Flood Risk Assessment & Drainage Strategy
For the Proposed Development of a
New Depot Site for Force One Limited,
On Land South of Whittlesey Road, March

Contents

Appendices

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Flood Risk Assessment & Drainage Strategy
For the Proposed Development of a
New Depot Site for Force One Limited,
On Land South of Whittlesey Road, March

1 Introduction

1.1 MTC Engineering (Cambridge) Limited have been asked to provide a Flood Risk Assessment and Drainage Strategy for the proposed development of a new depot for use by Force One Limited on the southern side of Whittlesey Road, March, on behalf of Force One Limited.

1.2 This Flood Risk Assessment and Drainage Strategy is based on the following information:-

1.2.1 Proposed Site layout supplied by Morton & Hall Consulting Limited;

1.2.2 Site Survey supplied by Morton & Hall Consulting;

1.2.3 Environment Agency Flood Data and consultation;

1.2.4 Fenland District Council Strategic Flood Risk Assessment;

1.2.5 Cambridgeshire County Council Surface Water Drainage Guidance for Developers (Updated November 2019);

1.2.6 Infiltration Testing undertaken by Force One Limited;

1.2.7 British Geological Survey information.

1.3 All the comments and opinions contained in this report including any conclusions are based on the information available to MTC Engineering (Cambridge) Ltd during our investigations. The conclusions drawn could therefore differ if the information is found to be inaccurate, incomplete or misleading. MTC Engineering (Cambridge) Ltd accept no liability should this prove to be the case, nor if additional information exists or becomes available with respect to this Site.

1.4 MTC Engineering (Cambridge) Ltd makes no representation whatsoever concerning the legal significance of its findings or any other matters referred to in the following report. Except as otherwise requested by the client, MTC Engineering (Cambridge) Ltd are not obliged and disclaim any obligation to update the report for events taking place after the Assessment was undertaken.

1.5 This report is a Flood Risk Assessment and Drainage Strategy of flooding and drainage issues associated with the proposed development. The information presented and conclusions drawn are based on statistical data and are for guidance purposes only. This report provides no guarantee against flooding of the study Site or elsewhere, nor as to the absolute accuracy of water levels, flow rates and associated probabilities quoted.

2 Site Description

2.1 The site is located on the southern side of Whittlesey Road, to the northeast of the Middle Level Commissioners office as shown on the site location plan provided in Appendix 1.

2.2 To the north the site is bound by Whittlesey Road, with open agricultural land located to the northwest of this, and an industrial yard to the northeast.

2.3 To the east the site is bound by a small commercial area consisting of several commercial buildings and associated access and parking areas, past which is Marina Drive, then several residential dwellings.

2.4 To the south the site is bound by the remainder of the agricultural field in which it is located, past which is Fox's Boat Yard and marina then the River Nene (Old Course) which runs in an easterly direction in the vicinity of the site.

2.5 To the west the site is bound by the access road to the Middle Level Commissioners offices and depot which are located to the southwest of the site, past which is an agricultural field.

2.6 The site itself is currently made up of an agricultural field, which has a general fall in a southeasterly direction from levels of between 0.5 and 0.8m above Ordnance Datum (AOD) or 100.5 to 100.8 metres Middle Level Datum (MLD) in the northwestern area to levels of between 0.7 and 0.8 metres below Ordnance Datum (99.3m and 99.2m MLD) in the southeast.

2.7 A couple of low spots/depressions are present at the site, the first being in the central northern part of the site with levels in this area tending to be around 0.3m below Ordnance Datum (99.7m MLD), and second low spot being in the northwestern corner of the site with levels of around 0.5m below Ordnance Datum (99.5m MLD).

2.8 Levels along the northern boundary then tend to bank up towards Whittlesey Road and the adjacent access which are at levels of between 0.65m and 1m AOD (100.65 and 101m MLD) in the vicinity of the site. A copy of the topographical site survey is provided in Appendix 2.

2.9 A couple of drains are present in the vicinity of the site, with the first of these being a riparian drain which runs in a westerly direction along the northern boundary of the site to the south of Whittlesey Road. The riparian drain generally runs as an open channel in the vicinity of the site, with the only culverted sections being as it passes under the former site access as a 300mm pipe approximately a quarter of the way along the northern boundary, and beneath the access road to Middle Level Commissioners as a 750mm diameter pipe.

2.10 The second drain present in the vicinity of the site is the March West and White Fen Internal Drain Board (IDB) Drain 39 which runs in a westerly direction along the northern side of Whittlesey Road, with this then turning to flow in a southerly direction where it then drains to the River Nene (Old course) via West Fen Pumping Station.

2.11 The nearest Middle Level Commissioners watercourse to the site is the River Nene (Old Course), which is located approximately 130m south of the site at its closest point, with the Twenty Foot River (drain) running in an easterly/northeasterly direction approximately 4.1km northwest of the site at its closest point.

2.12 The nearest Main River is the River Nene, which along with the eastern end of the Whittlesey Washes is located approximately 4.75km north of the site at its closest point. The ‘Dog in a Doublet’ sluice which is considered to represent the upstream end of the tidal stretch of the River Nene is located to the north of Whittlesey.

2.13 In addition to the watercourses detailed above there is a network of smaller private drains running through the surrounding fenland.

2.14 There are no further significant surface water features requiring detailed description in the vicinity of the site.

2.15 British Geological Survey Mapping indicates that the bedrock geology underlying the Site is the West Walton Formation and Ampthill Clay Formation, with a superficial geology of Tidal Flat Deposits present across the majority of the site.

2.16 Infiltration testing has been undertaken at the site with a copy of the trial pit logs provided in Appendix 3. Infiltration tests where repeated 3 times at the site, with the lowest infiltration rate recorded during testing being 0.008m/hr. The results are therefore above the rate of 0.0036m/hr specified by CIRIA as the minimum rate at which infiltration systems prove suitable for use.

2.17 In addition to the infiltration testing, a further deeper trial hole was excavated to approximately 2.5m below ground level. During the excavation of the trial hole some seepage of water occurred, this was not from the base of the trial hole however, but from above the clay layer. It is likely that this is as a result of the excavation of the trial hole, which would create a direct path for any shallow water in the topsoil above causing it to seep into the trial hole.

3 Sources of Potential Flood Risk

3.1 In accordance with The National Planning Policy Framework all forms of flood risk need to be considered in relation to any development.

3.2 The first form of flood risk to be considered in respect of The National Planning Policy Framework is fluvial flooding, whilst the second form of flood risk to be considered is flooding from the sea.

3.3 The River Nene is considered to be tidal downstream of the Dog in a Doublet sluice, which is adjacent to the B1040 crossing to the northwest of Whittlesey and thus upstream of the site. As such it is considered appropriate to consider both the fluvial and tidal flood risks arising from the River Nene and Whittlesey Washes together in this instance.

3.4 The Environment Agency's Flood Map for Planning (Appendix 4) shows the site and surrounding land to lie within defended Flood Zone 3, with the Strategic Flood Risk Assessment indicating a similar pattern of flooding.

3.5 The River Nene in this area is an embanked watercourse with tidal flood defences present, with the Whittlesey Washes being the area between the River Nene and Counter Drain which is designed to flood during times of high fluvial flow or tidal water levels. This defence system is maintained by the Environment Agency and provide a 1 in 150 year standard of defence against tidal events, along with offering protection against fluvial flood events to in excess of a 1 in 200 year return period.

3.6 The Environment Agency have recently carried out works to improve the southern bank of the Whittlesey Washes Flood Storage Reservoir and it is considered that the reservoir is well maintained hence the risk of overtopping or failure is considered to be low.

3.7 In the unlikely event that either a overtopping or breach of defences occurred during a flood event occurrence during a tidal flood event would represent a worst case scenario than a fluvial flooding event at the same level due to the greater volume of water available.

3.8 Environment Agency data indicates that the modelled 1 in 200 year tidal level at the Dog in a Doublet is 4.42 metres AOD. Considering a residential lifespan of 100 years and applying the recommended 'higher central' and 'upper end' allowances for sea level rise of 1.2m and 1.6m respectively supplied in Table 3 of the Flood Risk Assessment: Climate Change Allowances Guidance, by 2125 the 1 in 200 year level could potentially rise to 5.62m AOD and 6.02m AOD respectively.

3.9 In comparison, the 1 in 100 year fluvial flood level with allowance for climate change on the River Nene at the Dog in a Doublet Sluice is 4.13 metres AOD, whilst the 1 in 1000 year flood level with an allowance for climate change is 4.41 metres AOD, hence is below the present day 1 in 200 year modelled tidal flood level.

3.10 The primary focus of the assessment of flood risk to the site from the River Nene is therefore tidal flood risk as it is considered that this represents the greatest flood risk to the site from the River Nene, although fluvial flood risks from other non-tidal sources are also assessed later.

3.11 There are large areas of surrounding fenland at levels below Ordnance Datum between the site and the southern bank of the Whittlesey Washes, which is over 4.75km northwest of the site. A network of embanked roads cross this area, including most notably the A605, and provide significant raised obstructions to the flow of water, whilst the Twenty Foot River is also an embanked watercourse that would provide an obstruction to flow, with the overall effect of compartmentalising the surrounding fenland into a network of very large, separate storage areas.

3.12 During any overtopping or breach event the low lying Fenland in the cell adjacent to the overtopping would begin to fill first, with other cells of low lying fenland then

beginning to fill with flood water only once the water level in the first cell to be flooded reached a level at which it could begin flowing over embanked roads and into adjacent cells.

3.13 Overtopping would provide flood water at a lower rate than a breach, and it is not anticipated that a sufficient volume of water would be supplied to fill the cells of low lying fenland to the north of the A605 as would be required prior to water coming south across the A605 and towards the site.

3.14 In the event that a breach of defences was to occur then flood water could potentially be supplied at a much faster rate than in the event of an overtopping, thus there is a greater risk that water could come south of the A605 and also past the Twenty Foot River, creating a breach of this water course too.

3.15 However, even in these unlikely circumstances, there is a very large area of land at a lower level than the site to the north and east including White Moor and West Fen which would fill with water before the site experienced flooding, whilst the network of smaller drains in the area would distribute water to the lowest lying areas first.

3.16 As such the overall risk of flooding occurring at the site during a fluvial or tidal event in which the south bank of the Whittlesey Washes became overtopped or failed is therefore considered to be low.

3.17 Detailed Flood Risk Mapping provided by the Environment Agency is not available for the site in this instance. However it should be noted that correspondence has previously taken place with the Environment Agency with regards to the potential flood risk to land located to the north of the application site (thus closer to Whittlesey Washes), in which the Environment Agency confirmed that they do not consider this area of land to be at any significant risk of flooding from tidal sources or fluvial flooding from the Main Rivers for which the Environment Agency are responsible for assessing, and that the primary flood risk comes from Internal Drainage Board watercourses and Middle Level Commissioners systems in this instance as per the letter provided in Appendix 5.

3.18 As such it is not considered that there are any significant flood risk to the site associated with tidal sources or Mainer Rivers.

3.19 There are however other fluvial sources of flood risk with the first of these being from the Middle Level Commissioners High Level systems, the Old River Nene and Twenty Foot Drain.

3.20 These are embanked watercourses and considered to offer a standard of defence in excess of a 1 in 100 year event, with 0.5 metres freeboard given against design water levels for "hard" defences and 0.9 metres freeboard for "soft defences". Under normal circumstances the water level in the section of the Old Rive Nene to the south of the site is 0.50 metres below Ordnance Datum (99.50m MLD) although at times may rise slightly to 0.30 metres below Ordnance Datum (99.70m MLD), with the maximum in channel water level at the A141 Bridge being 0.82 metres AOD (100.82m MLD), during a 1 in 100 year event with allowance for climate change.

3.21 Given that there would be at least 0.5m freeboard provided against design water levels, it is considered that there would be sufficient capacity for additional flow during more extreme events, and it is not considered that water would come out of bank and onto the site under any circumstance. Further to this, as the watercourses are owned and maintained by Middle Level Commissioners, whose own offices are located directly adjacent to the Old River Nene and immediately west of the site, it is considered that a breach of these watercourses defences is very unlikely.

3.22 As such the risk of flooding to the site from any Middle Level Commissioners High Level System is considered to be low.

3.23 The final fluvial flood risk to the site comes from the network of smaller private watercourses and drains in the vicinity of the site, including the March West and White Fen IDB drain which runs along the northern side of Whittlesey Road in the vicinity of the site.

3.24 The March West and White Fen Drainage Board system generally maintains a standard of protection of 1 in 20 years and 1 in 100 years to agricultural and developed land respectively, however generally maintains a freeboard of 1.2 metres between design water levels and the lowest land levels, thus it is considered likely that the Board's system could accommodate a 1 in 100 year event although this is not proven.

3.25 As such the only significant risk to the site from these watercourses is considered to be in the event of a blockage occurring on one of the drains along the site boundaries. In any such event water may flow out of bank around the blockage, causing some limited overland flow and pooling of water on the site before flows entered the drain again downstream of the blockage, however drains in the vicinity of the site are well maintained, thus the risk of blockage is considered to be low.

3.26 There are no further significant fluvial flood risks to the site and the overall fluvial flood risk to the site is considered to be low.

3.27 The third form of flood risk to be considered in respect of The National Planning Policy Framework is flooding from land.

3.28 Intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems can quickly run off land and result in local flooding. In developed areas, this flood water can be polluted with domestic sewage with foul sewer surcharge and overflow. Local topography and built form can have a strong influence on the direction and depth of flow. The design of development down to a micro level can influence or exacerbate this. Overland flow paths need to be taken into account in development to minimise the risk of flooding from overland flow.

3.29 Any overland flows coming towards the site from the higher land to the north/northeast would be picked up by drains on either side of Whittlesey Road whilst due to ground levels it is not considered that flows could come towards the site from any other direction.

3.30 The overall flood risk to the site from overland flows coming onto the site is therefore considered to be low.

3.31 The only remaining overland flow/surface water flood risk involves the potential for some ponding to occur from rainfall landing on the site itself which could pond in low points.

3.32 As the only water that could pond on the site in such circumstances would be water initially landing on the site the volume available would be low, and Environment Agency mapping indicates that even in a 1 in 1000 year event the vast majority of any ponding is predicted to remain less than 300mm deep.

3.33 It is not considered that this would have any significant impact upon the site, the majority of which mapping indicates would remain dry event during a 1 in 1000 year rainfall event, particularly as a surface water drainage system will be added as part of the development, and the overall risk of the site flooding from surface water is considered to be low.

3.34 The fourth form of flood risk to be considered in accordance with The National Planning Policy Framework is flooding from rising groundwater.

3.35 Groundwater flooding occurs when water levels in the ground rise above surface elevations. It is most likely to occur in low lying areas underlain by permeable rocks (aquifers). These may be extensive, regional aquifers, such as chalk or sandstone, or may be localised sands and river gravels in valley bottoms underlain by less permeable rocks. 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.

3.36 During the infiltration testing carried out, a further deeper trial hole was excavated to approximately 2.5m below ground level. During the excavation of the trial hole some seepage of water occurred, however this was not from the base of the trial hole, but

from above the clay layer. It is likely that this is as a result of the excavation of the trial hole, which would create a direct path for any shallow water that may percolate through the topsoil above causing it to seep into the trial hole rather than from the presence of a groundwater table.

3.37 Whilst even if any groundwater were present any outflow would be directly to the adjacent drains rather than via spring lines developing on the site.

3.38 As such the risk of flooding occurring at the site due to rising groundwater levels is considered to be low.

3.39 The fifth form of flood risk to be considered in accordance with the National Planning Policy Framework is the risk of flooding from blocked, overloaded, or burst sewers and water mains.

3.40 Should a sewer or water main block, burst or become overloaded on Whittlesey Road any flow coming south towards the site would be picked up by the drain along the northern boundary of the site and channeled in a westerly direction away from the site without having any significant impact upon the site.

3.41 The risk of flooding occurring at the site due to blocked, overloaded, or burst sewer or water mains is therefore considered to be low.

3.42 The last form of flood risk to be considered in accordance with the National Planning Policy Framework is flooding from reservoirs, canals or other artificial sources.

3.43 The only significant source of flood risk to the site which may be considered an artificial source of flood risk is the Whittlesey Washes which have already been assessed in detail earlier in relation to fluvial and tidal flood risk.

3.44 There are four balancing ponds located within the West Fen Pumping Station catchment to the east of the A141, however should these fail it is anticipated that flows would be restricted beneath the A141 and would not pose a significant risk to the site.

3.45 The overall flood risk to the site from artificial sources is considered to be low.

4 The Proposal

4.1 The proposal involves the development of a new depot with office and training facilities, yard and landscaping areas on land south of Whittlesey Road, March as shown on the site layout provided in Appendix 6.

4.2 As detailed in Section 3 it is not considered that the site is at a significant risk of flooding by any means. As such no specific flood related measures such as minimum floor levels are required in this instance.

4.3 External levels around the units will however be designed to ensure that overland flows will not be directed towards or enter any buildings under any circumstances, and floor levels of the office and training rooms which are the most vulnerable parts of the development will be set as high as is reasonably practicable.

4.4 Drainage areas based upon the layout are shown on the drainage plan provided in Appendix 7 and are as follows:

- Unit roof areas: Approximately 2,295m^2
- Main access road area: Approximately 2,185m^2
- Lorry yard area: Approximately 4,000m^2
- Car Parking areas: Approximately 2,010m^2

4.5 The main flood risk issue at this site is in fact ensuring that the above areas do not increase the off-site risk of flooding, therefore to deal with surface water runoff from these areas the Surface Water Drainage Strategy detailed in Section 5 has been developed in compliance with current relevant local and national guidance.

5 Sustainable Drainage Strategy

5.1 Point of Discharge

5.1.1 In line with the surface water run off hierarchy, the preferable means of disposal for surface water is via infiltration or re-use.

5.1.2 Infiltration testing has been undertaken at the site as detailed in Appendix 3, with the lowest infiltration rate recorded during testing being 0.008m/hr.

5.1.3 The result are above the rate of 0.0036m/hr specified by CIRIA as the minimum rate at which infiltration systems may prove suitable for use.

5.1.4 Infiltration systems will therefore be used to drain all new impermeable areas to be created at the proposed development.

5.2 Proposed SuDS Systems and Infiltration Calculations

5.2.1 Living/green roof systems are a preferred SuDS technique, as they are not just a flood reduction measure but also reduce pollution through filtration and provide a landscape and wildlife benefit. The design of building structures, which will have a lightweight roof systems, will however mean that a green roof cannot be provided in this instance for structural reasons.

5.2.2 Water re-use systems such as water butts are a preferred drainage system as they reduce the demand upon potable water. As such the inclusion of such systems will be considered further at the detailed design phase, and such systems may be provided at the site. Attenuation provided in such systems will however not be counted towards that required to accommodate the design rainfall event prior to infiltration as the systems may already be full at the time rainfall event occurs.

5.2.3 Permeable paving is a SuDS technique that is appropriate to use at most developments, and provides both a flood reduction benefit due to the attenuation provided in the base

and a pollution reduction benefit due to the filtration of water as it passes through the permeable surfacing.

5.2.4 Permeable paving will therefore be used on all car parking areas proposed at the development as shown on the drainage layout provided in Appendix 8. The proposed access road and yard areas will be impermeably surfaced; however the yard areas will be underlain by a Type 3 sub-base in order to permit infiltration whilst also providing attenuation, thus effectively acting as permeably paved area.

5.2.5 Surface water discharge from the proposed building roof areas (2,295m^2) and approximately 990m^2 of the impermeably surfaced access road will discharge to the sub-base of the proposed car parking and yard areas (6,010m^2) as shown on the drainage layout provided in Appendix 8.

5.2.6 Micro Drainage calculations (Appendix 9) based upon the lowest infiltration rate recorded during testing of 0.008m/hr show that an attenuation volume of 496.8m^3 is required to sufficiently drain the impermeable area of 0.929Ha associated with the proposed roof, access, yard and parking area during a 1 in 100 year plus 40% climate change rainfall event whilst infiltration takes place.

5.2.7 The proposed car parking areas (2,010m^2) will have a sub-base thickness of 300mm whilst the proposed yard areas (4,000m^2) will have a sub-base thickness of 450mm (which is similar to that required for structural reasons) thus based upon both areas having a void space 30% these areas would provide a total attenuation volume of 720.9m^3, thus significantly exceeding that required.

5.2.8 Basins and ponds are considered a preferred SuDS feature as they provide both a flood and pollution reduction measure whilst also giving rise to a landscape/wildlife benefit.

5.2.9 Two infiltration basins will therefore be provided at the proposed development, as shown on the drainage layout (Appendix 8). These will be landscaped features allowing pollution treatment to take place via settlement and adsorbtion, whilst also providing an attenuation whilst infiltration takes place.

5.2.10 The first of these (Infiltration Basin 1) will be located in the area of open space in the northwestern part of the site and will provide attenuation for surface water runoff from the first 545m^2 of access road. Micro Drainage calculation (Appendix 10) based upon the lowest infiltration rate recorded during testing of 0.008m/hr show that an attenuation volume of 33.7m^3 is required to sufficiently drain a 1 in 100 year plus 40% climate change rainfall event from the 545m^2 access road via the infiltration basin.

5.2.11 Based upon a base area of 120m^2 and side slopes of 1 in 3 to a design depth of 0.5m Infiltration Basin 1 will provide an attenuation volume of approximately 77.5m^3, thus in excess of that required to sufficiently attenuate surface water discharge from the 545m^2 access during a 1 in 100 year plus 40% climate change event whilst infiltration takes place.

5.2.12 The second infiltration basin (Infiltration Basin 2) will be located in the central western part of the site, will provide attenuation for surface water runoff from approximately 650m^2 access road.

5.2.13 Micro Drainage calculation (Appendix 11) based upon the same infiltration rate show that an attenuation volume of 40.8m^3 is required to sufficiently drain the area of 0.065Ha during a 1 in 100 year plus 40% climate change rainfall event whilst infiltration takes place.

5.2.14 Based upon a base area of 80m^2 and side slopes of 1 in 3 to a design depth of 0.5m Infiltration Basin 2 will provide an attenuation volume of approximately 56m^3, thus exceeding that required to sufficiently attenuate surface water discharge from the impermeable area of 650m^2 during a 1 in 100 year plus 40% climate change event whilst infiltration takes place.

5.3 SuDS Treatment Stages

5.3.1 All surface water will receive an appropriate level of treatment in line with requirements prior to discharge.

5.3.2 Drainage from all access and parking areas, which are considered to be lightly trafficked areas, will initially be though the permeable paving which provides a filtration system, removing pollutants such as hydrocarbons from discharge.

5.3.3 A second treatment stage will be then be provided by filtration through the membrane (such as Terram) in which the base of the permeably paved areas will be wrapped, removing further pollutants from discharge and ensuring that surface water from these areas is suitably treated in line with requirements prior to discharge.

5.3.4 Surface water from the roofs is considered clean discharge and will be directly to the base of the permeably paved areas, with one treatment stage provided as water is filtered through the membrane such as Terram in which the storage blanket will be wrapped.

5.3.5 Discharge from the main access and yard which will be impermeably surfaced will initially be through conventional drainage systems incorporating features such as smart sponges located within gullies or trapped gullies absorbing pollutants such as hydrocarbons and oils prior to discharge.

5.3.6 Surface water from the access and yard area discharging to the sub-base beneath will then receive a second treatment stage via filtration through the membrane (such as Terram) in which the sub-base of the permeably paved areas will be wrapped, removing further pollutants from discharge.

5.3.7 Surface water from the access discharging to the infiltration basin will receive a second treatment stage via the infiltration basin which will provide an area in which settlement and adsorbtion can take place prior to discharge.

5.3.8 Appropriate treatment will therefore be provided to all surface water discharge from the proposed development.

5.4 Future Maintenance of SuDS Systems

5.4.1 Responsibilities of the various aspects of the proposed surface water drainage system to be provided at the development are detailed within the maintenance plan provided in Appendix 12.

5.5 The final detailed design will only take place once planning permission has been granted and will be based upon this Sustainable Drainage Strategy with the design to accommodate all rainfall during a 1 in 100 year plus 40% climate change rainfall event whilst infiltration takes place. It has been clearly demonstrated that the proposed development can be drained in accordance with all national and local requirements, and no further surface water drainage information is required at the current stage.

6 Assessment

6.1 The proposal involves the development of a new depot with office facilities, yard and landscaping areas on land south of Whittlesey Road, March.

6.2 Under Table 2 of the Technical Guidance to the National Planning Policy Framework the proposed development is classified as “less vulnerable” development, which is appropriate in Flood Zones 1, 2, and 3a without the need to pass the Exception Test, however a Sequential Test may be required.

6.3 The Sequential Test is a planning rather than technical flood risk issue for which the Local Planning Authority, rather than the Environment Agency or Lead Local Flood Authority are responsible for. Information relating to the Sequential Test is therefore not provided as part of this Flood Risk Assessment which deals with technical flood risk issues only, with separate information to be submitted to the Local Planning Authority in relation to the Sequential Test as necessary.

6.4 All sources of potential flood risk to the proposed site have been considered in Section 3, and it is not considered that the site is at a significant risk of flooding by any means with no specific flood related measures such as the setting of minimum floor levels required.

6.5 However to ensure that the proposed units are sufficiently protected against any flooding external levels will be designed to ensure that surface water is not channeled towards or into buildings under any circumstances. The floor levels of the office and training room section of the development will also be set as high as is reasonably practicable.

6.6 The underlying geology is suitable for the use of infiltration systems at the site and therefore surface water discharge will be via infiltration.

6.7 The estimated attenuation volumes required to sufficiently attenuate surface water discharge during a 1 in 100 year plus 40% climate change event whilst infiltration takes place will provided through a range of SuDS systems including infiltration basins and permeable paving as detailed in Section 5.

6.8 Further details are provided within the Drainage Strategy submitted in support of the application, which fully details how the proposed development will comply with all local and national surface water drainage requirements.

6.9 Further details of the surface water drainage system will only take place once conditional planning approval has been granted. The final design will however be based upon this drainage strategy and designed to accommodate all rainfall during a 1 in 100 year plus 40% climate change event with discharge being made via infiltration. It has been clearly demonstrated that the proposed development can be drained in accordance with all national and local requirements.

7 Conclusion

7.1 The proposal involves the development of a new depot with office facilities, yard and landscaping areas on land south of Whittlesey Road, March.

7.2 It is not considered that the site is at a significant risk of flooding by any means, and no specific flood resistant or resilient construction methods are not required in this instance.

7.3 External levels will however be designed to ensure that flow paths will not cause water to enter any buildings under any circumstances, and the floor levels of the offices and training parts of the development will be set as high as is reasonably practicable.

7.4 Infiltration testing has been undertaken at the site, with the lowest infiltration rate obtained being 0.008m/hr, which is above the minimum acceptable rate of 0.0036m/hr, and it is considered that infiltration systems will provide a viable means of draining all surface water.

7.5 Surface water drainage from all new development areas at the site will be to infiltration either via the sub-base of the yard and parking areas, or via the two infiltration basins to be provided at the site, all of which will be designed to provide sufficient capacity during all events upto and including a 1 in 100 year plus 40% climate change event whilst infiltration takes place.

7.6 Supporting calculations have been provided to demonstrate that infiltration systems will accommodate a 1 in 100 year plus 40% climate change rainfall event. Information demonstrating that all relevant local and national requirements relating to surface water drainage are met has also been provided.

7.7 This will ensure that there is no adverse impact upon the flood risk to the surrounding area.

7.8 Adequate treatment will be provided to all surface water prior to discharge to the ground.

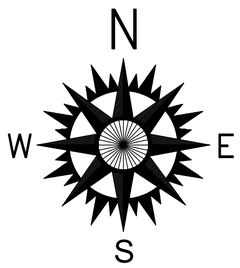
7.9 Maintenance of all drainage systems will be the responsibility of the site owner.

7.10 Full detailed drainage design will take place once conditional planning approval has been granted.

7.11 There are no flood risk or drainage related grounds under The National Planning Policy Framework on which to object to the proposed development of on land south of Whittlesey Road, March.

APPENDIX 1

SITE LOCATION PLAN



LOCATION PLAN
(1:1250)
LICENCE NUMBER 100022432

Please read, if in doubt ask. Change nothing without consulting the Engineers.

Contractor to check all dimensions on site before work starts or materials are ordered. If in doubt ask. All dimensions are in mm unless stated otherwise.

Where materials, products and workmanship are not fully specified they are to be of the standard appropriate to the works and suitable for the purpose stated in or reasonably to be inferred from the drawings and specification. All work to be in accordance with good building practice and BS 8000 to the extent that the recommendations define the quality of the finished work. Materials products and workmanship to comply with all British Standards and EOTA standards with, where appropriate, BS or EC marks.

All products and materials to be handled, stored, prepared and used or fixed in accordance with the manufacturers current recommendations.

The contractor is to arrange inspections of the works by the BCO (or NHBC) as required by the Building Regulations and is to obtain completion certificate and forward to the Engineer

LEGEND

APPLICATION SITE

LAND OWNED BY APPLICANT

	REVISIONS	DATE

MORTON & HALL CONSULTING LIMITED

1 Gordon Avenue,
March,
Cambridgeshire.
PE15 8AJ

Tel: 01354 655454
Fax: 01354 660467
E-mail: info@mortonandhall.co.uk
Website: www.mortonconsultingengineers.co.uk

Fenland District Council Building Design Awards
Building Excellence in Fenland

CLIENT
Force One Ltd

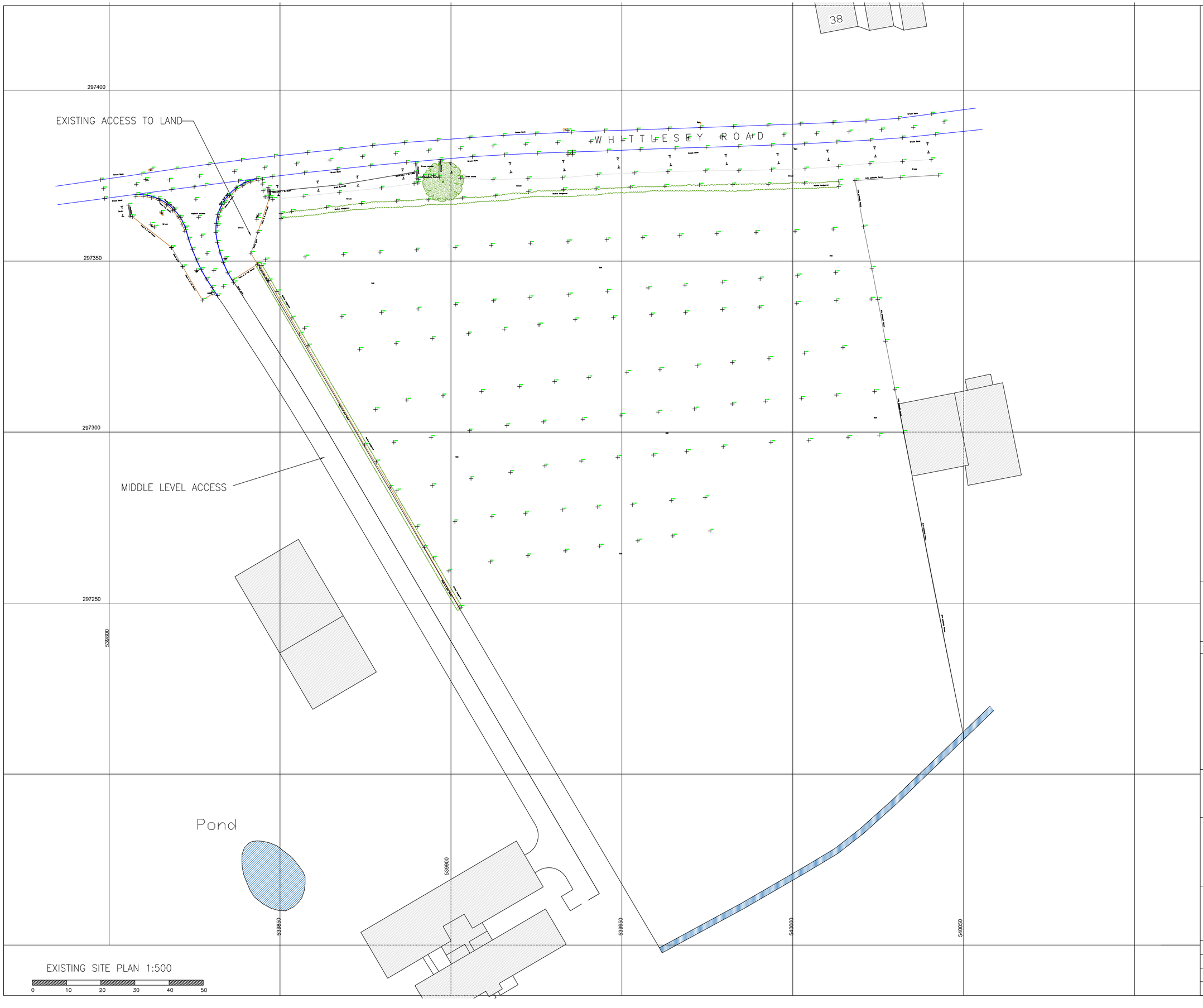
PROJECT
Land North East of
Middle Level Commissioners
Whittlesey Road
March
PE15 0AH

TITLE
Location Plan

DRAWN	MH	DATE OF ISSUE	
CHECKED			
DATE	March 2021	DRAWING NUMBER	H6537/02
SCALE	AS SHOWN		

APPENDIX 2

TOPOGRAPHICAL SURVEY



EXISTING SITE PLAN 1:500

0 10 20 30 40 50

Please read, if in doubt ask. Change nothing without consulting the Engineers.

Contractor to check all dimensions on site before work starts or materials are ordered. If in doubt ask. All dimensions are in mm unless stated otherwise.

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N
W E
S

LEGEND

APPLICATION SITE

LAND OWNED BY APPLICANT

REVISIONS	DATE

MORTON & HALL CONSULTING LIMITED

1 Gordon Avenue,
March,
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PE15 8AJ

Tel: 01354 655454
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LABC BUILDING EXCELLENCE AWARDS winner

Fenland District Council Building Design Awards Building Excellence in Fenland

CLIENT
Force One Ltd

PROJECT
Land North East of
Middle Level Commissioners
Whittlesey Road
March
PE15 0AH

TITLE
Existing Site Plan/
Topographical Survey

DRAWN	MH	DATE OF ISSUE	
CHECKED			
DATE	March 2021	DRAWING NUMBER	H6537/01
SCALE	AS SHOWN		

APPENDIX 3

INFILTRATION TEST RESULTS

Shavonne Cooper

From: Declan Burke <Declan@forceoneltd.co.uk>
Sent: 13 April 2021 11:49
To: Shavonne Cooper
Cc: Office
Subject: RE: H6537 - Whittlesey Road March Cambs

Good Morning,

Sorry about the delay in coming back to you, my MD who was on site when carrying out the excavations was on leave.

He has given me the following dimensions at the bottom of the excavation.

1.2l x 0.6w x 1.3d. He has said that defiantly 500l of water was added. We do not have an exact measurement of how deep the water was when the test begun but hopefully you can determine this from the dimensions given.

Kind Regards

Declan Burke

From: Shavonne Cooper <scooper@mtcengineering.co.uk>
Sent: 07 April 2021 09:39
To: Declan Burke <Declan@forceoneltd.co.uk>
Cc: Office <office@mtcengineering.co.uk>
Subject: RE: H6537 - Whittlesey Road March Cambs

Good morning Declan,

Thanks for coming back.

I will need the dimensions of the trial hole to calculate the infiltration rates accurately, please could you advise on what these where in the part of the trial hole where the test were undertaken?

The dimensions are needed to determine/calculate the starting water level and are also required for calculating the actual infiltration rate itself.

Kind Regards

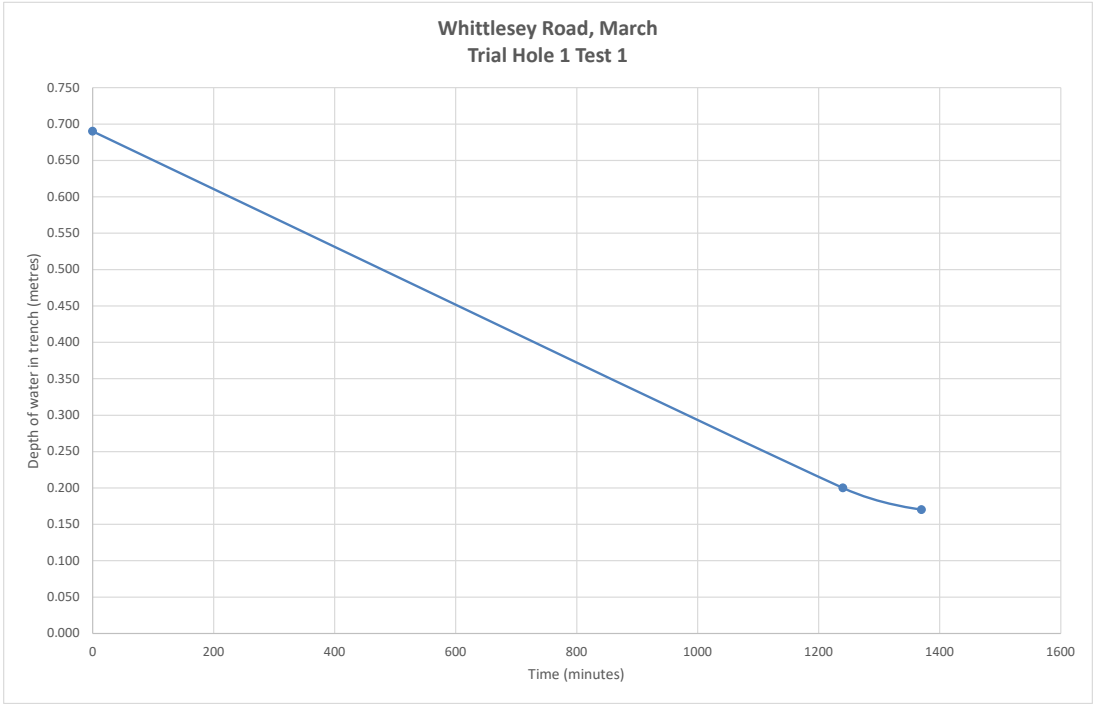
Shavonne Cooper

For and on behalf of
MTC Engineering (Cambridge) Ltd.

Whittlesey Road, March

Time (min)	Depth to Water (m)	Depth of Water (m)
0	0.00	0.690
1240	0.49	0.200
1370	0.52	0.170

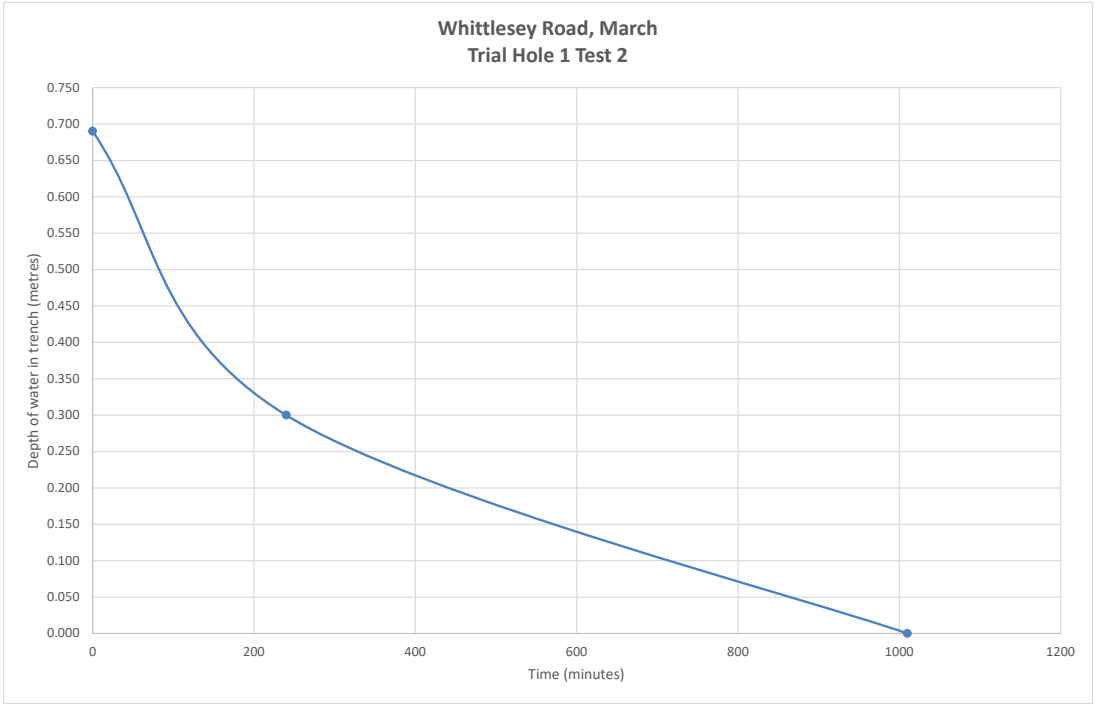
Pit Dimensions (m)	
Pit Length	1.2
Pit Width	0.6
Pit Depth	1.3
Pipe Length	1.2
Void Space	100%
Depths (m)	
D75	0.5175
D25	0.1725
D50	0.345
Times (minutes)	
T75	436.5306
T25	1359.1667
Volumes, Areas and Times	
Vp75-25	0.2484
Ap50	1.962
Tp75-25	922.6360544
q (m/minute)	0.00014
q (mm/hour)	8.2
q (m/sec)	2.28703E-06
q(m/hr)	0.00823329



Whittlesey Road, March

Time (min)	Depth to Water (m)	Depth of Water (m)
0	0.00	0.690
240	0.39	0.300
1010	0.69	0.000

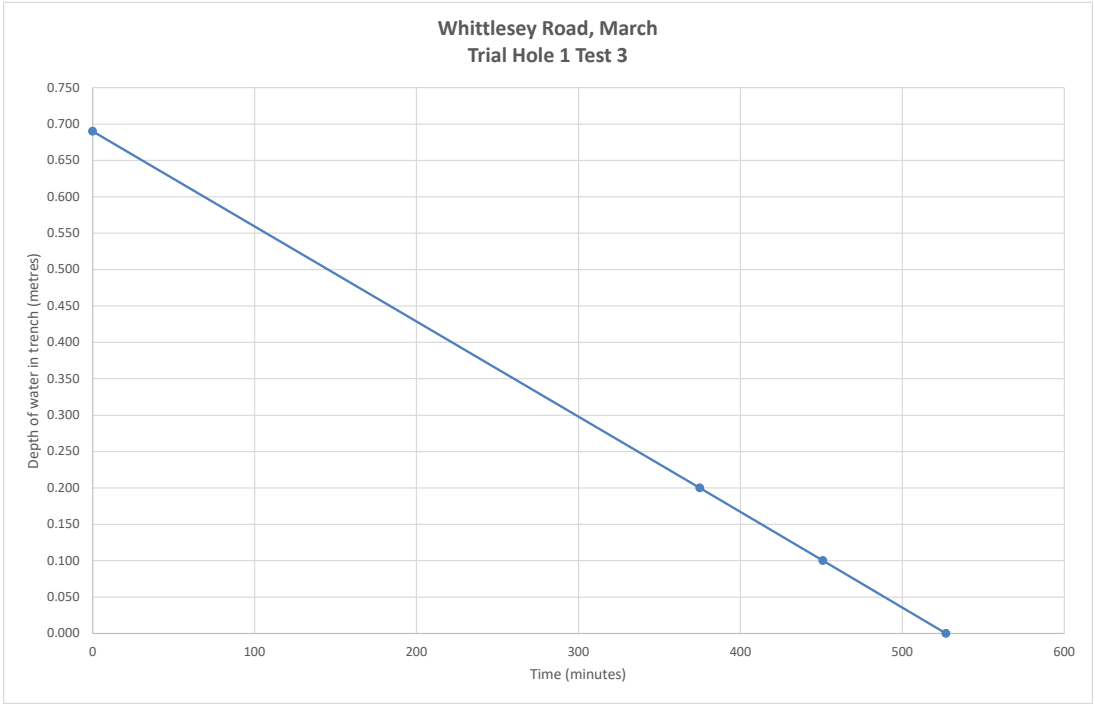
Pit Dimensions (m)	
Pit Length	1.2
Pit Width	0.6
Pit Depth	1.3
Pipe Length	1.2
Void Space	100%
Depths (m)	
D75	0.5175
D25	0.1725
D50	0.345
Times (minutes)	
T75	106.1538
T25	567.2500
Volumes, Areas and Times	
Vp75-25	0.2484
Ap50	1.962
Tp75-25	461.0961538
q (m/minute)	0.00027
q (mm/hour)	16.5
q (m/sec)	4.57625E-06
q(m/hr)	0.016474504



Whittlesey Road, March

Time (min)	Depth to Water (m)	Depth of Water (m)
0	0.00	0.690
375	0.49	0.200
451	0.59	0.100
527	0.69	0.000

Pit Dimensions (m)	
Pit Length	1.2
Pit Width	0.6
Pit Depth	1.3
Pipe Length	1.2
Void Space	100%
Depths (m)	
D75	0.5175
D25	0.1725
D50	0.345
Times (minutes)	
T75	132.0153
T25	395.9000
Volumes, Areas and Times	
Vp75-25	0.2484
Ap50	1.962
Tp75-25	263.8846939
q (m/minute)	0.00048
q (mm/hour)	28.8
q (m/sec)	7.99626E-06
q(m/hr)	0.028786551



APPENDIX 4

ENVIRONMENT AGENCY FLOOD MAP FOR PLANNING

Flood map for planning

Your reference	Location (easting/northing)	Created
2638	**539940/297340**	**10 May 2021 13:55**

Your selected location is in flood zone 3 – an area with a high probability of flooding that benefits from flood defences.

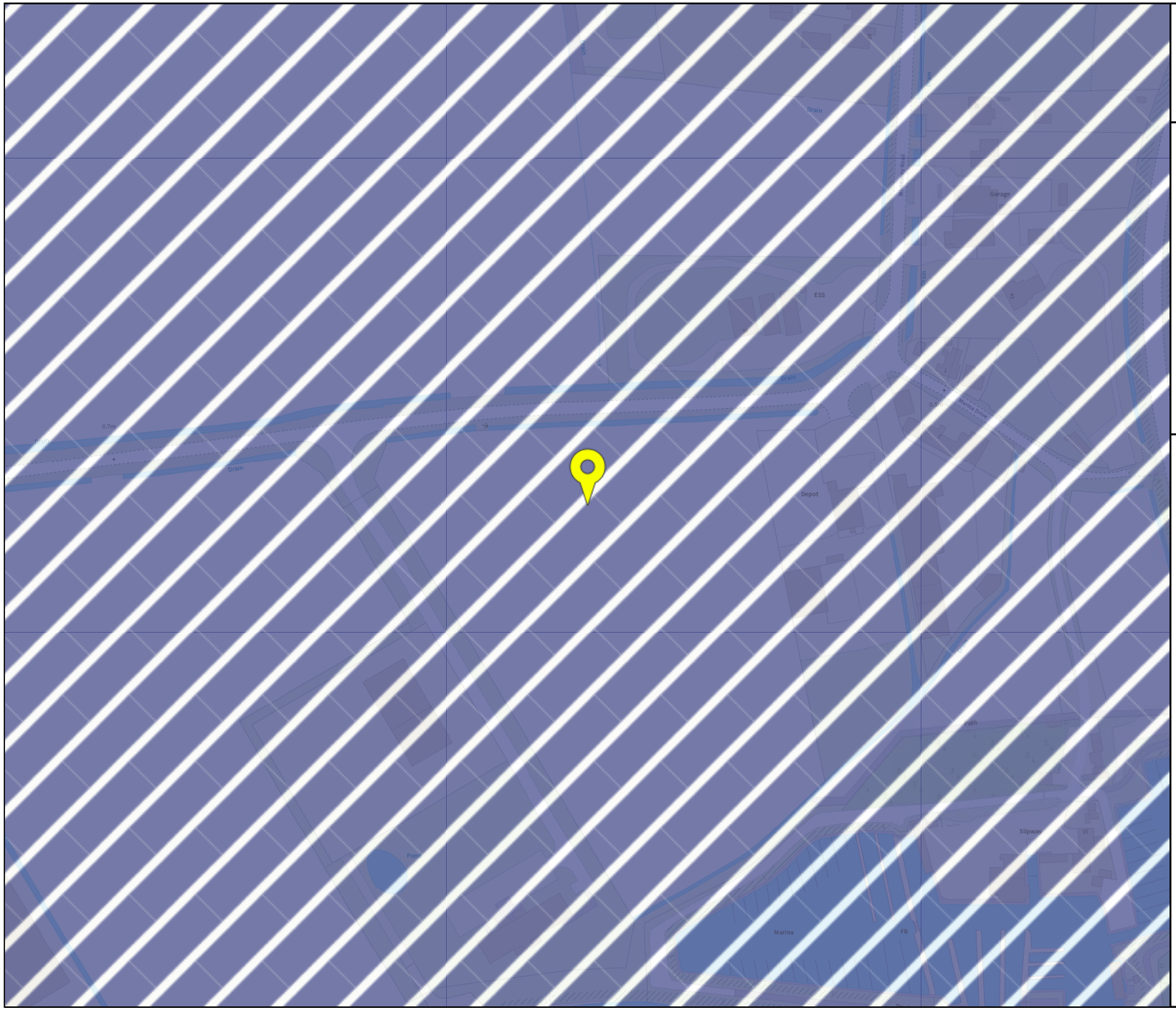
This means:

- you may need to complete a flood risk assessment for development in this area
- you should ask the Environment Agency about the level of flood protection at your location and request a Flood Defence Breach Hazard Map (You can email the Environment Agency at: enquiries@environment-agency.gov.uk)
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (find out more at www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.



Environment Agency

Flood map for planning

Your reference
2638

Location (easting/northing)
539940/297340

Scale
1:2500

Created
10 May 2021 13:55

- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m

APPENDIX 5

ENVIRONMENT AGENCY CORRESPONDENCE

Mr Mike Brindley
MTC Engineering
24 High Street
Whittlesford
CAMBRIDGE
CB22 4LT

Our ref: AC/2017/125484/01-L01
Your ref: F/YR15/0640/F

Date: 16 February 2017

Dear Mr Brindley

Enquiry re finished floor levels: F/YR15/0640/F (Hybrid application: full planning permission for the erection of five retail units (class a1), 2 x drive-thru restaurants/coffee shops (class a3/a5), associated parking, access, street furniture, balancing pond, pumping station, electricity sub-station and associated works and outline planning permission for a further 3 x retail units (class a1) with siting and access to be determined and all other matters reserved). Land South Of St Mary's View Wisbech Road March Cambridgeshire

Thank you for your email received 26th January 2017.

We have reviewed the submitted Flood Risk Assessment (FRA) for the proposed development at St Mary's View, Wisbech Road, March.

We confirm that we consider the main source of flood risk at this site is associated with watercourses under the jurisdiction of the Internal Drainage Board (IDB). As such, we have no objection to the proposed development on flood risk grounds. However, the IDB should be consulted with regard to flood risk associated with watercourses under their jurisdiction and surface water drainage proposals.

As the site is located within an area considered to be at risk of flooding, we recommend that flood resilience measures are incorporated into the design of the development. For more information on flood resilience techniques, please see the Department for Communities and Local Government (DCLG) guidance document "Improving the Flood Performance of New Buildings – Flood Resilient Construction, 2007", which is available on the following website: https://www.gov.uk/government/publications/flood-resilient-construction-of-new-buildings

If you would like to discuss this matter further please contact our flood risk advisor Natalie Bridgman - 020 302 51902

Yours sincerely

Mrs Emily Davies
Sustainable Places Planning Advisor

Dial 02084745242
E-mail planning_liaison.anglian_central@environment-agency.gov.uk

APPENDIX 6

SITE LAYOUT

A	ROAD ACCESS AMENDED	MAY 21
	REVISIONS	DATE

MORTON & HALL CONSULTING LIMITED

1 Gordon Avenue,
March,
Cambridgeshire.
PE15 8AJ

Tel: 01354 655454
Fax: 01354 660467
E-mail: info@mortonandhall.co.uk
Website: www.mortonconsultingengineers.co.uk

LABC east anglia — LABC BUILDING EXCELLENCE AWARDS winner

Fenland District Council Building Design Awards — Building Excellence in Fenland — CATEGORY WINNER 2009 & 2011

CLIENT
Force One Ltd

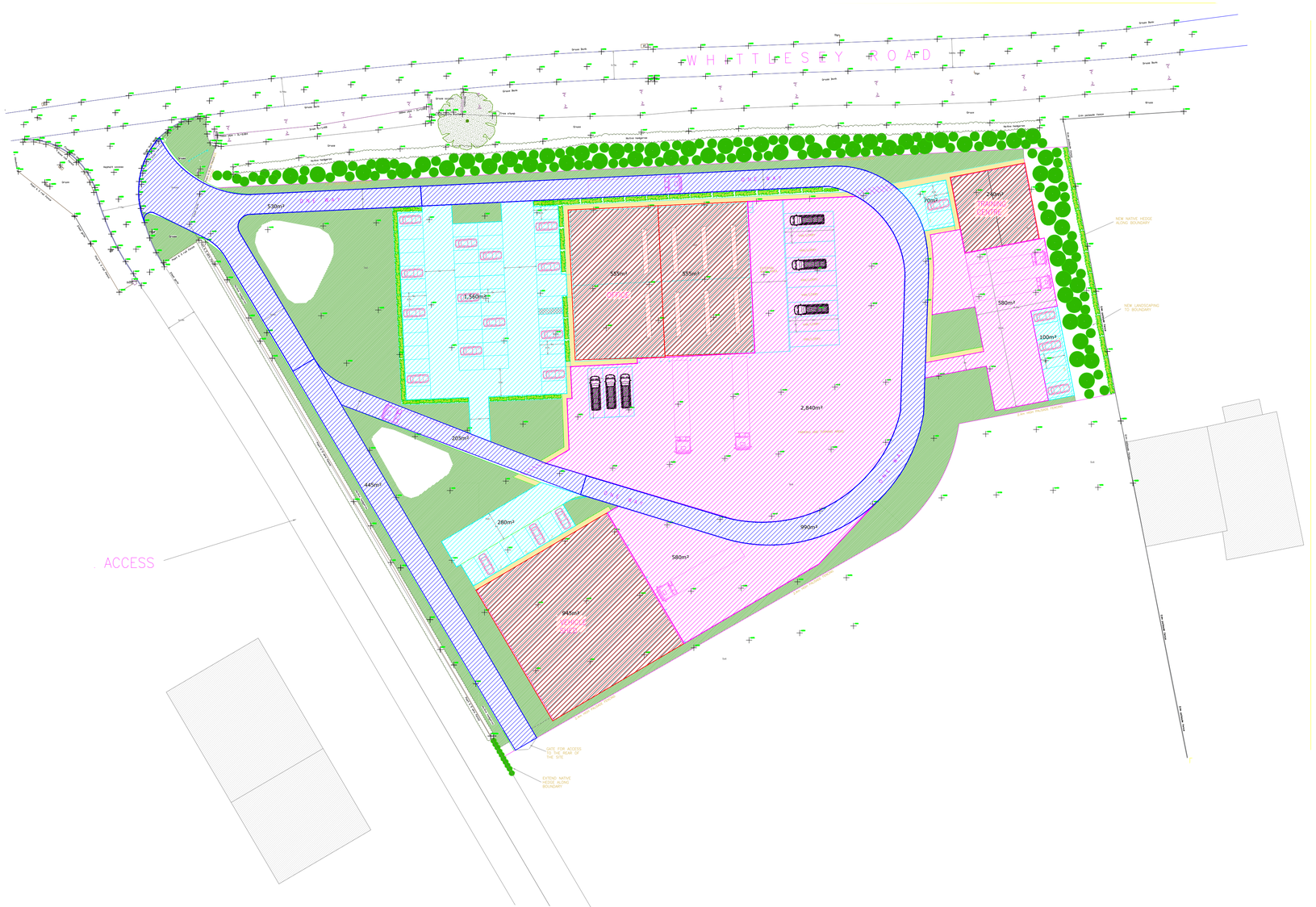
PROJECT
Land North East of
Middle Level Commissioners
Whittlesey Road
March
PE15 0AH

TITLE
Proposed Site Plan

DRAWN	MH	DATE OF ISSUE	
CHECKED			
DATE	March 2021	DRAWING NUMBER	H6537/07 A
SCALE	AS SHOWN		

APPENDIX 7

IMPERMEABLE AREA PLAN



Drain Areas

PROPOSED ROOF AREAS: 2,295m²

PROPOSED YARD AREAS: 4,000m²

PROPOSED CAR PARKING AREAS: 2,010m²

PROPOSED ACCESS AREAS: 2,170m²

North Arrow

N
W E
S

NOTES

1. The contractor shall check all tie-ins for line and level with existing before commencing any works. The Engineer shall be notified immediately, in writing, should any errors be found.
2. Any discrepancies, of whatever nature, must be reported to the Engineer prior to the commencement or continuance of any further works.
3. All private drainage works to be in accordance with the requirements of Building Regulations 2010, Part H, "Drainage and waste disposal", (01st October 2015).
4. All pipes to be bedded and backfilled in accordance with Part H, Diagram 10. Shallow pipes shall be protected in accordance with Part H, Diagram 11.
5. Unless otherwise stated, all private drainage to be 100mm diameter. Gradients have been shown where there are pipe capacity issues and these should be regarded as minimums. Unless there are constraints dictating otherwise, gradients shall generally be 1 in 60. 100mm diameter pipes shall not be laid flatter than 1 in 80, 150mm diameter pipes shall not be laid flatter than 1 in 150.
6. All pipes, chambers and fittings to be installed strictly in accordance with the manufacturers instructions.
7. Pipes which run adjacent to buildings shall be installed in strict accordance with Part H, Clauses 2.23 to 2.25 and Diagram 8.
8. All private manholes, inspection chambers and drainage channels to comply with BS EN124. Cover strengths to be:
   Class D400 in heavy trafficked areas (access roads, service yards etc.)
   Class C250 in lightly trafficked areas (car parks, driveways etc)
   Class B125 in Non trafficked areas
   Class A15 in landscaping areas
9. All drains in the vicinity of existing or proposed trees to be constructed in accordance with the requirements of NHBC Practice Note 3.
10. Private drainage frames must be tied to manhole risers by use of manufacturers ties (e.g. Polypipe ref. FRX500 fixing kit and FRXSD1 black ties.) The ground works contractor will be held fully responsible for any accidents due to incorrect fitting or failure to use the correct manufacturers fixing equipment.
11. All existing land drains encountered on site during construction to be re-connected.
12. Should any departure from the slab level be considered, agreement shall be sought from the Engineer immediately and prior to commencement or continuance of any works, and should take full account of all restrictions to the slab level.
13. Garage slabs relate to the finished level of the concrete at the front entrance of the garage.
14. Where a drive slopes towards a garage there is to be a 75mm ramp up to the garage slab.
15. Maximum gradients of gardens to be 1 in 6 (unless stated otherwise), except for designed banking works.
16. All dimensions in metres unless otherwise stated.
17. As underlying ground conditions may be variable across the site the Contractor shall undertake onsite porosity tests at the location and depth of each soakaway. Tests should be undertaken in accordance with BRE365 and results forwarded to the Engineers to allow verification of designs.
18. All existing services, sewers and drains indicated on this drawing and any other related drawings are shown only indicatively, and shall have their positions and level confirmed on site by the Contractor.
19. The invert levels of all existing sewers, drains, ditches, tanks or other features and apparatus where a new connection is to be made shall have their precise position and level confirmed on site by the Contractor prior to commencement of any construction work. The results of the investigations shall be confirmed to MTC Engineering (Cambridge) Ltd so that the design can be verified.

SOAKAWAY PROTECTION:
Please ensure that during the construction phase all soakaways, gullies and gully laterals are protected from the ingress of silt or grit from the site. Placing a fine heavy duty geotextile under the gully grating, between it and the frame should suffice.

NOTE:
At the location of the proposed lateral connection the contractor shall establish the position and depth of any existing services to prevent any clash in level and abortive costs.

PRELIMINARY DESIGN
NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION/REASON FOR ISSUE	APPR

MTC ENGINEERING
MTC Engineering (Cambridge) Ltd.
Ground Floor, 24 High Street
Whittlesford, Cambridgeshire, CB22 4LT
Tel (01223) 837270, fax (01223) 835648
E-mail office@mtcengineering.co.uk

PROJECT
WHITTLESEY ROAD, MARCH
CAMBRIDGESHIRE

TITLE
Drainage Area Plan

ORIG	DATE
SEC	MAY 2021
CHKD	SCALE 1:500@A1
APPR	DRAWING NO 2638-04 REV

APPENDIX 8

DRAINAGE LAYOUT

Private Drainage Key

- Storm Inspection Chamber (Depth <0.6m [1 side connection])
- Storm Inspection Chamber (Depth <1.2m [2 side connections])
- Storm BR manhole PCC Ring (1.2-1.5m)
- Storm BR manhole PCC Ring (1.50-2.7m)
- Gully
- Permavoid Diffuser box
- ACO Qmax system
- High Point
- Low Point
- Proposed impermeably surfaced access road
- Proposed impermeably surfaced yard area with Type 3 sub-base
  Sub-base thickness 450mm
  Sub-base void: 30%
- Proposed permeably surfaced parking area
  Sub-base thickness 300mm
  Sub-base void: 30%
- Overland flow routes

North Arrow

N
W E
S

NOTES

1. The contractor shall check all tie-ins for line and level with existing before commencing any works, The Engineer shall be notified immediately, in writing, should any errors be found.
2. Any discrepancies, of whatever nature, must be reported to the Engineer prior to the commencement or continuance of any further works.
3. All private drainage works to be in accordance with the requirements of Building Regulations 2010, Part H, "Drainage and waste disposal", (01st October 2015).
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14. Where a drive slopes towards a garage there is to be a 75mm ramp up to the garage slab.
15. Maximum gradients of gardens to be 1 in 6 (unless stated otherwise), except for designed banking works.
16. All dimensions in metres unless otherwise stated.
17. As underlying ground conditions may be variable across the site the Contractor shall undertake onsite porosity tests at the location and depth of each soakaway. Tests should be undertaken in accordance with BRE365 and results forwarded to the Engineers to allow verification of designs.
18. All existing services, sewers and drains indicated on this drawing and any other related drawings are shown only indicatively, and shall have their positions and level confirmed on site by the Contractor.
19. The invert levels of all existing sewers, drains, ditches, tanks or other features and apparatus where a new connection is to be made shall have their precise position and level confirmed on site by the Contractor prior to commencement of any construction work. The results of the investigations shall be confirmed to MTC Engineering (Cambridge) Ltd so that the design can be verified.

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Please ensure that during the construction phase all soakaways, gullies and gully laterals are protected from the ingress of silt or grit from the site. Placing a fine heavy duty geotextile under the gully grating, between it and the frame should suffice.

NOTE:
At the location of the proposed lateral connection the contractor shall establish the position and depth of any existing services to prevent any clash in level and abortive costs.

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NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION/REASON FOR ISSUE	APPR

MTC ENGINEERING
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Ground Floor, 24 High Street
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Tel (01223) 837270, fax (01223) 835648
E-mail office@mtcengineering.co.uk

PROJECT
WHITTLESEY ROAD, MARCH
CAMBRIDGESHIRE

TITLE
Drainage Plan

ORIG	DATE
SEC	MAY 2021
CHKD	SCALE 1:500@A1
APPR	DRAWING NO 2638-03 REV

APPENDIX 9

MICRO DRAINAGE CALCULATIONS: PERMEABLE PAVING

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 628 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.311	0.111	6.7	199.3	O K
30 min Summer	99.347	0.147	6.7	264.7	O K
60 min Summer	99.382	0.182	6.7	327.8	O K
120 min Summer	99.413	0.213	6.7	384.1	Flood Risk
180 min Summer	99.428	0.228	6.7	410.3	Flood Risk
240 min Summer	99.435	0.235	6.7	423.6	Flood Risk
360 min Summer	99.439	0.239	6.7	431.2	Flood Risk
480 min Summer	99.437	0.237	6.7	427.9	Flood Risk
600 min Summer	99.434	0.234	6.7	422.0	Flood Risk
720 min Summer	99.431	0.231	6.7	415.8	Flood Risk
960 min Summer	99.423	0.223	6.7	402.0	Flood Risk
1440 min Summer	99.406	0.206	6.7	371.4	Flood Risk
2160 min Summer	99.380	0.180	6.7	324.1	O K
2880 min Summer	99.355	0.155	6.7	280.0	O K
4320 min Summer	99.314	0.114	6.7	205.0	O K
5760 min Summer	99.283	0.083	6.7	149.0	O K
7200 min Summer	99.262	0.062	6.7	111.0	O K
8640 min Summer	99.250	0.050	6.6	89.7	O K
10080 min Summer	99.244	0.044	5.9	80.0	O K
15 min Winter	99.326	0.126	6.7	227.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	134.270	0.0	19
30 min Summer	87.055	0.0	34
60 min Summer	53.779	0.0	64
120 min Summer	32.159	0.0	122
180 min Summer	23.528	0.0	182
240 min Summer	18.759	0.0	242
360 min Summer	13.537	0.0	360
480 min Summer	10.729	0.0	470
600 min Summer	8.960	0.0	518
720 min Summer	7.731	0.0	574
960 min Summer	6.121	0.0	696
1440 min Summer	4.398	0.0	966
2160 min Summer	3.156	0.0	1364
2880 min Summer	2.492	0.0	1760
4320 min Summer	1.784	0.0	2508
5760 min Summer	1.406	0.0	3176
7200 min Summer	1.169	0.0	3824
8640 min Summer	1.005	0.0	4488
10080 min Summer	0.884	0.0	5240
15 min Winter	134.270	0.0	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	99.367	0.167	6.7	300.9	O K
60 min Winter	99.406	0.206	6.7	372.2	Flood Risk
120 min Winter	99.442	0.242	6.7	436.7	Flood Risk
180 min Winter	99.459	0.259	6.7	467.7	Flood Risk
240 min Winter	99.469	0.269	6.7	484.3	Flood Risk
360 min Winter	99.475	0.275	6.7	496.6	Flood Risk
480 min Winter	99.476	0.276	6.7	496.8	Flood Risk
600 min Winter	99.472	0.272	6.7	490.9	Flood Risk
720 min Winter	99.467	0.267	6.7	481.1	Flood Risk
960 min Winter	99.456	0.256	6.7	461.2	Flood Risk
1440 min Winter	99.432	0.232	6.7	418.3	Flood Risk
2160 min Winter	99.393	0.193	6.7	348.5	O K
2880 min Winter	99.356	0.156	6.7	282.0	O K
4320 min Winter	99.295	0.095	6.7	172.1	O K
5760 min Winter	99.257	0.057	6.7	102.0	O K
7200 min Winter	99.245	0.045	6.0	80.6	O K
8640 min Winter	99.239	0.039	5.2	69.5	O K
10080 min Winter	99.234	0.034	4.6	61.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	87.055	0.0	33
60 min Winter	53.779	0.0	62
120 min Winter	32.159	0.0	120
180 min Winter	23.528	0.0	180
240 min Winter	18.759	0.0	238
360 min Winter	13.537	0.0	352
480 min Winter	10.729	0.0	462
600 min Winter	8.960	0.0	570
720 min Winter	7.731	0.0	670
960 min Winter	6.121	0.0	752
1440 min Winter	4.398	0.0	1054
2160 min Winter	3.156	0.0	1492
2880 min Winter	2.492	0.0	1900
4320 min Winter	1.784	0.0	2596
5760 min Winter	1.406	0.0	3176
7200 min Winter	1.169	0.0	3816
8640 min Winter	1.005	0.0	4496
10080 min Winter	0.884	0.0	5224

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.433	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.929

Time (mins) From:	To:	Area (ha)
0	4	0.929

Model Details

Storage is Online Cover Level (m) 99.700

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00800	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	601.0
Max Percolation (l/s)	1669.4	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.200	Membrane Depth (m)	0

APPENDIX 10

MICRO DRAINAGE CALCULATIONS: INFILTRATION

BASIN 1

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 929 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.256	0.056	0.3	13.7	O K
30 min Summer	99.272	0.072	0.3	17.6	O K
60 min Summer	99.287	0.087	0.3	21.5	O K
120 min Summer	99.301	0.101	0.3	25.1	O K
180 min Summer	99.308	0.108	0.3	27.0	O K
240 min Summer	99.312	0.112	0.3	28.1	O K
360 min Summer	99.317	0.117	0.3	29.1	O K
480 min Summer	99.318	0.118	0.3	29.5	O K
600 min Summer	99.318	0.118	0.3	29.5	O K
720 min Summer	99.318	0.118	0.3	29.4	O K
960 min Summer	99.316	0.116	0.3	29.0	O K
1440 min Summer	99.313	0.113	0.3	28.1	O K
2160 min Summer	99.306	0.106	0.3	26.4	O K
2880 min Summer	99.299	0.099	0.3	24.6	O K
4320 min Summer	99.286	0.086	0.3	21.3	O K
5760 min Summer	99.275	0.075	0.3	18.4	O K
7200 min Summer	99.265	0.065	0.3	15.9	O K
8640 min Summer	99.257	0.057	0.3	14.0	O K
10080 min Summer	99.251	0.051	0.3	12.5	O K
15 min Winter	99.262	0.062	0.3	15.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	134.270	0.0	19
30 min Summer	87.055	0.0	34
60 min Summer	53.779	0.0	64
120 min Summer	32.159	0.0	122
180 min Summer	23.528	0.0	182
240 min Summer	18.759	0.0	242
360 min Summer	13.537	0.0	362
480 min Summer	10.729	0.0	480
600 min Summer	8.960	0.0	600
720 min Summer	7.731	0.0	672
960 min Summer	6.121	0.0	780
1440 min Summer	4.398	0.0	1026
2160 min Summer	3.156	0.0	1432
2880 min Summer	2.492	0.0	1844
4320 min Summer	1.784	0.0	2636
5760 min Summer	1.406	0.0	3400
7200 min Summer	1.169	0.0	4104
8640 min Summer	1.005	0.0	4760
10080 min Summer	0.884	0.0	5448
15 min Winter	134.270	0.0	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	99.280	0.080	0.3	19.8	O K
60 min Winter	99.297	0.097	0.3	24.1	O K
120 min Winter	99.313	0.113	0.3	28.2	O K
180 min Winter	99.321	0.121	0.3	30.4	O K
240 min Winter	99.326	0.126	0.3	31.7	O K
360 min Winter	99.331	0.131	0.3	33.0	O K
480 min Winter	99.334	0.134	0.3	33.5	O K
600 min Winter	99.334	0.134	0.3	33.7	O K
720 min Winter	99.334	0.134	0.3	33.7	O K
960 min Winter	99.332	0.132	0.3	33.1	O K
1440 min Winter	99.327	0.127	0.3	31.7	O K
2160 min Winter	99.317	0.117	0.3	29.3	O K
2880 min Winter	99.307	0.107	0.3	26.7	O K
4320 min Winter	99.288	0.088	0.3	21.7	O K
5760 min Winter	99.271	0.071	0.3	17.5	O K
7200 min Winter	99.258	0.058	0.3	14.2	O K
8640 min Winter	99.249	0.049	0.3	12.1	O K
10080 min Winter	99.245	0.045	0.3	10.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	87.055	0.0	33
60 min Winter	53.779	0.0	62
120 min Winter	32.159	0.0	122
180 min Winter	23.528	0.0	180
240 min Winter	18.759	0.0	238
360 min Winter	13.537	0.0	354
480 min Winter	10.729	0.0	468
600 min Winter	8.960	0.0	580
720 min Winter	7.731	0.0	690
960 min Winter	6.121	0.0	894
1440 min Winter	4.398	0.0	1110
2160 min Winter	3.156	0.0	1560
2880 min Winter	2.492	0.0	1992
4320 min Winter	1.784	0.0	2812
5760 min Winter	1.406	0.0	3576
7200 min Winter	1.169	0.0	4248
8640 min Winter	1.005	0.0	4848
10080 min Winter	0.884	0.0	5552

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.433	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.055

Time (mins) From:	To:	Area (ha)
0	4	0.055

Model Details

Storage is Online Cover Level (m) 99.700

Infiltration Basin Structure

Invert Level (m) 99.200 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00800 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00800

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	240.0	0.500	329.4

APPENDIX 11

MICRO DRAINAGE CALCULATIONS: INFILTRATION

BASIN 2

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1095 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.266	0.066	0.3	16.2	O K
30 min Summer	99.284	0.084	0.3	20.9	O K
60 min Summer	99.303	0.103	0.3	25.5	O K
120 min Summer	99.319	0.119	0.3	29.9	O K
180 min Summer	99.328	0.128	0.3	32.1	O K
240 min Summer	99.333	0.133	0.3	33.5	O K
360 min Summer	99.339	0.139	0.3	34.9	O K
480 min Summer	99.341	0.141	0.3	35.6	O K
600 min Summer	99.342	0.142	0.3	35.8	O K
720 min Summer	99.342	0.142	0.3	35.8	O K
960 min Summer	99.340	0.140	0.3	35.3	O K
1440 min Summer	99.336	0.136	0.3	34.3	O K
2160 min Summer	99.330	0.130	0.3	32.5	O K
2880 min Summer	99.322	0.122	0.3	30.6	O K
4320 min Summer	99.308	0.108	0.3	26.9	O K
5760 min Summer	99.295	0.095	0.3	23.5	O K
7200 min Summer	99.283	0.083	0.3	20.6	O K
8640 min Summer	99.273	0.073	0.3	18.1	O K
10080 min Summer	99.265	0.065	0.3	16.0	O K
15 min Winter	99.274	0.074	0.3	18.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	134.270	0.0	19
30 min Summer	87.055	0.0	34
60 min Summer	53.779	0.0	64
120 min Summer	32.159	0.0	124
180 min Summer	23.528	0.0	182
240 min Summer	18.759	0.0	242
360 min Summer	13.537	0.0	362
480 min Summer	10.729	0.0	482
600 min Summer	8.960	0.0	600
720 min Summer	7.731	0.0	720
960 min Summer	6.121	0.0	836
1440 min Summer	4.398	0.0	1080
2160 min Summer	3.156	0.0	1472
2880 min Summer	2.492	0.0	1876
4320 min Summer	1.784	0.0	2680
5760 min Summer	1.406	0.0	3464
7200 min Summer	1.169	0.0	4184
8640 min Summer	1.005	0.0	4928
10080 min Summer	0.884	0.0	5648
15 min Winter	134.270	0.0	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	99.294	0.094	0.3	23.4	O K
60 min Winter	99.315	0.115	0.3	28.6	O K
120 min Winter	99.334	0.134	0.3	33.6	O K
180 min Winter	99.344	0.144	0.3	36.2	O K
240 min Winter	99.350	0.150	0.3	37.8	O K
360 min Winter	99.356	0.156	0.3	39.5	O K
480 min Winter	99.360	0.160	0.3	40.4	O K
600 min Winter	99.361	0.161	0.3	40.8	O K
720 min Winter	99.361	0.161	0.3	40.9	O K
960 min Winter	99.360	0.160	0.3	40.6	O K
1440 min Winter	99.354	0.154	0.3	39.0	O K
2160 min Winter	99.345	0.145	0.3	36.5	O K
2880 min Winter	99.334	0.134	0.3	33.8	O K
4320 min Winter	99.313	0.113	0.3	28.3	O K
5760 min Winter	99.294	0.094	0.3	23.3	O K
7200 min Winter	99.278	0.078	0.3	19.1	O K
8640 min Winter	99.264	0.064	0.3	15.7	O K
10080 min Winter	99.254	0.054	0.3	13.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	87.055	0.0	33
60 min Winter	53.779	0.0	62
120 min Winter	32.159	0.0	122
180 min Winter	23.528	0.0	180
240 min Winter	18.759	0.0	238
360 min Winter	13.537	0.0	356
480 min Winter	10.729	0.0	470
600 min Winter	8.960	0.0	584
720 min Winter	7.731	0.0	694
960 min Winter	6.121	0.0	912
1440 min Winter	4.398	0.0	1142
2160 min Winter	3.156	0.0	1600
2880 min Winter	2.492	0.0	2048
4320 min Winter	1.784	0.0	2896
5760 min Winter	1.406	0.0	3688
7200 min Winter	1.169	0.0	4464
8640 min Winter	1.005	0.0	5104
10080 min Winter	0.884	0.0	5744

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.433	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.065

Time (mins) From:	To:	Area (ha)
0	4	0.065

Model Details

Storage is Online Cover Level (m) 99.700

Infiltration Basin Structure

Invert Level (m) 99.200 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00800 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00800

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	240.0	0.500	329.4

APPENDIX 12

MAINTENANCE PLAN

Future Management & Maintenance Arrangement for SuDS for the Proposed Development of Land South of Whittlesey Road, March

Contents

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Future Management & Maintenance

Arrangements for SuDS for

the Proposed Development of Land

South of Whittlesey Road, March

1 SuDS at Land South of Whittlesey Road, March;

SUDS are engineered solutions that aim to mimic natural drainage processes. They help to reduce pollution of watercourses and localised flooding, as well as providing amenity benefit and biodiversity. The following lists of features are to be provided as part of the proposed development of land south of Whittlesey Road, March

- **Permeable surfaces** such as permeable block paving, porous Asphalt and gravel, these allow rain water to percolate through the pervious surface into the voided construction below, this allows for cleaning, storage and controlled release. They must be protected from silt, sand, compost, mulch, etc.
- **Detention/Infiltration Basin** is a depression in the ground where water is stored and treated. Water levels rise after rain and then drops to the normal level as the excess soaks into the ground.
- **Inlets and outlets structures** are often conveyance pipes protected with mesh guards. They must be free from obstruction at all times to allow free flow through the SuDS.
- I**nspection Chambers** and rodding eyes are used on bends or where pipes come together. They allow cleaning of the system if necessary.

3 Responsibilities of SuDS at Land south of Whittlesey Road, March –

Private Property SuDs – SuDs located within property boundaries will be the responsibility of the property owner to maintain and will include:

- Private Drainage
- Permeable paving
- Detention/infiltration basin
- Inlets/outlets

4 Key Factors to be Considered During Maintenance -

- Undesirable plants – all efforts should be made to prevent drains becoming blocked and the growth of unintentional vegetation which could be detrimental to the intentional plant regime, biodiversity aims and the building fabric.

- Regular site attendance for litter collection, grass cutting and checking of inlets, outlets and control structures.

- Occasional visits to brush permeable pavement, remove silt from source control features and manage wetland vegetation.

- Drain heads and outlets – all drainage points must be checked every year and cleared out it if necessary, to ensure optimum performance.

5 SuDS and Landscaping Maintenance – Summary -

	REGULAR MAINTENANCE	Frequency	Unit Rate	Total
1	LITTER MANAGEMENT			
1.1	Pick up litter in SuDs and Landscape areas and remove from site.	12 visits monthly		
2	GRASS MAINTENANCE - all cutting to wildlife piles.			
2.1	Mow all grass verges, paths and amenity at 35-50mm with 75mm max. Leaving grass in situ.	as required or monthly		
2.2	Mow all dry swales, dry SuDS basins and margins to low flow channels and other SuDS features at 100mm with 150mm max. Cut wet swales or basins annually as wildflower areas.	4-8 wisits as required annually		
2.3	Wildflower areas strimmed to 50mm on 3 year rotation 30% each year.	1 visit annually		
3	INLET AND OUTLETS			
3.1	Inspect monthly, remove silt from slab aprons and debris. Strim 1m round for access.	monthly visits		
4	HARD SURFACES			
4.1	Sweep all paving regularly. Sweep and suction brush permeable paving in autumn after leaf fall.	1 visit		
	OCCASIONAL TASKS			
5	INSPECTION AND CONTROL CHAMBERS			
5.1	Annual inspection, remove silt and check free flow.	1 visit		
6	SITE MANAGEMENT			
6.1	Inspect swales, and basins annually for silt accumulation.	1 visit		
6.2	Excavate silt, stack and dry within 10m of the SuDS feature, but outside the design profile where water flows spread, rake and overseed.	As required		

8	NATIVE PLANTING			
8.1	Remove lower branches where necessary to ensure good ground cover to protect soil profile erosion.	1 visit annually		
	REMEDIAL WORK			
9	Inspect SuDS system regularly to check for damage or failure. Undertake remedial work as required.	As required		

6 Maintenance Specification -

6.1 GENERAL REQUIREMENTS

Maintenance activities comprise • **Regular Maintenance** • **Occasional Tasks** • **Remedial Work**	**Frequency**
Generally **Litter** Collect all litter or other debris and remove from site at each site visit	Monthly

- **Avoid** use of weedkillers and pesticides to prevent chemical pollution.
- **Avoid** de-icing agents wherever possible to allow bio-remediation of pollutants in permeable surfaces.
- **Protect** all permeable, porous and infiltration surfaces from silt, sand, mulch and other fine particles.

Exclusions:

- Maintenance of rainwater harvesting chambers, pumps, etc.

6.2 Permeable Surfaces

Permeable Paving combines hardstanding with SuDs and is designed to allow rainfall to percolate immediately through the surface near to where the raindrop lands. The water flows into a specially prepared sub-base, where the voids between the stones act as a temporary reservoir. Maintenance of the pavement is carried out to ensure the infiltration of the paving is not compromised as follow;

- A visual inspection of the paving should be carried out on a regular basis. This will confirm the effectiveness of the agitation maintenance due to variations between sites and allow any refinement of the regular agitation activity if necessary.
- The paving should be agitated (ie - brushed, vacuumed, etc) at least twice a year. This is to ensure no vegetation of any sort is allowed to grow and develop in the joints. Ideally, this activity should be carried out in the spring and autumn seasons.
- The paving should be inspected after any heavy precipitation to ensure no displacement of any organic matter onto the surface of the pavement.
- Where non-infiltration systems have been employed, the inspection of the outfalls should be undertaken initially on a twice-yearly basis.
- Weed growth – when sedimentation occurs in areas of permeable paving then there is the potential for weed growth, this will typically occur where there are overhanging trees or soft landscaping slopes down on to the paving or in areas which do not receive over run from vehicles particularly frequently. Weeds can be removed from the surface through the application of weed killers. Glyphosate based weed killers are the most common for general purpose use, they are most effective on grasses and perennial weeds with non-woody stems. Weeds should be sprayed when they are actively growing so that the Glyphosate will go down to the root and kill the weed completely.

PERMEABLE AND POROUS SUFRACES	
Regular Maintenance	**Frequency**
Cleaning Brush regularly and remove sweepings from all hard surfaces	Monthly
Occasional Tasks	**Frequency**
Permeable Pavements. Brush and vacuum surface once a year to prevent silt blockage and enhance design life.	
Remedial Work	**Frequency**
• Monitor effectiveness of permeable pavement and when water does not infiltrate immediately advise Client of possible need for reinstatement of top layers or specialist cleaning. • Recent experience suggests jet washing and suction cleaning will substantially reinstate pavement to 90% efficiency.	As required

6.4 Detention/Infiltration Basin

The SuDS sequence begins with the maintenance strip and bunding surrounding the infiltration basin.

ACTION:

- *Mow the grass area surrounding the basin.*
- *Cut any vegetation annually.*

ACTION:

- *Mow the path verge and grass up to the basin edge from the site side.*
- *Cut meadow grass annually removing cuttings to a wildlife pile or from site.*
- *Monitor how the basin edge develops and cut 30% of vegetation at 100mm each year during September -November, if required, removing cuttings to wildlife piles or from site.*
- *Occasionally remove basin vegetation, if it spreads across the basin, by hand clearing, raking or machine clearance, using a 1-3 tonne tracked vehicle, with cuttings removed to wildlife piles or from site.*
- *Check the inlet / outlet from the basin and the inlet on the other side of the bank are clear*
- *Detention/Infiltration basins require regular maintenance to ensure continuing operation to design performance standard. Regular inspection and maintenance is important for the effective operation of basins as designed. Litter and debris removal should be undertaken as part of general landscape maintenance for the site and before any other SuDS management task.*
- *Any invasive maintenance work such as silt or vegetation removal is only required intermittently, but should be planned to be sympathetic to requirements of wildlife in a basin. Care should be taken to avoid disturbance to nesting birds during breeding season and habitats of target species. The window for carrying out maintenance is usually between September and October. The removal of invasive silt and vegetation should only be carried out to limited areas at any one time (25-30% of the basin area on one occasion each year).*

- *Silt vegetation should be trimmed as necessary to keep the basin free of leaves and to maintain aesthetics. Any areas of slope that have become bare should be re-vegetated and any eroded areas should be regraded before planting.*

- *Access to maintain the basin should be provided from a public/private road, ideally an access should be at least 3.5m wide and have a maximum cross fall of 1 in 7 and be robust enough to withstand maintenance equipment. The access should extend to any forebay, safety and aquatic benches and inlets and outlets.*

- *Sediment excavated from basin that receive runoff from residential and road areas should be safely disposed of in accordance with current waste management legislation.*

- *New basins may become rapidly dominated by invasive species, it should be ensured that in the first five years, while vegetation is establishing, certain plant growth is controlled.*

DETENTION/INFILTRATION BASIN	
Regular Maintenance	**Frequency**
Remove litter and debris	Monthly (or as required)
Cut grass in public areas	Monthly (during
Cut meadow grass	Half yearly (spring before nesting season and autumn)
Inspect marginal and bankside vegetation and remove nuisance plants	Monthly (at start then as required
Inspect inlets and outlets, bankside structures, pipework etc for evidence of blockage and/or physical damage	Monthly
Inspect water body for signs of poor water quality	Monthly (May-October)
Inspect silt accumulation rates and establish appropriate removal frequency: undertake contamination testing once some build-up has occurred	Half yearly

Check mechanical devices	Half yearly
Hand cute submerged and emergent aquatic plants (at minimum of 0.1m above basin base)	Annually
Remove 25%of bank vegetation from water's edge to minimum of 1m above water level	Annually
Remove sediment from forebay	Every 1 to 5 years or as required
Remove sediment and planting from one quadrant of main body of basin without forebay	Every 5 years or as required
Occasional Maintenance	
Remove sediment from the main body of big basins when pool volume is reduced by 20%	Every 25-50 years
Remedial Actions	
Repair erosion or other damage	As required
Replant where necessary	As required
Aerate basin when signs of eutrophication are detected	As required
Realign rip-rap or repair other damage	As required
Repair/rehabilitate inlets, outlets and overflows	As required

6.8 INLETS, OUTLETS AND INSPECTION CHAMBERS

- **Inlets and outlets structures** may be surface structures or conveyance pipes with guards or headwalls. They must be free from obstruction at all times.

- **Inspection Chambers** and rodding eyes are used on bends or where pipes come together and allow cleaning of the system if necessary. They should be designed out of the system where possible.

INLETS, OUTLETS AND INSPECTION CHAMBERS	
Regular Maintenance	**Frequency**
Inspect surface structures removing obstructions and silt as necessary. Check there is no physical damage.	Monthly
Strim vegetation 1m min. surround to structures and keep hard aprons free from silt and debris.	Monthly
Remove cover and inspect ensuring water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt. Undertake inspection after leaf fall in autumn .	Annually
Occasional Maintenance	
Check topsoil levels are 20mm above edges of baskets and chambers to avoid mower damage.	As necessary
Remedial Work	
Unpack stone in basket features and unblock or repair and repack stone as design detail as necessary.	As required
Repair physical damage if necessary.	As required

6.9 SPILLAGE – EMERGENCY ACTION

Most spillages on development sites are of compounds that do not pose a serious risk to the environment if they enter the drainage in a slow and controlled manner with time available for natural breakdown in a treatment system. Therefore small spillages of oil, milk or other known organic substances should be removed where possible using soak mats as recommended by the Environment Agency with residual spillage allowed to bio-remediate in the drainage system.

In the event of a serious spillage, either by volume or of unknown or toxic compounds, then isolate the spillage with soil, turf or fabric and block outlet pipes from chamber(s) downstream of the spillage with a bung(s). (A bung for blocking pipes may be made by wrapping soil or turf in a plastic sheet or close woven fabric.)

Contact the Environment Agency immediately.