.988	0.088	11.3	676.9169	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	34.2	0.993	1.127	0.7594	
15 minute summer	2	1.001	3	29.0	0.764	0.999	2.8239	
15 minute summer	3	1.002	7	44.3	1.163	1.007	2.0636	
30 minute summer	4	2.000	5	14.6	0.838	1.012	0.9804	
30 minute summer	5	2.001	6	22.6	0.585	0.985	3.1260	
30 minute summer	6	2.002	7	45.0	1.133	1.960	0.0398	
30 minute summer	7	1.003	18	80.4	1.357	0.977	5.2039	
30 minute summer	10	3.000	11	33.0	0.829	1.434	0.1958	
30 minute summer	11	3.001	12	33.0	0.834	1.435	1.1377	
30 minute summer	12	3.002	13	37.0	1.085	1.611	0.1941	
60 minute summer	13	3.003	14	36.1	0.975	0.785	2.1030	
60 minute winter	14	3.004	15	32.9	1.043	1.431	2.6686	
15 minute summer	15	3.005	18	76.4	3.306	0.552	0.2771	
10080 minute summer	16	4.000	17	3.0	0.199	0.074	0.9585	
10080 minute summer	17	4.001	19	8.3	0.818	0.159	0.0562	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
10080 minute summer	19	6600	2.997	0.697	8.3	0.7887	0.0000	SURCHARGED
15 minute summer	9	12	2.365	0.265	39.6	1.9049	0.0000	SURCHARGED
15 minute summer	8	11	2.965	0.115	32.8	0.4378	0.0000	OK
360 minute winter	18	360	1.923	0.123	105.6	872.2653	0.0000	OK
15 minute summer	18_OUT	251	2.000	0.400	3.2	0.0000	0.0000	OK
15 minute summer	Existing Road	10	2.186	0.236	83.1	0.8744	0.0000	OK
15 minute summer	21_OUT	10	1.994	0.198	81.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
10080 minute summer	19	Hydro-Brake®	18	5.8				
15 minute summer	9	5.000	18	31.4	0.846	1.365	2.0639	
15 minute summer	8	6.000	18	31.9	1.596	0.501	1.1354	
360 minute winter	18	1.004	18_OUT	15.0	1.004	0.948	0.4123	1667.3
15 minute summer	Existing Road	7.000	21_OUT	81.8	1.093	0.514	4.7449	36.0

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	12	3.504	0.331	48.1	3.7342	0.0000	FLOOD RISK
15 minute summer	2	13	3.419	0.387	35.6	0.4375	0.0000	FLOOD RISK
30 minute summer	3	22	3.143	0.336	67.3	6.3921	0.0000	FLOOD RISK
30 minute summer	4	23	3.192	0.314	44.3	11.5606	0.0000	FLOOD RISK
30 minute summer	5	22	2.892	0.385	38.6	6.5618	0.0000	FLOOD RISK
30 minute summer	6	23	2.722	0.372	50.9	12.3598	0.0000	FLOOD RISK
30 minute summer	7	22	2.703	0.355	87.7	1.3093	0.0000	OK
30 minute summer	10	24	3.967	0.335	131.6	39.7778	0.0000	SURCHARGED
30 minute summer	11	24	3.928	0.306	33.4	0.3458	0.0000	FLOOD RISK
60 minute summer	12	43	3.790	0.226	39.0	3.4232	0.0000	FLOOD RISK
60 minute summer	13	47	3.739	0.187	36.9	0.2114	0.0000	OK
60 minute winter	14	60	3.523	0.452	49.4	18.4327	0.0000	FLOOD RISK
15 minute summer	15	11	3.040	0.151	92.3	1.8062	0.0000	OK
10080 minute summer	16	6300	3.016	0.116	8.7	756.7676	0.0000	OK
10080 minute summer	17	6420	3.009	0.109	13.2	835.8315	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	35.6	0.999	1.172	0.7594	
15 minute summer	2	1.001	3	31.1	0.781	1.069	2.8239	
30 minute summer	3	1.002	7	45.0	1.131	1.024	2.0636	
30 minute summer	4	2.000	5	15.4	0.874	1.065	0.9804	
30 minute summer	5	2.001	6	23.5	0.601	1.023	3.1260	
30 minute summer	6	2.002	7	48.6	1.222	2.115	0.0398	
30 minute summer	7	1.003	18	84.8	1.364	1.030	5.4446	
30 minute summer	10	3.000	11	33.4	0.840	1.453	0.1958	
30 minute summer	11	3.001	12	33.4	0.840	1.453	1.1537	
60 minute summer	12	3.002	13	36.9	1.084	1.604	0.2159	
60 minute summer	13	3.003	14	36.4	0.977	0.791	2.2968	
60 minute winter	14	3.004	15	34.0	1.077	1.479	2.7754	
15 minute summer	15	3.005	18	88.4	3.395	0.639	0.3120	
10080 minute summer	16	4.000	17	3.3	0.201	0.083	1.1897	
10080 minute summer	17	4.001	19	8.5	0.815	0.163	0.0669	

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	19	585	3.010	0.710	9.1	0.8031	0.0000	SURCHARGED
15 minute summer	9	12	2.411	0.311	49.7	3.6256	0.0000	FLOOD RISK
15 minute summer	8	10	2.982	0.132	41.2	0.5058	0.0000	OK
360 minute winter	18	360	1.950	0.150	131.0	1068.4160	0.0000	OK
15 minute summer	18_OUT	251	2.000	0.400	4.9	0.0000	0.0000	OK
15 minute summer	Existing Road	10	2.221	0.271	104.6	1.0060	0.0000	OK
15 minute summer	21_OUT	10	2.019	0.223	102.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute summer	19	Hydro-Brake®	18	5.9				
15 minute summer	9	5.000	18	34.2	0.912	1.488	2.1065	
15 minute summer	8	6.000	18	40.1	1.683	0.630	1.3548	
360 minute winter	18	1.004	18_OUT	16.5	1.014	1.038	0.4399	2135.8
15 minute summer	Existing Road	7.000	21_OUT	102.9	1.165	0.646	5.5923	45.2

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Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	13	3.680	0.507	76.7	11.2952	0.0000	FLOOD RISK
15 minute summer	2	13	3.569	0.537	37.9	0.6077	0.0000	FLOOD RISK
30 minute summer	3	24	3.228	0.421	93.1	17.7272	0.0000	FLOOD RISK
60 minute summer	4	43	3.257	0.379	53.8	24.9707	0.0000	FLOOD RISK
30 minute summer	5	23	2.990	0.483	53.3	12.4241	0.0000	FLOOD RISK
30 minute summer	6	24	2.790	0.440	70.9	23.4392	0.0000	FLOOD RISK
30 minute summer	7	23	2.767	0.419	101.5	3.6872	0.0000	FLOOD RISK
60 minute summer	10	45	4.045	0.413	160.0	81.7600	0.0000	FLOOD RISK
60 minute summer	11	45	4.010	0.388	32.9	0.4385	0.0000	FLOOD RISK
60 minute summer	12	49	3.882	0.318	44.2	7.8177	0.0000	FLOOD RISK
60 minute winter	13	51	3.841	0.289	36.7	0.3267	0.0000	FLOOD RISK
60 minute winter	14	58	3.572	0.501	57.3	24.6843	0.0000	FLOOD RISK
15 minute summer	15	12	3.082	0.193	131.6	5.3501	0.0000	OK
10080 minute summer	16	6900	3.097	0.197	13.9	1304.8490	0.0000	OK
10080 minute summer	17	6900	3.095	0.195	21.1	1519.4820	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	37.9	1.012	1.249	0.7594	
15 minute summer	2	1.001	3	35.1	0.882	1.207	2.8239	
30 minute summer	3	1.002	7	46.2	1.161	1.051	2.0636	
60 minute summer	4	2.000	5	16.7	0.947	1.153	0.9804	
30 minute summer	5	2.001	6	25.4	0.638	1.103	3.1260	
30 minute summer	6	2.002	7	56.8	1.428	2.472	0.0398	
30 minute summer	7	1.003	18	90.8	1.369	1.104	5.6996	
60 minute summer	10	3.000	11	32.9	0.828	1.433	0.1958	
60 minute summer	11	3.001	12	32.7	0.821	1.422	1.1541	
60 minute summer	12	3.002	13	37.7	1.084	1.639	0.2290	
60 minute winter	13	3.003	14	35.8	0.968	0.778	2.4345	
60 minute winter	14	3.004	15	37.3	1.120	1.623	3.0453	
15 minute summer	15	3.005	18	115.9	3.506	0.839	0.3948	
10080 minute summer	16	4.000	17	4.0	0.207	0.101	2.2052	
10080 minute summer	17	4.001	19	9.1	0.815	0.175	0.1146	

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Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
10080 minute summer	19	6900	3.095	0.795	9.1	0.8988	0.0000	SURCHARGED
15 minute summer	9	13	2.515	0.415	79.3	10.6350	0.0000	FLOOD RISK
15 minute summer	8	11	3.026	0.176	65.7	1.6755	0.0000	OK
480 minute winter	18	472	2.038	0.238	163.1	1706.9110	0.0000	FLOOD RISK
15 minute summer	18_OUT	251	2.000	0.400	10.6	0.0000	0.0000	OK
15 minute summer	Existing Road	10	2.327	0.377	166.7	1.4862	0.0000	OK
15 minute summer	21_OUT	10	2.080	0.284	163.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
10080 minute summer	19	Hydro-Brake®	18	6.0				
15 minute summer	9	5.000	18	40.2	1.048	1.751	2.1888	
15 minute summer	8	6.000	18	58.2	1.796	0.914	1.8445	
480 minute winter	18	1.004	18_OUT	19.3	1.105	1.218	0.4401	3764.2
15 minute summer	Existing Road	7.000	21_OUT	163.4	1.319	1.027	7.7646	72.1

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Design Settings

Rainfall Methodology	FEH-13	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	100	Maximum Rainfall (mm/hr)	250.0	Include Intermediate Ground	✓
Additional Flow (%)	45	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	0.200		

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
D	10.000	1000.0	975	Circular	10.000	7.825	1.200	10.000	7.815	1.210

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
D	D1	1875	Manhole	Adoptable	D2	1875	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections		Link	IL (m)	Dia (mm)	Link Type
D1	0.000	30.000	10.000	2.175	1875	Manhole	Adoptable		0	D	7.825	975	Circular
D2	10.000	30.000	10.000	2.185	1875	Manhole	Adoptable		1	D	7.815	975	Circular

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0	30 year (l/s)	3.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	✓	100 year (l/s)	3.9
Winter CV	1.000	Drain Down Time (mins)	240	2 year (l/s)	1.4	Check Discharge Volume	x

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Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	0	0	0
30	0	0	0	100	45	10	0

Pre-development Discharge Rate

Site Makeup	Greenfield	BFIHost	0.682	Growth Factor 100 year	2.48	Q 30 year (l/s)	3.0
Greenfield Method	FEH	Region	7	Betterment (%)	0	Q 100 year (l/s)	3.9
Positively Drained Area (ha)	1.000	QBar/QMed conversion factor	1.136	QMed	1.4		
SAAR (mm)	675	Growth Factor 2 year	0.88	QBar	1.6		
Host	1	Growth Factor 30 year	1.95	Q 2 year (l/s)	1.4		

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	D1	10	8.086	0.261	152.5	2.7559	0.0000	OK
15 minute summer	D2	10	8.032	0.217	151.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	D1	D	D2	151.3	1.071	0.196	1.4162	66.0

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	D1	10	8.239	0.414	374.9	4.3748	0.0000	OK
15 minute summer	D2	10	8.161	0.346	372.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	D1	D	D2	372.8	1.389	0.484	2.6863	162.5

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	D1	10	8.293	0.468	471.7	4.9384	0.0000	OK
15 minute summer	D2	10	8.204	0.389	469.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	D1	D	D2	469.0	1.490	0.608	3.1502	204.3

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Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	D1	10	8.428	0.603	752.2	6.8318	0.0000	OK
15 minute summer	D2	10	8.312	0.497	748.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	D1	D	D2	748.4	1.732	0.971	4.3195	326.0

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Design Settings

Rainfall Methodology	FEH-13	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	100	Maximum Rainfall (mm/hr)	250.0	Include Intermediate Ground	✓
Additional Flow (%)	45	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
PP	0.332	5.00	3.440	1200	5.000	0.000	1.000
MH			2.150	1200	30.997	0.289	0.450
1			2.300	1200	54.451	0.424	0.700

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	PP	MH	25.999	0.600	2.440	1.700	0.740	35.1	225	5.20	155.5
1.001	MH	1	23.454	0.600	1.700	1.600	0.100	234.5	150	5.80	150.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	2.214	88.0	270.5	0.775	0.225	0.332	0.0	225	2.255
1.001	0.652	11.5	261.2	0.300	0.550	0.332	0.0	150	0.664

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	25.999	35.1	225	Circular	3.440	2.440	0.775	2.150	1.700	0.225
1.001	23.454	234.5	150	Circular	2.150	1.700	0.300	2.300	1.600	0.550

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	PP	1200	Manhole	Adoptable	MH	1200	Manhole	Adoptable
1.001	MH	1200	Manhole	Adoptable	1	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
PP	5.000	0.000	3.440	1.000	1200		0	1.000	2.440	225
MH	30.997	0.289	2.150	0.450	1200		1	1.000	1.700	225
							0	1.001	1.700	150
1	54.451	0.424	2.300	0.700	1200		1	1.001	1.600	150

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0	30 year (l/s)	9.7
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	✓	100 year (l/s)	12.3
Winter CV	1.000	Drain Down Time (mins)	240	2 year (l/s)	4.4	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	0	0	0
30	0	0	0	100	45	10	0

Pre-development Discharge Rate

Site Makeup	Greenfield	BFIHost	0.682	Growth Factor 100 year	2.48	Q 30 year (l/s)	9.7
Greenfield Method	FEH	Region	7	Betterment (%)	0	Q 100 year (l/s)	12.3
Positively Drained Area (ha)	3.184	QBar/QMed conversion factor	1.136	QMed	4.4		
SAAR (mm)	675	Growth Factor 2 year	0.88	QBar	5.0		
Host	1	Growth Factor 30 year	1.95	Q 2 year (l/s)	4.4		

Node PP Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	2.440	Product Number	CTL-SHE-0160-1200-0900-1200
Design Depth (m)	0.900	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	12.0	Min Node Diameter (mm)	1200

Node PP Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	102.000	Depth (m)	0.600
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.740	Length (m)	10.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	140	Slope (1:X)	1000.0		

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.62%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	PP	24	2.792	0.352	53.0	17.1658	0.0000	SURCHARGED
240 minute winter	MH	128	1.836	0.136	12.0	0.1535	0.0000	OK
240 minute winter	1	128	1.702	0.102	12.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	PP	Hydro-Brake®	MH	12.0				
240 minute winter	MH	1.001	1	12.0	0.803	1.042	0.3455	76.1

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.62%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	PP	58	2.952	0.512	72.3	67.3138	0.0000	SURCHARGED
480 minute winter	MH	216	1.836	0.136	12.0	0.1534	0.0000	OK
480 minute summer	1	216	1.702	0.102	12.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	PP	Hydro-Brake®	MH	12.0				
480 minute winter	MH	1.001	1	12.0	0.803	1.042	0.3455	177.2

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.62%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	PP	60	3.046	0.606	92.5	96.8383	0.0000	SURCHARGED
600 minute winter	MH	270	1.836	0.136	12.0	0.1534	0.0000	OK
600 minute winter	1	270	1.702	0.102	12.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	PP	Hydro-Brake®	MH	12.0				
600 minute winter	MH	1.001	1	12.0	0.803	1.042	0.3454	228.2

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Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.62%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	PP	118	3.316	0.876	90.5	182.2220	0.0000	FLOOD RISK
960 minute winter	MH	405	1.836	0.136	12.0	0.1535	0.0000	OK
960 minute winter	1	405	1.702	0.102	12.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	PP	Hydro-Brake®	MH	12.0				
960 minute winter	MH	1.001	1	12.0	0.803	1.042	0.3455	391.8

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Design Settings

Rainfall Methodology	FEH-13	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	100	Maximum Rainfall (mm/hr)	250.0	Include Intermediate Ground	✓
Additional Flow (%)	45	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
G1	0.218	5.00	10.000	1500	0.000	60.000	1.800
G2			10.000	1500	10.000	60.000	1.810

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
G	G1	G2	10.000	0.600	8.200	8.190	0.010	1000.0	600	5.22	155.3

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
G	0.762	215.3	177.4	1.200	1.210	0.218	0.0	417	0.846

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
G	10.000	1000.0	600	Circular	10.000	8.200	1.200	10.000	8.190	1.210

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
G	G1	1500	Manhole	Adoptable	G2	1500	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
G1	0.000	60.000	10.000	1.800	1500	0	G	8.200	600
G2	10.000	60.000	10.000	1.810	1500	1	G	8.190	600

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0	30 year (l/s)	3.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	✓	100 year (l/s)	3.9
Winter CV	1.000	Drain Down Time (mins)	240	2 year (l/s)	1.4	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	0	0	0
30	0	0	0	100	45	10	0

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Pre-development Discharge Rate

Site Makeup	Greenfield	BFIHost	0.682	Growth Factor 100 year	2.48	Q 30 year (l/s)	3.0
Greenfield Method	FEH	Region	7	Betterment (%)	0	Q 100 year (l/s)	3.9
Positively Drained Area (ha)	1.000	QBar/QMed conversion factor	1.136	QMed	1.4		
SAAR (mm)	675	Growth Factor 2 year	0.88	QBar	1.6		
Host	1	Growth Factor 30 year	1.95	Q 2 year (l/s)	1.4		

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Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	G1	10	8.354	0.154	39.2	0.6450	0.0000	OK
15 minute summer	G2	10	8.314	0.124	38.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	G1	G	G2	38.9	0.789	0.181	0.4945	17.0

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Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	G1	10	8.442	0.242	96.4	1.0126	0.0000	OK
15 minute summer	G2	10	8.387	0.197	95.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	G1	G	G2	95.8	1.028	0.445	0.9335	41.8

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Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	G1	10	8.472	0.272	121.2	1.1402	0.0000	OK
15 minute summer	G2	10	8.412	0.222	120.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	G1	G	G2	120.5	1.102	0.560	1.0948	52.5

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Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	G1	10	8.549	0.349	193.3	1.5490	0.0000	OK
15 minute summer	G2	10	8.474	0.284	192.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	G1	G	G2	192.4	1.277	0.894	1.5064	83.8

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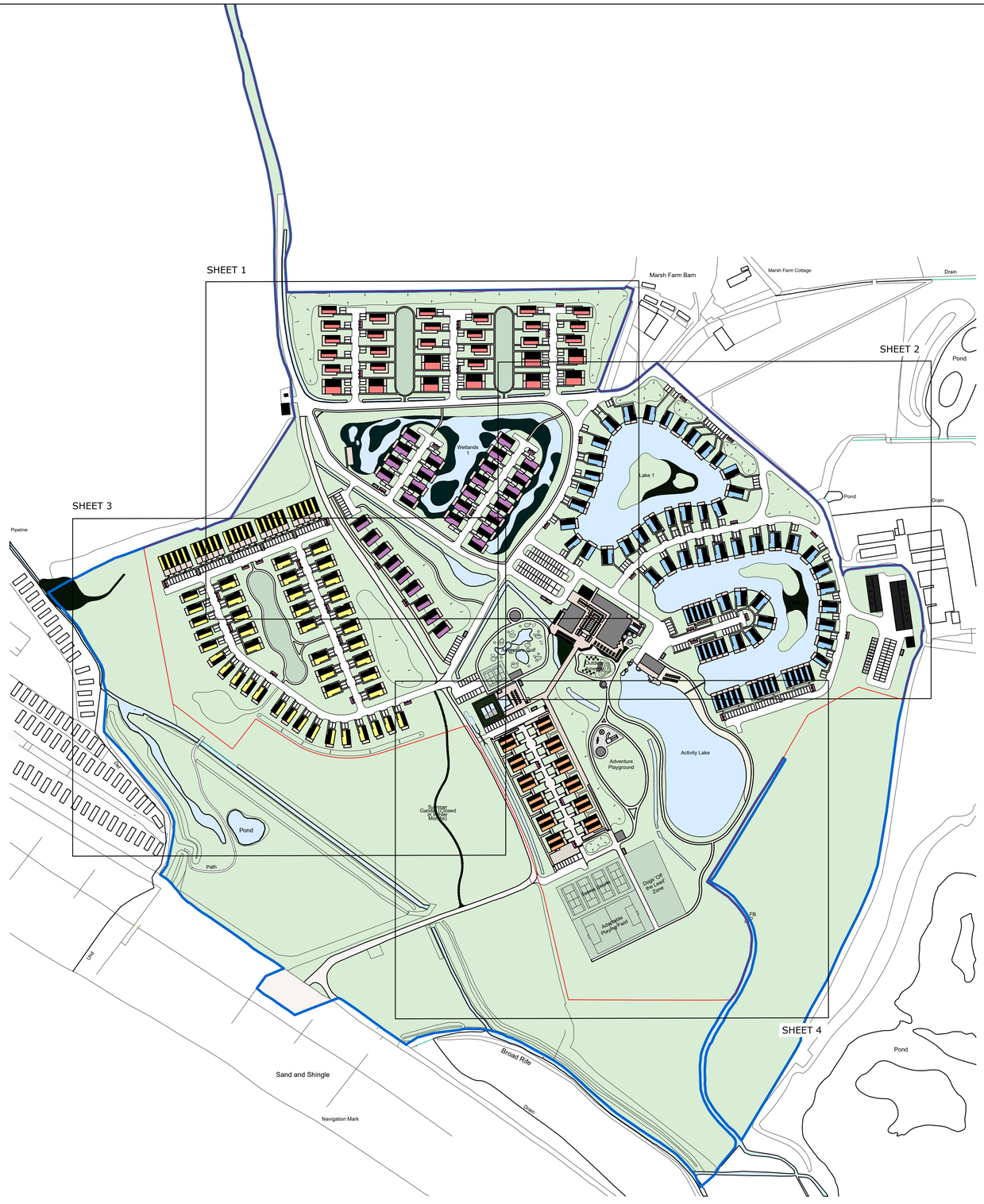
Appendix A.5 – Indicative Drainage Layout



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Rev	Description	Author	Checked	Date
P1	Updated scheme	EC	SMB	11/08/23
P0	First issue	EC	SMB	15/06/23

CLIENT
Cove Communities

PROJECT
Medmerry Park, Stoney Lane
Chichester

SCALE	PROJ REF	ORIGINATOR	CHECKED BY
1:2000	3341	EC	SMB

HC DWG REF:
3341_DWG_r3

DWG TITLE	DWG No.
LOCATION PLAN	HC-3341-500

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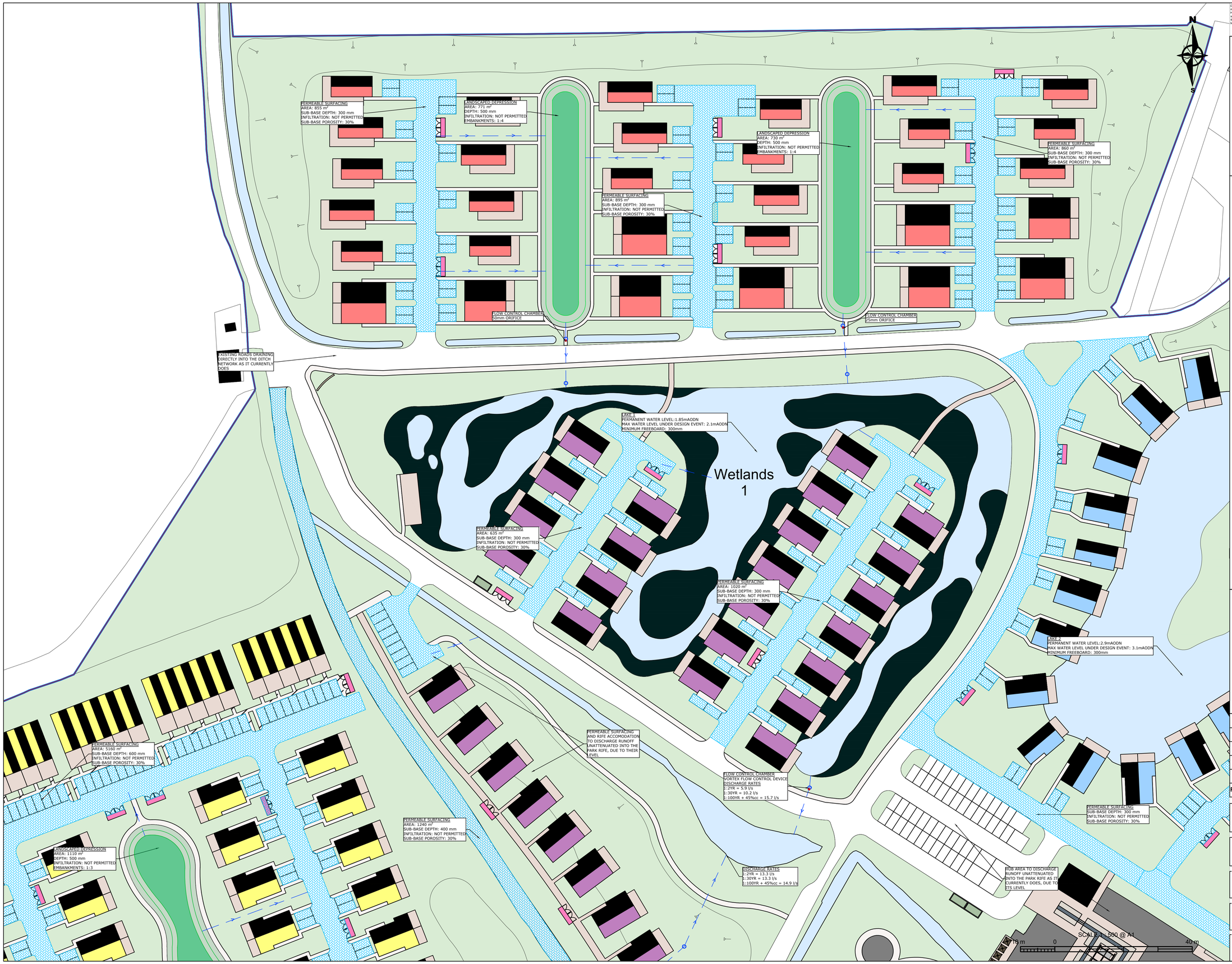

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KEY:

- SURFACE WATER DRAIN
- SURFACE WATER MANHOLE
- FLOW CONTROL DEVICE
- PERMEABLE SURFACING SYSTEM
- LANDSCAPED DEPRESSION
- SWALE

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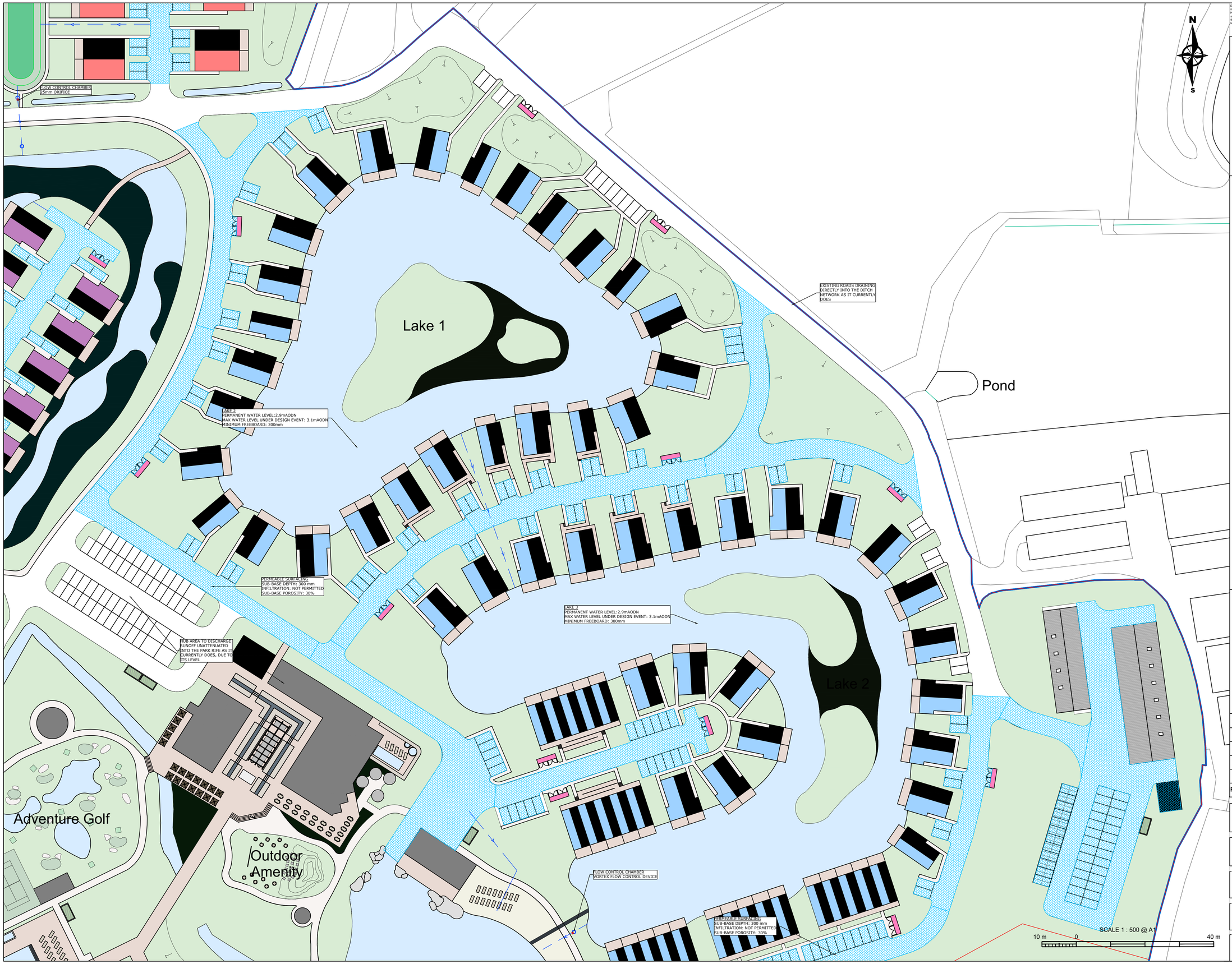
DWG TITLE: INDICATIVE SURFACE WATER DRAINAGE STRATEGY

DWG No.: HC-3341-501 SHEET 1



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DWG TITLE: INDICATIVE SURFACE WATER DRAINAGE STRATEGY

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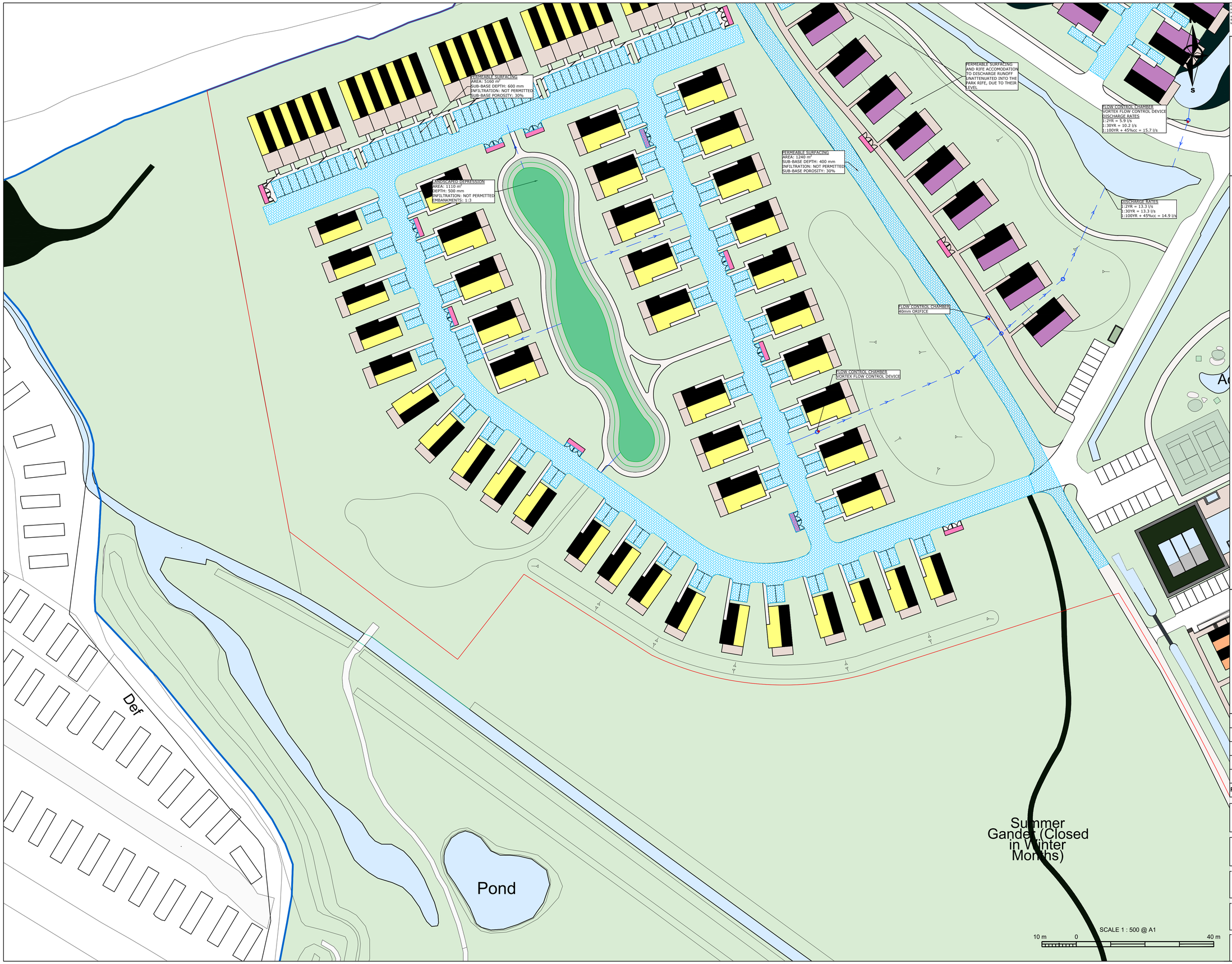

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DWG TITLE: INDICATIVE SURFACE WATER DRAINAGE STRATEGY

DWG No.: HC-3341-501 SHEET 3

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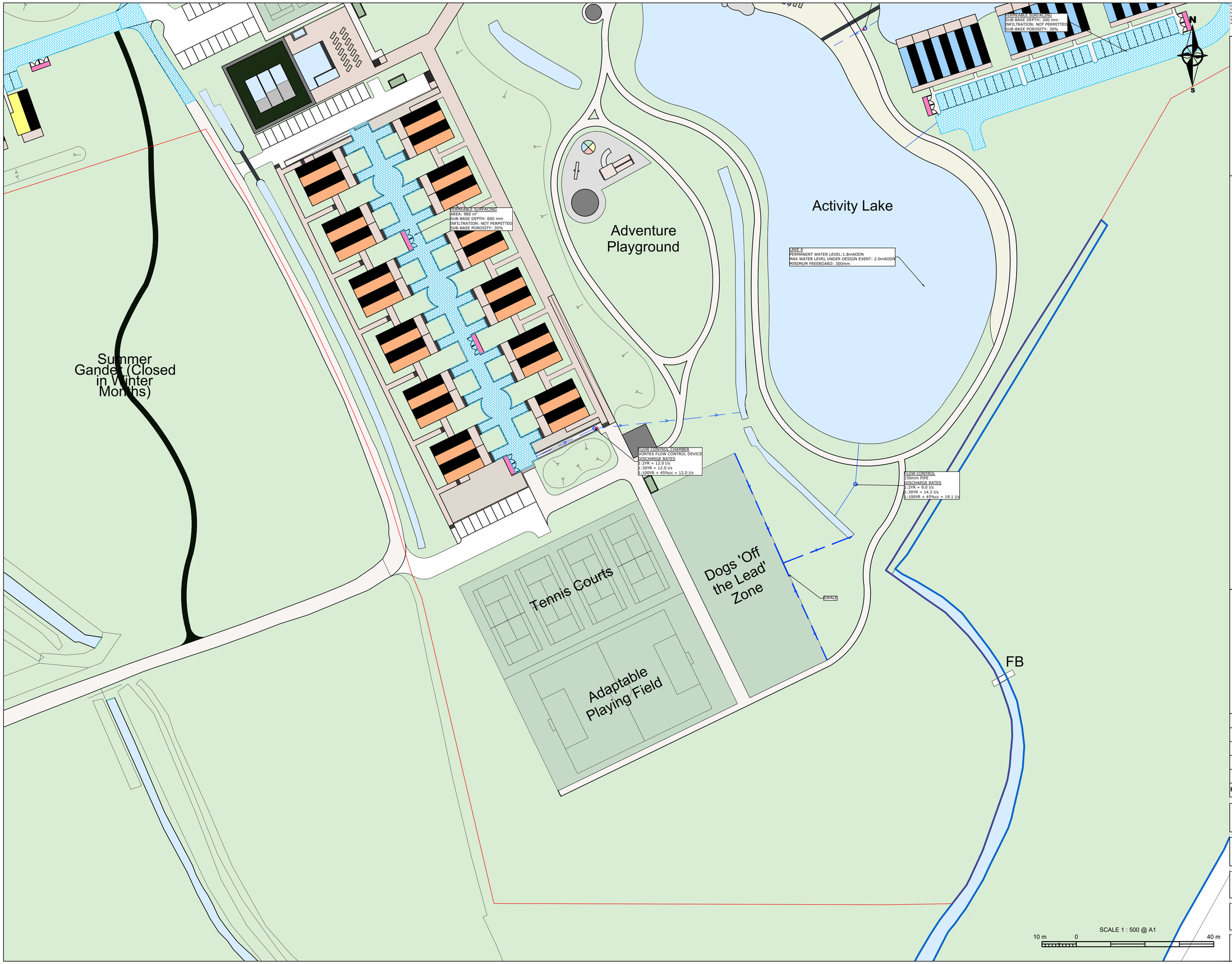

GENERAL NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS, ARCHITECTS AND SPECIALISTS DRAWINGS AND THE SPECIFICATION.
2. ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THE RELEVANT BRITISH STANDARDS, EUROPEAN NORMS, CODES OF PRACTICE AND BUILDING PRACTICE.
3. ALL DIMENSIONS ARE TO BE CHECKED BY THE CONTRACTOR PRIOR TO STARTING THE WORKS ON SITE. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
4. ALL DRAINAGE SYSTEMS WILL NEED TO BE INSTALLED AND DESIGNED FOR SUITABLE LOADING REQUIREMENTS.
5. THE CONTRACTOR SHALL OBTAIN PRIOR APPROVAL AND ALL NECESSARY LICENCES FROM THE THE HIGHWAY AUTHORITY AND/OR SEWERAGE UNDERTAKER BEFORE CARRYING OUT ANY WORKS.
6. THIS DRAWING WAS PRODUCED FOR USE IN CONJUNCTION WITH A PLANNING SUBMISSION AND SHOULD NOT BE USED FOR OTHER PURPOSES. A MORE DETAILED DESIGN INCLUDING PRODUCT SPECIFICATIONS WILL NEED TO BE PRODUCED PRIOR TO CONSTRUCTION.

KEY:

- SURFACE WATER DRAIN
- SURFACE WATER MANHOLE
- FLOW CONTROL DEVICE
- PERMEABLE SURFACING SYSTEM
- LANDSCAPED DEPRESSION
- SWALE

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Rev	Description	Author	Checked	Date
P1	Updated scheme	EC	SMB	11/08/23
P0	First issue	EC	SMB	15/06/23

CLIENT: Cove Communities

PROJECT: Medmerry Park, Stoney Lane Chichester

SCALE	PROJ REF	ORIGINATOR	CHECKED BY
1:500	3341	EC	SMB

HC DWG REF: 3341_DWG_r3

DWG TITLE: INDICATIVE DRAINAGE STRATEGY

DWG No.: HC-3341-501 SHEET 4

Appendix A.6 – Maintenance Schedules

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Operation and Maintenance Schedule – Wetlands / Large Ponds		
Maintenance Schedule	**Required Action**	**Typical Frequency**
Regular Maintenance and inspections	Remove litter and debris	Monthly (or as required following inspections)
	Cut grass – for public areas or in accordance with ecological guidance	Monthly (during growing season)
	Cut grass – meadow grass (if present)	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 waterbody for signs of poor water quality.	Monthly between May and October
	Inspect and determine silt accumulation rates within any forebay and within the main body of the wetland / pond area.	Half yearly
	Use silt accumulation rates to establish appropriate removal frequencies. Silt removed from the wetland / pond area should be tested for contamination and disposed of appropriately.	Half yearly (or after some build-up of silt is observed) to be adjusted based on siltation rate.
	Check the operation and condition of any mechanical devices e.g. penstock's, flow control devices etc,	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above the pond base; include max 25% of the pond surface)	Annually
	Remove 25% of bank vegetation from waters edge to a minimum of 1m above water level	Annually

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance and inspections	Tidy all dead growth (scrub clearance) before the start of the growing season (note tree maintenance is usually part of the overall landscape management contract).	Annually
	Remove sediment from any forebay	Every 1-5 years or as required based on sedimentation / siltation rates.
	Remove sediment and planting from one quadrant of the main body of ponds / wetland area (excludes forebay)	Every 5 years or as required based on sedimentation / siltation rates.
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional maintenance	Remove sediment from the main body of big ponds / wet areas when pool volume is reduced by 20%	As required. Note: with effective pre-treatment and maintenance (e.g., desilting of the forebay) this should only be required rarely e.g. every 25-50 years
Remedial Actions	Repair erosion or other damage	As required
	Replant where necessary (includes aquatic plants)	As required
	Aerate pond when signs of eutrophication are detected	As required
	Realign rip-rap and repair any other damage	As required
	Repair inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

General Operation and Maintenance Table for Wetlands / large ponds

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Operation and Maintenance Schedule – Rain Gardens / Bioretention Systems		
Maintenance Schedule	**Required Action**	**Typical Frequency**
Routine Inspection	Inspect infiltration surfaces for any silting or ponding and record the dewatering time of the raingarden or bioretention system. Look for any areas of standing water. Inspect any hidden elements of the drainage for the feature e.g. underdrains, overflows etc. If standing water or damage is discovered instigate remedial maintenance.	Quarterly inspections, system to be artificially filled with water or inspections to directly follow periods of heavy rainfall.
	Check operation of underdrains by inspection of flows after rainfall.	Annually
	Assess planting for disease infection poor growth invasive species etc. and replace as necessary.	Quarterly (more frequent inspection may be required depending on plants used and during growing season)
	Inspect inlets and outlets for blockage or damage to any scour protection	Quarterly, or whenever standing water is observed for significant periods of time following rainfall events.
Routine maintenance	Remove litter and surface debris. Weed area to remove nuisance plants.	Quarterly (or more frequently for tidiness and aesthetic reasons)
	Replace any plants to maintain planting density	As required, care should be taken to select replacement plants that are suitable for the soil substrate used within the bioretention system.
	Remove sediment, litter, and debris build-up from around any inlets, downpipes, and forebay.	Quarterly to biannually (adjust based on observed accumulation frequencies)
Occasional Maintenance and Remedial Actions	Infill any holes or scour in the filter medium, improve erosion protection if required.	As required following routine inspection or observations of damage / poor operation.
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch.	As required following routine inspection or observations of damage / poor operation.
	Remove and replace filter medium and vegetation above	As required following routine inspection however is unlikely to be required more frequently than every ~20 years.
	Replace scour protection if dislodged or damaged	As required following routine inspection or observations of damage / poor operation.

General Operation and Maintenance Table for Rain Gardens / Bioretention Systems

Note: Raingardens and bioretention systems are often designed in conjunction with site landscaping, as a result bespoke maintenance requirements are frequently required. Maintenance for any raingardens or bioretention systems should take into consideration any bespoke maintenance requirements that are specific to the final design.

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Operation and Maintenance Schedule – Pervious paving / surfacing		
Maintenance Schedule	**Required Action**	**Typical Frequency**
Regular Maintenance	Brushing and vacuuming (for driveways this can be a standard cosmetic sweep over whole surface).	At minimum once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – particular attention must be payed to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds or management using a suitable weed killer which will not adversely affect water quality. Weed killer should be applied directly into the weeds by an applicator rather than spraying.	As required – once per year on less frequently used pavements.
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving / surfacing.	As required when damage or erosion is detected following inspection. For block paving systems jointing material to be replaced shortly after installation and subsequently when required.
	Remedial work to any depressions. Rutting and cracked or broken blocks and replace lost jointing material (where block paving is used).	
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

General Maintenance Requirements for Permeable Surfacing (additional requirements may apply depending on type of surfacing material used).