Flood Risk Assessment and Sustainable Drainage Strategy

For the Proposed Demolition of an Existing Single Storey Block

And Replacement with a New Two Storey Block

At Queensmead School, Queens Walk,

South Ruslip, Hillingdon, London, HA4 0LS

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MTC Engineering (Cambridge) Ltd.
Company Reg no. 8494749 Registered in England & Wales, VAT Reg no. 168244003
Registered Office: Ground Floor, 24 High Street, Whittlesford, Cambridgeshire, CB22 4LT
T: +44 (0)1223 837270 F: +44 (0)1223 835648 E: office@mtcengineering.co.uk
Directors: M. J. Brindley J. T. Crawley C. S. Brindley
www.mtcengineering.co.uk

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1 Introduction

1.1 MTC Engineering (Cambridge) Ltd has been asked to provide a Flood Risk Assessment and Sustainable Drainage Strategy in respect of the proposed demolition of an existing single storey block and replacement with a new two storey block and other associated works at Queensmead School, Queens Walk, Hillingdon on behalf of Queensmead School.

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

1.2.1 Topographical Site Survey by Sumo Services Limited;

1.2.2 Proposed Layout provided by Monahan Blythen Hopkins Architects;

1.2.3 Environment Agency Modelled and Historical Flood data.

1.2.4 London Borough of Hillingdon Surface Water Management Plan and Strategic Flood Risk Assessment.

1.2.5 The Hillingdon Sustainable Drainage Design and Evaluation Guide.

1.2.6 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) Limited during our investigations. The conclusions drawn could therefore differ if the information is found to be inaccurate, incomplete or misleading. MTC Engineering (Cambridge) Limited 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) Limited 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) Limited 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 Sustainable Drainage Strategy is 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 Queensmead School is located on the northern side of Victoria Road and western side of Queens Walk, in South Ruslip, the London Borough of Hillingdon, as shown on the site location plan provided in Appendix 1.

2.2 To the north the eastern part of the site in which the school buildings are situated is bound by the Deanesfield Primary School site, whilst to the north the western section of the school site which is occupied by the playing field is bound by the residential dwellings fronting Long Drive.

2.3 To the east the site is bound by Queens Walk, past which lies primarily residential development.

2.4 To the south and west the site is bound by Victoria Road with retail development present on the opposite side of Victoria Road and then the railway line.

2.5 The school buildings are located in the southern and eastern area of the site, with the layout of the existing school buildings shown by the plan provided in Appendix 2, which shows the building that is the subject of this Planning Application highlighted in Red and labelled as Block B.

2.6 To the west of the school buildings lie the sports facilities and artificial grass football centre, with the playing field associated with the school lying to the north of this. Along the southern side of the artificial grass football centre are some earth embankments between this and Victoria Road.

2.7 A site survey showing the full school site is provided in Appendix 3. This shows ground levels in the vicinity of the existing school buildings to be in the region of 34.5 metres above Ordnance Datum (AOD), with the frontage and car parking areas being a little lower at about 34m AOD.

2.8 The artificial pitches are at levels between 34.5m and 35m AOD, with the banking to the south of these being at levels of about 36m AOD provided between these pitches and Victoria Road, and levels of about 34m AOD along the southern side of the embankments. The main playing field to the north rises in a northerly direction to levels of more than 36.5m AOD in the northern area of the site.

2.9 The only watercourse in the vicinity of the site is the Roxbourne (or eastern arm of Yeading Brook) which flows in a southwesterly direction through the residential development to the northeast of the site. This then enters a culvert on the opposite side of Field End Road which runs south along Field Road then west along the southern side of Victoria Road, before again becoming an open watercourse on the southern side of Victoria Road and western side of Civic Way, then running south and southwest beneath the railway lines.

2.10 It is not considered that there are any further significant open watercourse systems in the vicinity of the site.

2.11 British Geological Survey Mapping shows the site to be underlain by the London Clay Formation, which is a low permeability geology, with no superficial geology present in the vicinity of the school.

2.12 Surface water drainage from the existing school buildings including Building B is via a positive surface water sewer network that discharges off the school site by means of a 500mm diameter pipe and 200mm diameter pipe beneath Victoria Road opposite the Civic Way junction as shown by the drainage survey provided in Appendix 4. This is opposite the downstream end of the Roxbourne culvert and as such surface water from the school is believed to discharge into this watercourse.

2.13 The site is identified as lying within critical drainage area 027 in the London Borough of Hillingdon Surface Water Management Plan.

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.

3.3 The Environment Agency Flood Map for Planning (Appendix 5) indicates that the southern and eastern part of the site which includes the existing school buildings lies in Flood Zone 2, whilst the northwestern area of the playing field lies in Flood Zone 1.

3.4 The only significant source of fluvial flooding to the site is the Roxbourne system (or eastern arm of Yeading Brook) which is culverted beneath Field End Road and Victoria Road in the vicinity of the site. As such the primary risk associated with this system is that in an extreme event the capacity of the culvert may be exceeded, which would result in overland flows developing from the upstream end of the culvert at Field End Road and coming in a westerly/southwesterly direction with the general fall of land in the area.

3.5 The Environment Agency have modelled the potential flood scenarios in the area, with modelled flood data, defence data, and flood outlines all provided in Appendix 6.

3.6 The culvert data supplied shows that the Victoria Road culvert (asset ID 32400) has a design protection standard of 1 in 200 years, thus in events of less than this magnitude it is not anticipated that overland flows will occur.

3.7 This is confirmed by the mapping of the model scenarios which does not indicate any out of bank flow along the length of the culvert in a 1 in 100 year event, whilst as the Flood Zone 3 extent is based upon the 1 in 100 year flood extent this is why there is no Flood Zone 3 extent shown on the Flood Map for planning as flows would remain in the culvert during this event.

3.8 In more extreme fluvial flood events that have been modelled (the 1 in 100 year plus 20%, 25%, 35% and 70% climate change events and 1 in 1000 year event) it is anticipated that the capacity of the culvert would be exceeded and flows would occur between the upstream and downstream end of the culvert.

3.9 The only available model node in the vicinity of the site is node YE907, which is at the downstream end of the culvert on the western side of Civic Way just south of Victoria Road, where the Roxbourne (or eastern arm of Yeading Brook) returns to an open watercourse.

3.10 As this node is on the opposite side of Victoria Road towards the downstream end of the buildings on the school site thus in close proximity to the building to be replaced, it is considered that water levels at this node provide a reasonable assessment of flood levels at the building to be replaced.

3.11 Water levels at node YE907 during a 1 in 100 year event are 34.16m AOD, rising to 34.37m AOD, 34.45m AOD and 34.65m AOD in the 25%, 35% and 70% climate change scenarios respectively. In the 1 in 1000 year event the anticipated water level is 35.34m AOD.

3.12 All flood lines have been plotted on the site survey in the vicinity of Block B using the above levels, with a copy provided in Appendix 7. As can be seen, these closely follow the pattern indicated by Environment Agency mapping of the modelled flood extents in the vicinity of Block B (Appendix 6) which indicates that water levels at the various events are accurate in the vicinity of the site.

3.13 As shown by both the flood lines in Appendix 7 and modelled footprints in Appendix 6, during a 1 in 100 year plus 25% climate change event flood water would only reach the very southern tip of Block B, with a slightly greater flood extent in the 1 in 100 year plus 35% climate change event. Even with a 70% allowance for climate change the ground surrounding approximately the northern half of the block would remain dry.

3.14 The existing ground floor level of Block B is 35.47m AOD, thus the ground floor of the building would remain dry during a 1 in 100 year plus 70% climate change event, with more than 800mm freeboard provided against this event. 130mm freeboard is also provided against the modelled 1 in 1000 year water level.

3.15 Historical flood records indicate that a very small area of flooding occurred at the upstream end of the culvert on the eastern side of Field End Road in 1999 and 2007, however sufficient ponding for flood water to start flowing west across Field End Road did not occur in either event, and there are no historical records of any flooding from this culvert having effected the Queensmead School site in the past.

3.16 The overall risk to ground surrounding the existing Block B at Queensmead School is considered to be low, at between a 1 in 100 and 1 in 1000 year risk, with limited risk in the southern areas during a 1 in 100 year plus climate change event. The building itself however has a significantly raised ground floor level and thus is not considered to be at significant risk of internal flooding occurring at ground floor level under any circumstances.

3.17 There are no further sources of fluvial flood risk to the school that require assessment.

3.18 The second form of flood risk to be considered in respect of The National Planning Policy Framework is flooding from the sea.

3.19 The site is well inland, well upstream of the tidal reach of any watercourse, and with ground levels in excess of 34 metres AOD is not considered to be at any significant risk of flooding from the sea.

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

3.21 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.

3.22 The Environment Agency surface water flood map for the area indicates a similar surface water flow pattern to that which would occur in a fluvial event in which the upstream end of the culvert became blocked or overloaded, with surface flows coming westwards from the junction of Field End Road and Victoria Road towards the lower area in the vicinity of Queensmead School, with copies of various surface water flood maps provided in Appendix 8.

3.23 During a 1 in 30 year surface water event (a high risk event) ponding of water at the site would tend to occur in the low car parking area to the south of Block B, with water either not quite reaching or just reaching the very southern tip of Block B itself.

3.24 During a medium risk surface water event (1 in 100 year event) the flood extent shown by the mapping in Appendix 8 is very similar to that of the 1 in 100 year plus 70% climate change event shown in Appendices 6 and 7, thus water levels at the site would likely be very similar to during this event at about 34.65m AOD or so, with a large part of the southern area of the building surrounded by ponded water but no internal flooding occurring at ground floor level given the raised floor level of 35.47m AOD.

3.25 During a low risk 1 in 1000 year surface water flood event, the flood footprint would be very similar to that occurring during a 1 in 1000 year fluvial event as shown by comparing the flood extents shown in Appendices 6 and 8, thus the water level would also likely be similar at about 35.34m AOD, thus the building would be surrounded by flood water but the ground floor would remain dry.

3.26 Velocity mapping for the surface water events shows that in the vicinity of Block B water would generally be ponding with a velocity of less than 0.25 metres per second (m/s) even in a 1 in 1000 year event, with the majority of actual flow occurring to the south of the school on Victoria Road.

3.27 It should be noted that in this area fluvial and surface water flooding would tend to give rise to similar flood risks at the site, with the culverted fluvial system providing the main drainage system for the area, thus when this becomes blocked fluvial flows would flow overland in a very similar way to the surface water events.

3.28 As such the overall risk to the site from surface water flooding is considered to be similar to that posed by fluvial flooding and assessed earlier, with the building itself considered to be at a low risk of flooding due to the raised floor level but surrounding ground at risk of flooding in extreme surface water events.

3.29 Given the differences in the way surface water flooding is mapped/modelled and the detailed hydraulic modelling of the fluvial event, which is considered to be of a higher level of detail, the fluvial modelling is considered to represent the most accurate assessment of both fluvial and surface water risks in the vicinity of the site in this instance.

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

3.31 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.

3.32 British Geological Survey Mapping indicates that the bedrock geology underlying the site is the London Clay Formation, with no superficial geology present at the site.

3.33 This is a low permeability geology that would not have significant groundwater present thus the risk of flooding occurring due to rising groundwater is considered to be low.

3.34 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.

3.35 Should any sewer or water main on Victoria Road become blocked, burst or overloaded flows would tend to be channeled along Victoria Road without coming northwards towards Block B as this would involve flowing uphill.

3.36 Should any sewer or water main on the school site in the vicinity of Block B become blocked, burst or overloaded flows would tend to run southwards past the block towards the lower car park area of the site without having any significant impact upon the building itself given the raised floor level.

3.37 The overall risk of flooding from blocked, overloaded, or burst sewers and water mains is therefore considered to be low.

3.38 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.

3.39 There are no reservoirs, canals or other artificial sources of flood risk whose failure would be likely to cause flooding at the site under any circumstances.

4 The Proposal

4.1 The proposal involves the demolition of the existing single storey Block B and adjacent temporary classrooms and buildings and replacement with a new two storey block, with copies of the proposed new block floor plans and elevations provided in Appendix 9. The new plant room shown on these plans is not included as part of the current Planning Application but forms part of a separate Planning Application.

4.2 The new block will be located on the site of Block B, with the plan provided in Appendix 10 showing the location of the new building on the topographic survey.

4.3 To ensure that the new classroom is adequately protected against flooding the ground floor level will be set at 35.49m AOD which is over 1m above the modelled 1 in 100 year plus 35% climate change water level of 34.45m AOD, 840mm above the modelled 1 in 100 year plus 70% climate change water level of 34.65m AOD, 150mm above the 1 in 1000 year fluvial flood level of 35.34m AOD, and 20mm above the ground floor level of the existing building to be replaced.

4.4 As detailed in Section 3, surface water flood levels are considered to be similar to fluvial flood levels in extreme events at the site thus the raised floor level proposed is also considered sufficient to adequately protect the replacement building against surface water flooding and ensures that it is better protected than the existing building.

4.5 It is not considered that any further flood resilient or resistant construction is required to protect the replacement building against flooding.

4.6 Given the sites location in a critical drainage area with potential for flooding to occur at the site in a 1 in 100 year plus climate change fluvial flood event/extreme surface water flood event development is required to ensure that there is no loss in flood storage on the site. The 1 in 100 year plus 35% climate change event is usually considered the appropriate design event for flood storage compensation, thus a design water level of 34.45m AOD required consideration in this instance.

4.7 Compensation is normally considered on a level for level basis using 150mm bands, thus in this instance two bands require consideration being 34.15m to 34.30m AOD and 34.30m to 34.45m AOD. No ground raising on ground with existing levels below 34.15m AOD is proposed as part of the planning application thus no lower levels bands require consideration.

4.8 The plan provided in Appendix 10 shows the footprint of the existing buildings to be demolished, proposed building, and the existing 1 in 100 year plus 35% climate change flood line on the topographic survey of this area of the site.

4.9 As shown in magenta in Appendix 10, a 12.8m^2 area at the very southern tip of the replacement building falls outside the footprint of existing buildings on the site and within the current 1 in 100 year plus 35% climate change flood plain. The average level of ground in this area is approximately 24.2m AOD at present, with all existing levels being between 34.15m and 34.3m AOD. As such this part of the proposed building will result in a loss in flood storage of approximately 1.152m^3 in the 34.15m to 34.3m AOD level band, and 1.92m^3 in the 34.30m to 34.45m AOD level band.

4.10 A second area that will be occupied by the replacement building between the main building to be demolished and smaller building to the south to be demolished also falls within the current 1 in 100 year plus 35% climate change flood plain.

4.11 The 40.5m^2 area shown in magenta has existing levels of between 34.15m and 34.3m AOD, and an average level of approximately 34.23m AOD. As such this part of the proposed building will result in a loss in flood storage of approximately 2.835m^3 in the 34.15m to 34.3m AOD level band, and 6.075m^3 in the 34.30m to 34.45m AOD level band.

4.12 The 6.7m^2 area of this shown in red has existing levels of between 34.30m and 34.45m AOD, and an average level of approximately 34.37m AOD. As such this part of the proposed building will result in a loss in flood storage of approximately 0.536m^3 in the 34.30m to 34.45m AOD level band.

4.13 The two areas shown hatched green either side of the southern building to be demolished fall outside of the proposed footprint of the replacement building will be reduced to a maximum level of 34.3m AOD. The total area is 6.5m^2 thus a compensation volume of 0.975m^3 will be provided in the 34.30m to 34.45m AOD level band.

4.14 Limited additional compensation may also be provided at the eastern end of this building where some ground at the gate is just above 34.45m AOD as this will likely be lowered as part of the proposals however this would be a small gain only thus has not been calculated.

4.15 All other areas of the replacement building are either already occupied by existing buildings to be demolished thus would have no impact upon flood storage volume or are located on ground currently above the 1 in 100 year plus 35% climate change water level of 34.45m AOD thus would have no impact upon flood storage.

4.16 In summary based upon the losses and gains detailed in Paragraphs 4.9 to 4.15 above, the construction and demolition works associated with the replacement building will result in a total loss in flood storage of 3.987m^3 in the 34.15m to 34.3m AOD level band, and 7.556m^3 in the 34.30m to 34.45m AOD level band.

4.17 To provide compensation for these losses, an area of the embankment near the artificial grass football centre will be removed, with the 28.1m^2 existing mound in the southeastern corner of the car park shown in red on the plan provided in Appendix 11 lowered to a maximum level of 34.2m AOD. This will provide a compensation volume of approximately 2.81m^3 in the 34.15m to 34.3m AOD level band, and 4.215m^3 in the 34.30m to 34.45m AOD level band.

4.18 A second 27.5m^3 area shown in magenta will also be lowered to a maximum level of 34.25m AOD, providing a compensation volume of approximately 1.375m^3 in the 34.15m to 34.3m AOD level band, and 4.125m^3 in the 34.30m to 34.45m AOD level band.

4.19 Taking into account the proposed compensation areas, there will be an overall gain in flood storage of 0.198m^3 in the 34.15m to 34.3m AOD level band, and 0.784m^3 in the 34.30m to 34.45m AOD level band.

4.20 No excavated material from either of the mound areas will be deposited on land at the school with an existing ground level at or below 34.45m AOD to ensure that the volume of flood storage compensation is provided, with no other raising of ground or structures that are not detailed within this Flood Risk Assessment to be provided on ground below 34.45m AOD as part of this Planning Application.

4.21 This will ensure that there is no loss of flood storage in a 1 in 100 year plus 35% climate change flood event at the site but infact a slight gain in both level bands effected, thus there will be no adverse impact upon the off-site risk of flooding but a slight reduction.

4.22 To ensure that there is no adverse impact upon the off-site risk of flooding as a result of increased discharge rates from the site, particularly given the location in a critical drainage area, surface water drainage has been considered at an early stage and the strategy detailed in Section 5 produced to ensure that the proposed development complies with all relevant local and national guidance.

4.23 Foul drainage will continue to be to the existing foul network serving the school as at present.

5 Sustainable Drainage Strategy

5.1 Point of Discharge, Discharge Rates, and Attenuation Volumes

5.1.1 In line with the Drainage Hierarchy, and the Hillingdon Sustainable Drainage Design and Evaluation Guide, surface water should be discharged to the ground via infiltration systems where feasible. However, the site is underlain by a bedrock geology of the London Clay Formation. This geology has a low permeability and infiltration systems are not considered to provide a feasible method of draining surface water from the site in this instance.

5.1.2 The second preferable method of discharge in line with the Drainage Hierarchy is discharge to a surface watercourse.

5.1.3 The only surface watercourse in the area is the Roxbourne (or eastern arm of Yeading Brook) which is culverted in the area and to which existing surface water from Queensmead School and the roof areas of the buildings to be replaced is drained via the existing surface water sewer system at the school site.

5.1.4 Surface water discharge from the replacement buildings will therefore continue to be to the Roxbourne system via the existing surface water drainage network on site which will have revisions made as necessary to accommodate discharge from the site.

5.1.5 The existing building footprint to be demolished as part of the proposal is approximately 830m^2 (Appendix 7) which is currently positively drained via downpipes to the surface water drainage network serving Queensmead School site.

5.1.6 Micro Drainage calculations (Appendix 12) show that during a 1 in 1 year event the existing discharge rate from the current roof area is 15.1 litres per second (l/s), with the maximum discharge volume being 34.5m^3. During a 1 in 30 year event the rate and volume will increase to 36.6 l/s and 64.0m^3, then increasing to 46.5 l/s and 78.7m^3 during a 1 in 100 year event.

5.1.7 Post development the roof area of the replacement building will be approximately 1,040m^2 (Appendix 10). All external paths and paved areas that will be altered will use permeable paving.

5.1.8 Micro Drainage Calculations (Appendix 13) show that the greenfield run off rate from an area of 0.105Ha is 0.1 l/s during a 1 in 1 year event, rising to 0.4 l/s and 0.5 l/s in 1 in 30 and 1 in 100 year events respectively. The QBAR discharge rate is 0.2 l/s.

5.1.9 In accordance with section 9.5.6 The Hillingdon Sustainable Drainage Design and Evaluation Guide and S3 of the Non-Technical Standards for Sustainable Drainage Systems, brownfield developments should reduce discharge rates to greenfield rates where practicable, however where this is not feasible should restrict discharge rates as close to greenfield rates as is feasible and certainly below existing rates.

5.1.10 The greenfield discharge rate of 0.2 l/s is considered an extremely low discharge rate and below that which can be practicably achieved. A maximum discharge rate of 2.0 l/s is therefore proposed for all events upto and including a 1 in 100 year plus 40% climate change rainfall event, as this will permit the use of a flow control such as a hydrobrake of suitable diameter that the risk of blockage is adequately reduced, whilst permitting an attenuation depth of 400mm to be used which is required due to the limited alterations proposed on the school site outside of the immediate area of the new classroom block.

5.1.11 Reducing discharge rates to 2.0 l/s will provide a significant benefit in frequent events with a 13.1 l/s (or 87%) reduction to existing rates achieved in 1 in 1 year events, a 34.6 l/s (or 95%) reduction to existing rates achieved in a 1 in 30 year event, and a 44.5 l/s (or 96%) reduction to existing rates achieved in a 1 in 100 year event.

5.1.12 Micro Drainage calculations (Appendix 14) show that to achieve this reduction in discharge rates during a 1 in 100 year plus 40% climate change rainfall event an attenuation volume of 52.2m^3 must be incorporated within the surface water drainage systems to be provided at the site.

5.2 SuDS Systems Proposed at Development

5.2.1 Living/green roof systems are a preferred SuDS technique, given that they are a flood reduction measure, reduce pollution through filtration, and provide a landscape and wildlife benefit.

5.2.2 In this instance however living roofs will not prove feasible as the new buildings will have lightweight roof structures thus would not be capable of supporting living roofs.

5.2.3 Basins and ponds are considered preferred SuDS features as they provide both a flood and pollution reduction measure along with landscape and wildlife benefits.

5.2.4 The only available space in which ponds could be located is in the school playing field area, however being a school there are safety considerations relating to the use of open storage areas meaning that they would need to be designed as shallow systems, whilst as the playing field is both at a higher level than the replacement building site and a significant distance from the site it would not be possible to permit gravity from the replacement building to any SuDS features provided in this area.

5.2.5 As such the use of open basins and ponds to provide attenuation is not considered practicable in this instance.

5.2.6 Permeable paving is a SuDS technique that is appropriate to use at most developments, including the proposed development, 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 is passes through the permeable surfacing.

5.2.7 A number of access pathways will require alteration as part of the proposed development, whilst some existing building areas will revert to ground level surfacing or pathways. All such areas that are surfaced to provide pathways/access (some such areas may be grassed/landscaped areas) will use permeable paving to incorporate SuDS into the redevelopment.

5.2.8 The permeable pathways and other external areas that will be altered and remain at ground level post redevelopment will also be used to provide a crated attenuation system using blocks such as aquacell with a 400mm depth and 95% void space to provide attenuation for discharge from the roof areas of the buildings.

5.2.9 To provide the necessary attenuation volume of 52.2m^3 the proposed blanket would require an area of about140m^2. This will likely be located in the vicinity of the new plant room (which is being applied for under a separate application), as indicated on the plan provided in Appendix 10 where a significant area of ground will require resurfacing in association with the demolition and construction works in this area.

5.2.10 As required under 9.5.6 of The Hillingdon Sustainable Drainage Design and Evaluation Guide the attenuation system will be upstream of the 2 l/s flow control and outfall to the existing school drainage network rather than incorporated into the network serving the wider school site.

5.2.11 The use of water re-use/recycling systems such as water butts or greywater systems for toilet flushing will be considered at the detailed design phase once conditional planning permission has been granted. Any such systems provided will not count towards attenuation volumes as they may already be full when an extreme rainfall event occurs (particularly during school holiday periods), thus will overflow to the main attenuation system provided.

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 to the surface water sewer network.

5.3.2 Drainage from all external access areas will be through the permeable paving which provides a filtration system, removing pollutants such as hydrocarbons from surface water prior to discharge.

5.3.3 Surface water from the roofs is considered clean discharge and will be treated by flowing through the membrane such as Terram in which the attenuation blanket will be wrapped prior to discharge.

5.3.4 There are no trafficked areas associated with the proposed redevelopment and thus no areas that require more than one stage of treatment prior to discharge, and all surface water will therefore receive the required number of treatment stages prior to discharge.

5.4 **Maintenance of SuDS Systems**

5.4.1 As the drainage systems serve Queensmead School only Queensmead School will be responsible for the maintenance of the drainage systems.

5.4.2 As part of the detailed drainage design a maintenance plan will be provided for the various SuDS systems at the site to ensure that Queensmead School are aware of their maintenance responsibilities and the actions required to ensure systems continue to operate as designed.

5.5 Full detailed design of the surface water drainage system will only take place once conditional planning approval has been granted, with provision of the full detailed design to be secured by appending a suitable planning condition as part of any planning approval granted.

5.6 This will be based on this outline Sustainable Drainage Strategy, which clearly demonstrates that the proposed development can be drained in accordance with all national and local requirements.

5.7 As post development discharge rates will be limited to a maximum of 2.0l/s during all rainfall events upto and including a 1 in 100 year plus 40% climate change event, this will significantly reduce rates below existing and ensure that the downstream risk of flooding is reduced thus providing a benefit to the wider area and critical drainage area.

6 Assessment

6.1 The proposed redevelopment involves the demolition of Block B of Queensmead School, South Ruslip to provide a two storey classroom block.

6.2 The existing and proposed school use is of a “more vulnerable” use in accordance with the Planning Practice Guidance.

6.3 The wider Queensmead School site is shown on the Environment Agency Flood Map for Planning as lying partially in Flood Zones 1 and 2, with the site of the existing buildings including the replacement building being in Flood Zone 2 and playing field areas being Flood Zone 1.

6.4 “More vulnerable” development is appropriate in Flood Zone 2 subject to the Sequential Test being passed. The Exception Test is not required.

6.5 Sequential Test

6.5.1 The Local Planning Authority are responsible for applying the Sequential Test, with the aim of this test being to where possible locate development in areas at the lowest probability of flooding as stated in Paragraph 101 of the National Planning Policy Framework.

6.5.2 As an extension to an existing school the proposal could not be relocated to another site thus the district wide Sequential Test is passed.

6.5.3 In terms of location of buildings sequentially within the site itself, the replacement building needs to be located in the area of the site in which the existing building is located, as this is the only area in the developed section of the school in which it could be located.

6.5.4 The building could not be provided in the playing field area of the school as it would not relate well to other buildings and would result in a loss of playing field space.

6.5.5 As such it is not possible to relocate the building to another area of the site other than that proposed and therefore the Sequential Test is considered to be passed.

6.6 Based upon the assessment provided in Section 3 there is a limited surface and fluvial flood risks to the southern end of the proposed building in a 1 in 100 year plus climate change fluvial flood event/1 in 100 year surface water event, with a greater risk occurring in a 1 in 1000 year fluvial/surface water events in which the building may be surrounded by ponded water.

6.7 The floor level of the replacement school building will therefore be raised to a minimum floor level of 35.49m AOD which is over 1m above the modelled 1 in 100 year plus 35% climate change water level of 34.45m AOD, 840mm above the modelled 1 in 100 year plus 70% climate change water level of 34.65m AOD, 150mm above the 150mm above the 1 in 1000 year fluvial flood level of 35.34m AOD, and is 20mm above the ground floor level of the existing building to be replaced.

6.8 This will provide sufficient protection against flooding to the building and occupants, and no further flood resistant or resilient construction is considered necessary.

6.9 As detailed in Section 4 and Appendices 10 and 11 the proposed redevelopment will increase the available storage at the site in a 1 in 100 year plus 35% climate change flood event in both effected 150mm flood storage bands, thus there will be no adverse impact upon the off-site risk off flooding associated with a loss in flood storage.

6.10 Post redevelopment surface water discharge rates will be reduced to just 2 l/s in all events upto and including a 1 in 100 year plus 40% climate change rainfall event, as detailed by the outline drainage strategy in Section 5. This will significantly reduce discharge rates below existing, which vary from 15.1 l/s during a 1 in 1 year event to 46.5 l/s during a 1 in 100 year event.

6.11 This will ensure that there is a significant benefit provided to the wider area and reduction to the downstream risk of flooding.

6.12 To achieve this an attenuation volume of 52.2m^3 which will be provided by means of cellular storage such as Aquacell beneath areas adjacent to the building at ground level that will be revised as part of the works associated with demolitions and the replacement building.

6.13 A range of SuDS systems have been considered as detailed in Section 5, with appropriate systems such as permeable paving selected for use at the redevelopment.

6.14 All surface water will be adequately treated prior to discharge via the schools existing surface water drainage network.

6.15 The surface water drainage strategy provided demonstrates that this will be in compliance with all relevant local and national standards can be met, and it is appropriate to secure the full detailed design of the surface water drainage system by means of appending an appropriate drainage condition to any outline approval granted.

6.16 Foul drainage will continue as at present via the existing foul network serving the school.

7 Conclusion

7.1 The proposal involves the redevelopment of Block B of Queensmead School with a new two storey teaching block.

7.2 The proposed extension is of a “more vulnerable” use in accordance with the National Planning Policy Framework and is therefore acceptable in Flood Zone 2 subject to the Sequential Tests being passed, whilst the Exception Test is not required.

7.3 The Sequential Test is passed as detailed in Section 6.5.

7.4 To ensure that the replacement building is adequately protected against flooding the finished floor level will be set at a minimum level of 35.49m AOD. This provides more than 1m freeboard above the 1 in 100 year plus 35% climate change water level, 840mm above the 1 in 100 year plus 70% climate change water level, and 150mm above the 150mm above the 1 in 1000 year fluvial flood level. It will also ensure that the building is adequately protected against potential surface water flooding.

7.5 No further flood resistant or resilient construction is required in this instance.

7.6 There will be no loss in flood storage at the site in a 1 in 100 year plus 35% climate change flood event, with a slight increase in storage provided.

7.7 Post development surface water discharge rates from the roof area of the replacement building will be reduced to 2 l/s during all rainfall events upto and including a 1 in 100 year plus 40% climate change rainfall event. An attenuation volume of 52.8m^3 will be provided to achieve this reduction in discharge rates, with discharge being via the existing surface water drainage system serving this area of the school.

7.8 This represents a significant improvement upon existing discharge rates which are 15.1 l/s during a 1 in 1 year rainfall event and 46.5 l/s during a 1 in 100 year event, and will therefore reduce the downstream risk of flooding.

7.9 Appropriate SuDS systems such as permeable paving will be incorporated in the redevelopment, whilst all surface water will receive sufficient treatment prior to discharge from the site, and Queensmead School (who will be responsible for maintenance of systems) will be provided with a full maintenance plan.

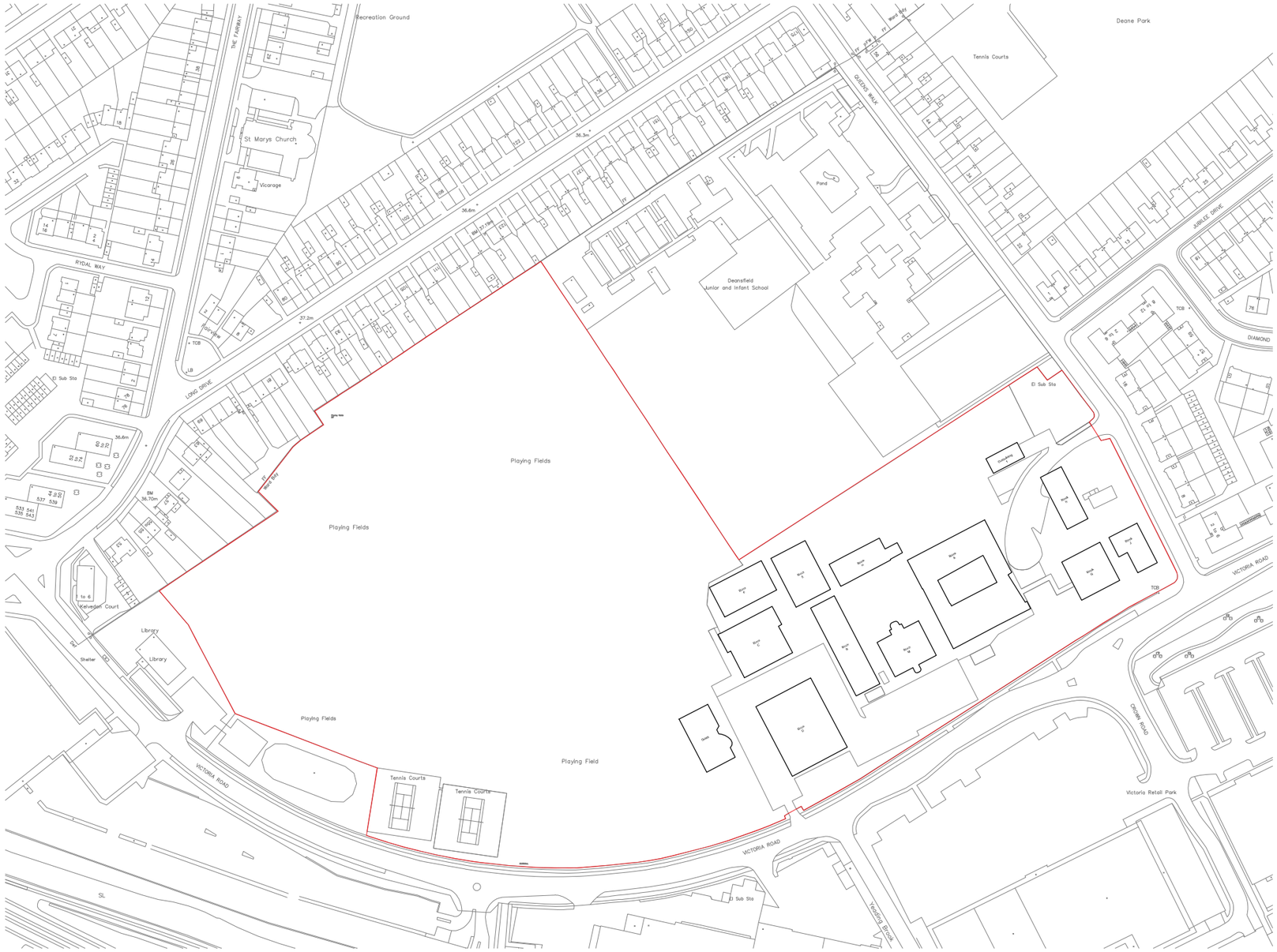
7.10 As fully detailed in Section 5 the proposed surface water drainage system will be fully compliant with all relevant local and national guidance, and it is appropriate to secure provision of the full detailed surface water drainage design by means of appending a suitable planning condition to any approval granted.

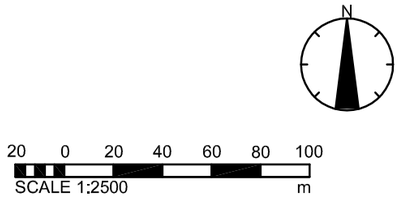
7.11 Foul drainage will continue to be via the existing foul network serving the school.

7.12 The proposal will have no adverse impact upon the off-site risk of flooding whilst the reduction in discharge rates will provide a benefit, and there are no flood risk or drainage related grounds under the National Planning Policy Framework on which to object to the proposed redevelopment of Block B of Queensmead School, Queens Walk, South Ruslip.

APPENDIX 1

SITE LOCATION PLAN





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REV	DESCRIPTION	DATE	BY	CHKD
-	-	00/00/15	XX	XX

ORIGINATOR:

RIDGE
PROPERTY & CONSTRUCTION CONSULTANTS

HARLING HOUSE
47-51 GREAT SUFFOLK STREET
LONDON
SE1 0BS
TEL: 020 7593 3400
FAX: 01993 815001
WWW.RIDGE.CO.UK

CLIENT:
QUEENSMEAD SCHOOL

CONTRACTOR CLIENT:
TBC

PROJECT:
QUEENSMEAD SCHOOL
FEASIBILITY DRAWINGS

TITLE:
EXISTING
SITE PLAN

DRAWN BY: JC
CHECKED BY: LD
SCALE: 1:2500 @ A3
DATE: MAY 2016

STATUS:
PRELIMINARY

DRAWING No: 00

JOB No:	ORG:	ZONE:	LEVEL:	TYPE:	ROLE:	NUMBER:	REV:
5-407	RDG	Z00	00	PL	B	0000	-

APPENDIX 2

SCHOOL BUILDING PLAN

N

10 0 10 20 30 40 50
SCALE 1:1250 m

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REV	DESCRIPTION	DATE	BY	CHKD
-	-	00/00/15	XX	XX

ORIGINATOR:

RIDGE
PROPERTY & CONSTRUCTION CONSULTANTS

HARLING HOUSE
47-51 GREAT SUFFOLK STREET
LONDON
SE1 0BS
TEL: 020 7593 3400
FAX: 01993 815001
WWW.RIDGE.CO.UK

CLIENT:
QUEENSMEAD SCHOOL

CONTRACTOR CLIENT:
TBC

PROJECT:
QUEENSMEAD SCHOOL
FEASIBILITY DRAWINGS

TITLE:
OPTION 2
SITE PLAN

DRAWN BY: JC
CHECKED BY: LD
SCALE: 1:1250 @ A3
DATE: MAY 2016

STATUS:
PRELIMINARY

DRAWING No: 06

JOB No:	ORG:	ZONE:	LEVEL:	TYPE:	ROLE:	NUMBER:	REV:
5-407	RDG	Z00	00	PL	B	0006	-

APPENDIX 3

TOPOGRAPHIC SURVEY

LEGEND

UTILITY LINETYPES

British Telecom		Gas	
Cable Television		Heating Pipes	
Closed Circuit Television		HV Cables	
Communications		Multiple Services Route	
Conduit		Oil	
Drainage - Combined Water		Oxygen	
Drainage - Foul Water		Street Lighting	
Drainage - Surface Water		Telecom Duct - coop	
Empty Duct		Unknown	
Electric		Unknown Cable	
Fire Hydrant Main		Unknown Pipeline	
Fibre Optic		Water	
Gas			

Assumed Service Route - See GENERAL NOTES. (Using abbreviation of service and colour as above)

UTILITY SURVEY INFORMATION

Located by Ground Penetrating Radar	GPR	Unable to Survey	UTS
Area of Concern		Unable to Lift (cover)	UTL
Contracted Survey Area	CSV WELL	Unable to Trace	ID
Previous Survey Area	PSV WELL	Unable to Trace (due to blockage)	BIB
Depth to Top of Service (metres)	(0.60B)	Unable to Trace Further	IBe
		End of Trace	BW

ABREVIATIONS used on a PAS 128 Survey

(0.00-B2P) 0.00M = Depth in metres, B2 = Quality Level, P = Post processed GPR

TOPOGRAPHIC & UTILITY DETAILS

Barrier (symbol - solid)		Post (symbol)	HPO
Bellina Beacon (symbol)		Rain Water Pipe (symbol)	RP
Bollard (symbol)		Road Sign (symbol)	RS
Bosenhole (symbol)		Rodding Eye (symbol)	CRE
British Telecoms IC	BTMH	Sapling (symbol)	
Building (incomplete detail)		Sign Post (symbol)	SP
Cable Into Ground (symbol)		Soak Away	SA
Cable TV Box (symbol)		Spot Height (symbol)	SL
CCTV Camera		Spot Height	50.00
Cover Level in metres	CL 50.00	Stop Cock (symbol)	SC
Direction of Flow (Drainage)		Stop Valve (symbol)	SV
Earth Point (symbol)		Survey Station (symbol)	
Earth Rod (symbol)	ER	Telephone Pole (symbol)	TP
Electric Cabinet	EC	Telephone Box (symbol)	
Electric Pole (symbol)		Traffic Bollard (symbol)	
Electric Sign (symbol)		Tree (dimensions in metres - e.g.)	
Embankment	Bottom of Bank / Top of Bank	Deciduous or Unk. Stem	DB 0.4 TB 7.0
Feeder Pillar	FP	Conifer	CB 0.4 TB 7.0
Fence Line		Stump	
Flag Pole (symbol)		Traffic Light (symbol)	
Flat Roof Level in metres	FRL 50.00	Unknown Valve (symbol)	
Flood Light (symbol)		Vent Pipe (symbol)	
Gas Valve (symbol)		Wall	
Gate	Gate / Gate	Waste Pipe (symbol)	
Ground Level in metres	GL 50.00	Water Meter (symbol)	
Gully	GULLY	Water Valve (symbol)	
Inspection Cover	IC		
Invert Level in metres	IL 50.00	Building Canopy	
Junction Box - BT	JB BT	Cladding	
Junction Box - Comms	JB COM	Drainage Channel	
Junction Box - Elec	JB	Drop Kerb (level in metres)	50.00
Lamp Post (symbol - sized)		Edge Detail (level in metres)	50.00
Light Bollard (symbol)		Footpath (level in metres)	50.00
Light in ground (symbol)		Fence	
Manhole	MH	Horse Fence	
Manhole Capped Port		Kerb channel (level in metres)	50.00
Parapet Level in metres	PL 50.00	Kerb top (level in metres)	50.00
Pipe Diameter in millimetres	Ø100	Overhead Service Line	
Pipe into Ground (symbol)		Pedestrian Railing	

GENERAL NOTES

Utilities may continue outside of the survey area. Any paint marks outside of the area are for investigative purposes only and may not represent the full extent of the sub-surface utilities.

Only sub-surface utility information is provided. Above ground utility information may be shown where it assists with positional referencing.

Where logic indicates a utility exists but which cannot be positively confirmed with the information provided by the utilities, it is shown as a dashed line. Such dashed lines have been highlighted with a background yellow colour for visual enhancement.

SUMO does not procure statutory or private source utility information as part of its detection service nor does it record any such information in a utility survey unless otherwise noted. *Statutory plans should be consulted to supplement this survey.*

Vertical & Horizontal Position - Vertical position (depth) is indicative to the top of the utility/feature and is recorded as DTS (depth to top of service) and should not be taken as exact. Where depth information from the technology is unclear, depth is not shown. Drains may have been detected using threading and the depth indicated could be between the top and the bottom of the drain. Horizontal position is indicative to the centre of the utility/feature and should not be taken as exact.

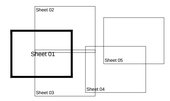
Warranty - Biodegradable paints are used to mark-out the position of the utilities. Before long exposure to the elements and weather depending on ground, weather and traffic conditions. No warranty is given in respect of the durability of the paint markings and that they are a complete representation of the utilities therefore this drawing should be used as the primary reference for the survey results.

This drawing does not provide an absolute representation of the sub-surface. Utilities have been detected using non-invasive technologies only and the performance can be adversely affected by ground, weather and site conditions outside of SUMO's control therefore some utilities may be undetectable. While SUMO uses reasonable endeavours to detect all utilities it does not warrant that 100% detection will be achieved and that approximate depth penetration of the technologies will be greater than two metres.

Sewer and manhole details shown on this drawing have been obtained by observation and measurement from the surface and as such cannot be guaranteed. Where precise sewer details will be critical to the project design Sumo would recommend that entry into the chamber be undertaken using a specialist team, appropriately qualified for confined space entry. These teams can be supplied on request.

Irrespective of the information provided by a utility survey and statutory plans, excavation work should be undertaken with extreme caution and in accordance with HSE Guidelines - HSG47 Avoiding Danger from Underground Services

SHEET LAYOUT



Rev	Notes	Drawn	Date

Notes:

Survey is referenced to OS Grid and Level Datum.

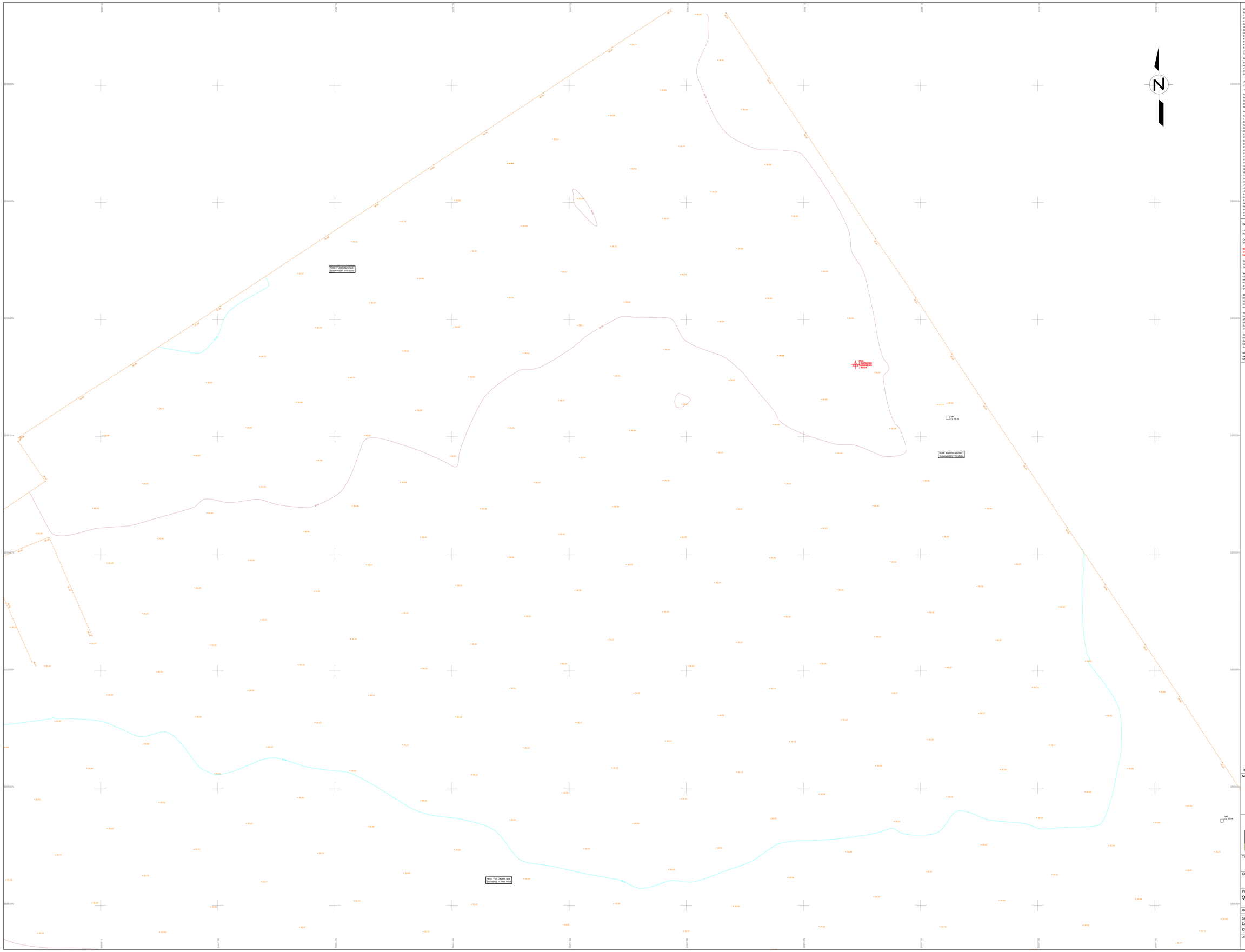
SUMO SERVICES Ltd
8 HAYWARD BUSINESS CENTRE
NEW LANE
HEDGE END
HAMPSHIRE
PO9 2NL
TEL: 0845 456 1104
FAX: 0845 406 0653
www.sumoservices.com

Title: Topographical Details

Client: Queensmean School

Project: Queensmead School, Queens Walk, South Ruislip.

Date Completed:	11/05/2018	Post Code:	HA4 0LS
Surveyed:	JHG, CW	Scale:	1/200 (A0 Sheet)
Drawn:	AKS		
Checked:	JHG, CW		
Job No: SOR012746		Dwg No: 01	Rev:



LEGEND

UTILITY LINETYPES

British Telecom
Cable Television
Closed Circuit Television
Communications
Cycle Route
Drainage - Combined Water
Drainage - Foul Water
Drainage - Surface Water
Empty Duct
Electric
Fire Hydrant Main
Fibre Optic
Gas
Assumed Service Route - See GENERAL NOTES
(Using abbreviation of service and colour as above)

Gas
Heating Pipes
HV Cables
Multiple Services Route
Oil
Oxygen
Street Lighting
Traffic Signal Loop
Unknown
Unknown Cable
Unknown Pipeline
Water

UTILITY SURVEY INFORMATION

Located by Ground Penetrating Radar	GPR	Unable to Survey	UTS
Area of Concern		Unable to Lift (cover)	UTL
Contracted Survey Area	CSV-WELL	Unable to Trace	IEO
Previous Survey Area	PSV-WELL	Unable to Trace (due to blockage)	IBL
Depth to Top of Service (metres)	(0.60d)	Unable to Trace Further	IRe
		End of Trace	IBe

ABREVIATIONS used on a PAS 128 Survey

(0.60d-B2P) 0.60d = Depth in metres, B2 = Quality Level, P = Post processed GPR

TOPOGRAPHIC & UTILITY DETAILS

Barrier (symbol - solid)		Post (symbol)	HPO
Bellina Beacon (symbol)	BB	Rain Water Pipe (symbol)	RP
Bollard (symbol)	B	Road Sign (symbol)	RS
Bosenhole (symbol)		Rodding Eye (symbol)	CRE
British Telecoms IC	BTMH	Sapling (symbol)	
Building (incomplete detail)		Sign Post (symbol)	SP
Cable into Ground (symbol)		Soak Away	SA
Cable TV Box (symbol)		Spot Height (symbol)	50.00
CCTV Camera		Spot Height	
Cover Level in metres	CL 50.00	Stop Cock (symbol)	SC
Direction of Flow (Drainage)		Stop Valve (symbol)	SV
Earth Point (symbol)		Survey Station (symbol)	
Earth Rod (symbol)	ER	Telephone Pole (symbol)	
Electric Cabinet	EC	Telephone Box (symbol)	
Electric Pole (symbol)		Traffic Bollard (symbol)	
Electric Sign (symbol)		Tree (dimensions in metres - e.g.)	Dia 10.0 Ht 15.0 Spd 7.0
Embankment	Bottom of Slope, Top of Slope	Diameter at 1m (tree) Height Spread	
Feeder Pillar	FP		
Fire Hydrant	FH		
Flag Pole (symbol)		Traffic Light (symbol)	
Flat Roof Level in metres	FRL 50.00	Unknown Valve (symbol)	UV
Flood Light (symbol)		Vent Pipe (symbol)	
Gas Valve (symbol)		Wall	
Gate		Waste Pipe (symbol)	WP
Ground Level in metres	GL 50.00	Water Meter (symbol)	WM
Gully	GULLY	Water Valve (symbol)	WV
Inspection Cover	IC		
Invert Level in metres	IL 50.00	Building Canopy	
Junction Box - BT	JB BT	Cycle Rack	
Junction Box - Comms	JB COM	Drainage Channel	
Junction Box - Elec	JB	Drop Kerb (level in metres)	DK 50.00
Lamp Post (symbol - sized)		Edge Detail (level in metres)	ED 50.00
Light Bollard (symbol)		Footpath (level in metres)	FP 50.00
Light in ground (symbol)		Fence	
Manhole	MH	Heras Fence	
Manhole Capped Port		Kerb channel (level in metres)	KC 50.00
Parapet Level in metres	PL 50.00	Kerb top (level in metres)	KT 50.00
Pipe Diameter in millimetres	(Ø150)	Overhead Service Line	
Pipe into Ground (symbol)		Pedestrian Railing	

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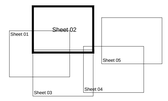

Rev	Notes	Drawn	Date

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Title:
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Client:
Queensmean School

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Queensmead School, Queens Walk, South Ruislip.

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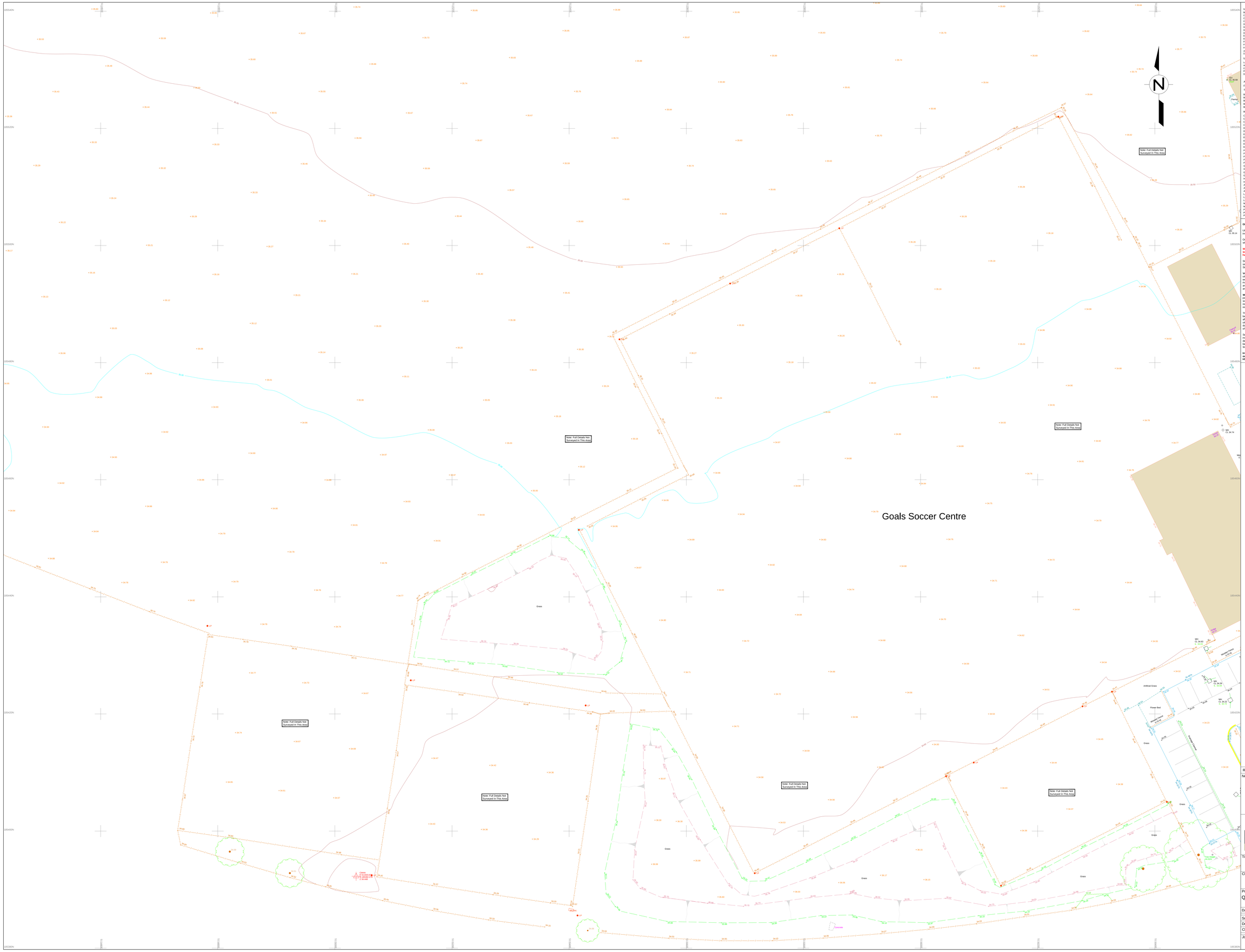
Checked:	JHG, CW		

Job No:	Dwg No:	Rev:
SOR012746	02	



LEGEND

UTILITY LINETYPES

British Telecom
Cable Television
Closed Circuit Television
Communications
Drainage
Drainage - Combined Water
Drainage - Foul Water
Drainage - Surface Water
Empty Duct
Electric
Fire Hydrant Main
Fibre Optic
Gas
Assumed Service Route - See GENERAL NOTES
(Using abbreviation of service and colour as above)

Gas
Heating Pipes
HV Cables
Multiple Services Route
Oil
Oxygen
Street Lighting
Traffic Signal Loop
Unknown
Unknown Cable
Unknown Pipeline
Water

UTILITY SURVEY INFORMATION

Located by Ground Penetrating Radar	GPR	Unable to Survey	UTS
Area of Concern		Unable to Lift (cover)	UTL
Contracted Survey Area	CSA	Unable to Trace	ECD
Previous Survey Area	PSA	Unable to Trace (due to blockage)	BLK
Depth to Top of Service (metres)	(0.60m)	Unable to Trace Further	Rw
		End of Trace	Rw

ABREVIATIONS used on a PAS 128 Survey

(0.60-B2P) 0.60m = Depth in metres, B2 = Quality Level, P = Post processed GPR

TOPOGRAPHIC & UTILITY DETAILS

Barrier (symbol - solid)		Post (symbol)	HPO
Bellina Beacon (symbol)		Rain Water Pipe (symbol)	RP
Bollard (symbol)		Road Sign (symbol)	RS
Bosenhole (symbol)		Rodding Eye (symbol)	CRE
British Telecoms IC	BTIsm	Sapling (symbol)	
Building (incomplete detail)		Sign Post (symbol)	SP
Cable Into Ground (symbol)		Soak Away	SA
Cable TV Box (symbol)		Spot Height (symbol)	50.00
CCTV Camera		Spot Height	50.00
Cover Level in metres	CL 50.00	Stop Cock (symbol)	SC
Direction of Flow (Drainage)		Stop Valve (symbol)	SV
Earth Post (symbol)	EP	Survey Station (symbol)	
Earth Rod (symbol)	ER	Telephone Pole (symbol)	TP
Electric Cabinet	EC	Telephone Box (symbol)	
Electric Pole (symbol)		Traffic Bollard (symbol)	
Electric Sign (symbol)		Tree (dimensions in metres - e.g.)	15
Embankment		Deciduous or Conif. Dead	DB 3.5
Feeder Pillar	FP	Deciduous Conifer	DB 3.5
Fence (symbol)		Hedge	HDG 2
Flag Pole (symbol)		Traffic Light (symbol)	
Flat Roof Level in metres	FRL 50.00	Unknown Valve (symbol)	
Flood Light (symbol)		Vent Pipe (symbol)	
Gas Valve (symbol)		Wall	
Gate		Waste Pipe (symbol)	WP
Ground Level in metres	GL 50.00	Water Meter (symbol)	
Gully	GULLY	Water Valve (symbol)	WV
Inspection Cover	IC		
Invert Level in metres	IL 50.00	Building Canopy	
Junction Box - BT	JB BT	Concrete	
Junction Box - Comms	JB COM	Drainage Channel	
Junction Box - Electric	JB	Drop Kerb (level in metres)	DK 50.00
Lamp Post (symbol - sized)		Edge Detail (level in metres)	ED 50.00
Light Bollard (symbol)		Footpath (level in metres)	FP 50.00
Light in ground (symbol)		Kerbs	
Manhole	MH	Metal Fence	
Pipe Cap/ Capped Port		Kerb channel (level in metres)	KC 50.00
Parapet Level in metres	PL 50.00	Kerb top (level in metres)	KT 50.00
Pipe Diameter in millimetres	Ø100	Overhead Service Line	
Pipe into Ground (symbol)		Pedestrian Railing	

GENERAL NOTES

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Warranty - Biodegradable paints are used to mark-out the position of the utilities. Before long exposure to the elements, depending on ground, weather and traffic conditions, no warranty is given in respect of the durability of the paint markings and that they are a complete representation of the utilities therefore this drawing should be used as the primary reference for the survey results.

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SHEET LAYOUT

Sheet 01
Sheet 02
Sheet 03
Sheet 04
Sheet 05

Rev	Notes	Drawn	Date

Notes:

Survey is referenced to OS Grid and Level Datum.

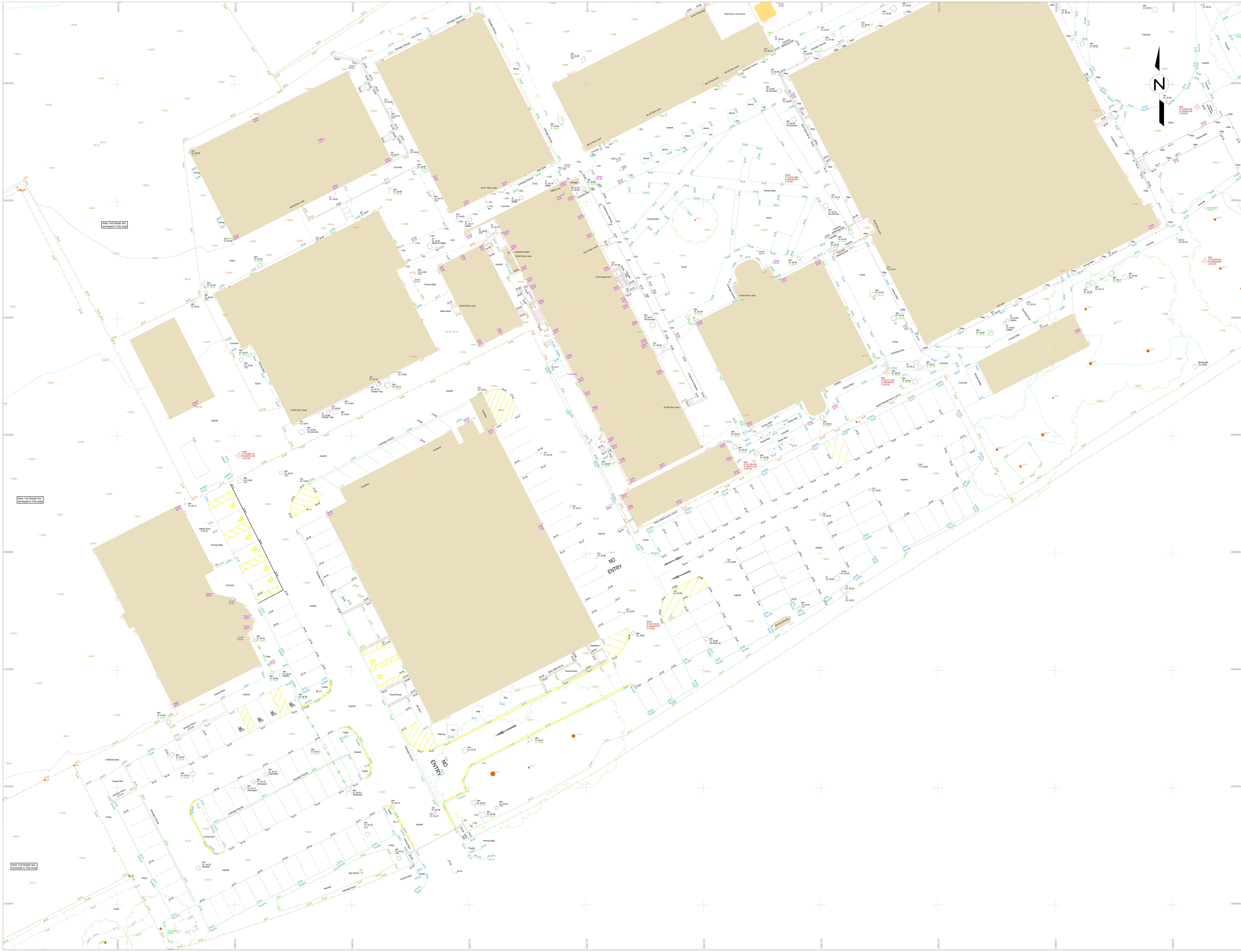
SUMO SERVICES Ltd
8 HAYWARD BUSINESS CENTRE
NEW LANE
HAVANT
HAMPSHIRE
PO9 2NL
TEL: 0845 458 1104
FAX: 0845 408 0653
www.sumoservices.com

Title: Topographical Details

Client: Queensmean School

Project: Queensmead School, Queens Walk, South Ruislip.

Date Completed:	11/05/2018	Post Code:	HA4 0LS
Surveyed:	JHG, CW	Scale:	1/200 (A0 Sheet)
Drawn:	AKS		
Checked:	JHG, CW		
Job No: SOR012746		Dwg No: 03	Rev:



LEGEND

UTILITY LINETYPES

British Telecom
Cable Television
Closed Circuit Television
Communications
Drainage
Drainage - Combined Water
Drainage - Foul Water
Drainage - Storm Water
Empty Duct
Electric
Fire Hydrant Main
Fibre Optic
Fuel
Gas
Heating Pipes
HV Cables
Multiple Services Route
Oil
Oxygen
Street Lighting
Traffic Signal Loop
Unknown
Unknown Cable
Unknown Pipeline
Water
Assumed Service Route - See GENERAL NOTES (Using abbreviation of service and colour as above)

UTILITY SURVEY INFORMATION

Located by Ground Penetrating Radar	GPR	Unable to Survey	UTS
Area of Concern		Unable to Lift (cover)	UTL
Contracted Survey Area	SVY AREA	Unable to Trace	U
Previous Survey Area	PREVIOUS	Unable to Trace (due to blockage)	B
Depth to Top of Service (metres)	(0.60d)	Unable to Trace Further	F
		End of Trace	E

ABREVIATIONS used on a PAS 128 Survey

(0.65d B2P) 0.65d = Depth in metres, B2 = Quality Level, P = Post processed GPR

TOPOGRAPHIC & UTILITY DETAILS

Barrier (symbol - sized)		Post (symbol)	PO
Belisha Beacon (symbol)		Rain Water Pipe (symbol)	RWP
Bollard (symbol)	B	Road Sign (symbol)	RS
Borehole (symbol)		Rodding Eye (symbol)	RE
British Telecoms IC	BTMH	Sapling (symbol)	
Building (incomplete detail)		Sign Post (symbol)	SP
Cable into Ground (symbol)		Soak Away	SA
Cable TV Box (symbol)		Spot Light (symbol)	SL
CCTV Camera		Spot Height	50.00
Cover Level in metres	CL 50.00	Stop Cock (symbol)	SC
Direction of Flow (Drainage)		Stop Valve (symbol)	SV
Distribution Board (symbol)	DB	Survey Station (symbol)	
Earth Rod (symbol)	ER	Telephone Pole (symbol)	TP
Electric Cabinet	EC	Telephone Box (symbol)	
Electric Pole (symbol)	EP	Traffic Bollard (symbol)	
Electric Sign (symbol)		Tree (dimensions in metres - e.g.) Diameter at 1mh: (bole) Height: Spread: Species:	Dia: 0.3 Sp: 7.5 Ht: 10.2 Maple
Embankment			
Feeder Pillar	FP	Traffic Light (symbol)	
Fire Hydrant	FH	Unknown Valve (symbol)	UV
Flag Pole (symbol)	FP	Vent Pipe (symbol)	VP
Flat Roof Level in metres	FRL 50.00	Wall	
Flood Light (symbol)	FL	Waste Pipe (symbol)	WP
Gas Valve (symbol)	GV	Water Meter (symbol)	WM
Gate	Single / Double	Water Valve (symbol)	WV
Ground Level in metres	GL 50.00		
Gulley	GU	Building Canopy	
Inspection Cover	IC	Crash Barrier	
Invert Level in metres	IL 50.00	Drainage Channel	
Junction Box - BT	JB BT	Drop Kerb (level in metres)	50.00
Junction Box - Comms	JB COM	Edge Detail (level in metres)	50.00
Junction Box - Elec	JB	Footpath (level in metres)	50.00
Lamp Post (symbol - sized)	LP	Fence	
Light Bollard (symbol)	LB	Heras Fence	
Light in ground (symbol)		Kerb channel (level in metres)	50.00
Manhole	MH	Kerb top (level in metres)	50.00
Manhole Capped Port		Overhead Service Line	
Parapet Level in metres	PL 50.00	Pedestrian Railing	
Pipe Diameter in millimetres	Ø 100		
Pipe into Ground (symbol)			

GENERAL NOTES

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Sheet 02
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Sheet 03

Rev	Notes	Drawn	Date

Notes:

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SUMO SERVICES Ltd
8 HAYWARD BUSINESS CENTRE
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Title: Topographical Details

Client: Queensmean School

Project: Queensmead School, Queens Walk, South Ruislip.

Date Completed:	11/05/2018	Post Code:	HA4 0LS
Surveyed:	JHG, CW	Scale:	1/200 (A0 Sheet)
Drawn:	AKS		
Checked:	JHG, CW		
Job No:	SOR012746	Dwg No: 04	Rev:

LEGEND

UTILITY LINETYPES

British Telecom	Gas
Cable Television	Heating Pipes
Closed Circuit Television	HV Cables
Communications	Multiple Services Route
Drainage	Oil
Drainage - Combined Water	Oxygen
Drainage - Foul Water	Street Lighting
Drainage - Storm Water	Traffic Signal Loop
Empty Duct	Unknown
Electric	Unknown Cable
Fire Hydrant Main	Unknown Pipeline
Fibre Optic	Water
Fuel	

Assumed Service Route - See GENERAL NOTES (Using abbreviation of service and colour as above)

UTILITY SURVEY INFORMATION

Located by Ground Penetrating Radar	GPR	Unable to Survey	UTS
Area of Concern		Unable to Lift (cover)	UTL
Contracted Survey Area	SVY AREA	Unable to Trace	U
Previous Survey Area	PREVIOUS	Unable to Trace (due to blockage)	B
Depth to Top of Service (metres)	(0.60d)	Unable to Trace Further	F
		End of Trace	E

ABREVIATIONS used on a PAS 128 Survey
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Direction of Flow (Drainage)		Stop Valve (symbol)	SV
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Earth Rod (symbol)	ER	Telephone Pole (symbol)	TP
Electric Cabinet	EC	Telephone Box (symbol)	
Electric Pole (symbol)	EP	Traffic Bollard (symbol)	
Electric Sign (symbol)		Tree (dimensions in metres - e.g.) Diameter at 1mh: (bole) Height: Spread: Species:	Dia: 0.3 Sp: 7.5 Ht: 10.2 Maple
Embankment			
Feeder Pillar	FP	Traffic Light (symbol)	
Fire Hydrant	FH	Unknown Valve (symbol)	UV
Flag Pole (symbol)	FP	Vent Pipe (symbol)	VP
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Invert Level in metres	IL 50.00	Drainage Channel	
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Lamp Post (symbol - sized)	LP	Fence	
Light Bollard (symbol)	LB	Heras Fence	
Light in ground (symbol)		Kerb channel (level in metres)	50.00
Manhole	MH	Kerb top (level in metres)	50.00
Manhole Capped Port		Overhead Service Line	
Parapet Level in metres	PL 50.00	Pedestrian Railing	
Pipe Diameter in millimetres	Ø100		
Pipe into Ground (symbol)			

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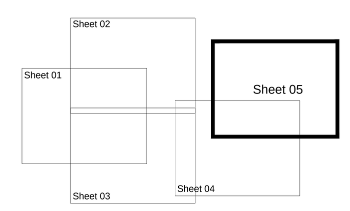
SHEET LAYOUT



Rev	Notes	Drawn	Date

Notes:

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Drawn:	AKS		
Checked:	JHG, CW		
Job No:	SOR012746	Dwg No: 05	Rev:

APPENDIX 4

DRAINAGE SURVEY

SERVICES KEY

- BT Cables
- BT Cables — Overhead
- THUS Telecom
- Electricity Cables
- Gas Pipes
- Lighting Cables
- Lighting Cables — Overhead
- Multiple Service Duct
- Unknown Service
- Sewer Pipe
- Water Mains
- Water Mains — Assumed Route

EOS	End Of Signal — Unable to trace further
EOT	End Of Trace — Service exits boundary of survey
UTR	Unable to Raise Manhole cover

Please note that it was not possible to locate the complete water/gas distribution network within the site This drawing shows details of services located/traced on site. Please note that other services may exist on site. Please refer to stautory record drawings for further details.

Note:

1. All information has been overlaid onto a topographic survey drawing. All levels and coordinates are relative to Ordnance Survey grid and datum.

2. Electro-detection and ground probing radar (GPR) techniques have been used in the location of underground services. The results are not infallible and trial excavations must be carried out to confirm service identification, position and depths.

It is essential to note that it is not possible to trace all services on a site other than by physically exposing them. On sites which have a long history of different building phases and development or which are relatively restricted there are limitations due to the number of redundant services in the ground, the close proximity of different services and the number of times the ground has been disturbed. Whilst Radio Detection and Ground Penetrating Radar are very useful they both have their limitations, notably:

Radio Detection:

A) Can only trace metallic services.
B) Difficult to distinguish between services unless a positive trace signal can be applied at a stop valve or similar and even then a signal can be transferred on to adjacent pipes or cables. It may not be possible to seperate services that are close together as their is no discernable signal change. Thus it should be assumed that there is the possibility that each line denoting a single cable/pipe is possibly more than one cable/pipe.
C) Difficult to resolve signals within 1m of buildings, walls, parked cars etc.

GPR:

A) Depth penetration limited to 3m and resolution is poor below 1.5m.
B) Resolution in made up ground, waterlogged ground or that which has been previously disturbed may be poor.
C) Unable to distinguish between services.
D) Unable to be used on rough ground

3. Although all reasonable effort has been made on site and in searching available record drawings the completeness of the underground services information cannot be guaranteed. Loy Surveys Ltd will not accept liability for pipes or cables which have not been detected

4. Where no depth of service is shown it has not been possible to accurately measure the depth of the service. As such extreme care should be exercised in these areas.

Road · Kerb · Drop Kerb · Surface · Fence · Wall · Verge · Terrain Break · Waterline · Ditch · Pipe · Open Drain · Railway · Overhead Electric · Overhead Telecom · Boundary

Building · Open Sided Building · Minor Building · Roofline · Foundations

Contours

NOTE: All contours marked as dashed are indicative only.

FOLIAGE

- Bush
- Individual Deciduous Tree Trunk Diameter Greater Than 0.3m
- Individual Coniferous Tree Trunk Diameter Greater Than 0.3m
- Stump
- Foliage Line
- Hedge
- Group of Trees or Saplings.

SYMBOLS

Stn 10 10.00	Control Station	Inv 10.00	Invert Level
10.00 +	Spot Level	B.Lev 10.00	Bed Level
TH 10.00	Threshold Level	T.Pit	Trial Pit
B.Hole 10.00	Borehole	Eave 10.00	Eave Level
W.Lev 10.00	Water Level	Ridge 10.00	Ridge Level

DRAINAGE

+ Buc	Buchan Trap	+ G	Gulley
o DP	Down Pipe	+ KO	Kerb Outlet

SERVICES

+ AV	Air Valve	+ MK	Marker
+ A/C	Air Conditioning Unit		Metal Cover
+ BT	British Telecom	MH CL 10.00	Manhole Cover Level
+ CCTV	Close Circuit Television	+ RE	Rodding Eye
+ ER	Earthing Rod	+ SC	Stop Cock
+ EB	Electricity Box	+ SV	Stop Valve
● EP	Electricity Pole	● TP	Telegraph Pole
+ FH	Fire Hydrant	+ Vent	Vent
+ GV	Gas Valve	+ WM	Water Meter
+ IC	Inspection Cover	+ CA	Cable Television

STREET FURNITURE

●	Bollard	O PB	Post Box
● BS	Bus Stop	O	Post / Gate Post
+ JB	Junction Box	+ RP	Reflector Post
● LP	Lamp Post	● RS	Road Sign
+ L	Lighting	● Sign	Sign (Misc.)
⊠	Lit Bollard	+ Stay	Stay
+ LB	Litter Bin	+ Tap	Tap
+ PM	Parking Meter	+ TCB	Telephone Call Box
O MR	Mooring Ring	● TL	Traffic Light

Accuracy commensurate with scale of drawing.

NOTE : 1. Grid based on OS National Grid, derived from OSTN-02.
2. Levels are relative to OS Datum, derived from OSGM-02.

Revision	Description	Date

Contract Title

Queensmead
High School

Plot Title

Underground Services
Survey
(Sheet 1 of 2)

Surveyor	Checked by	Contract No.	Scale	Date
NC	GC	32247	1:200	Aug 2015

London Borough of Hillingdon
Civic Centre, 4N/05
High Street, Uxbridge
London UB8 1UW
01895277933

Loy Surveys
Chartered Land Surveyors
1 Paisley Road Renfrew PA4 8JH
(T)0800 833 312
(F)0800 838 214 (E)survey@loy.co.uk (W)www.loy.co.uk

APPENDIX 5

ENVIRONMENT AGENCY FLOOD MAP FOR PLANNING

Flood map for planning

Your reference	Location (easting/northing)	Created
2153	**511813/185509**	**20 Jun 2018 3:20**

Your selected location is in flood zone 2, an area with a medium probability of flooding.

This means:

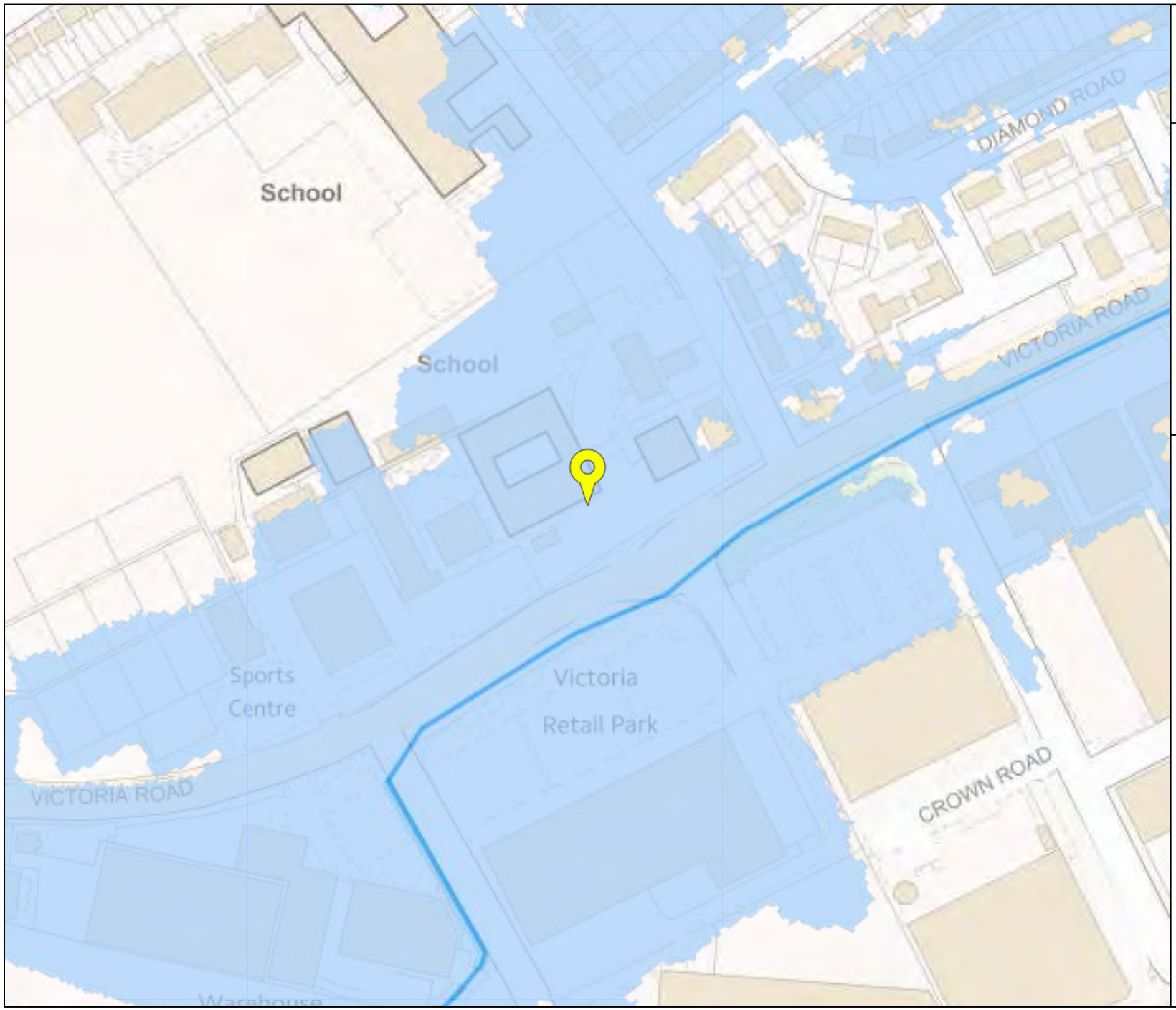
- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

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.

The Open Government Licence sets out the terms and conditions for using government data. https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/



Environment Agency

Flood map for planning

Your reference
2153

Location (easting/northing)
511813/185509

Scale
1:2500

Created
20 Jun 2018 3:20

- 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

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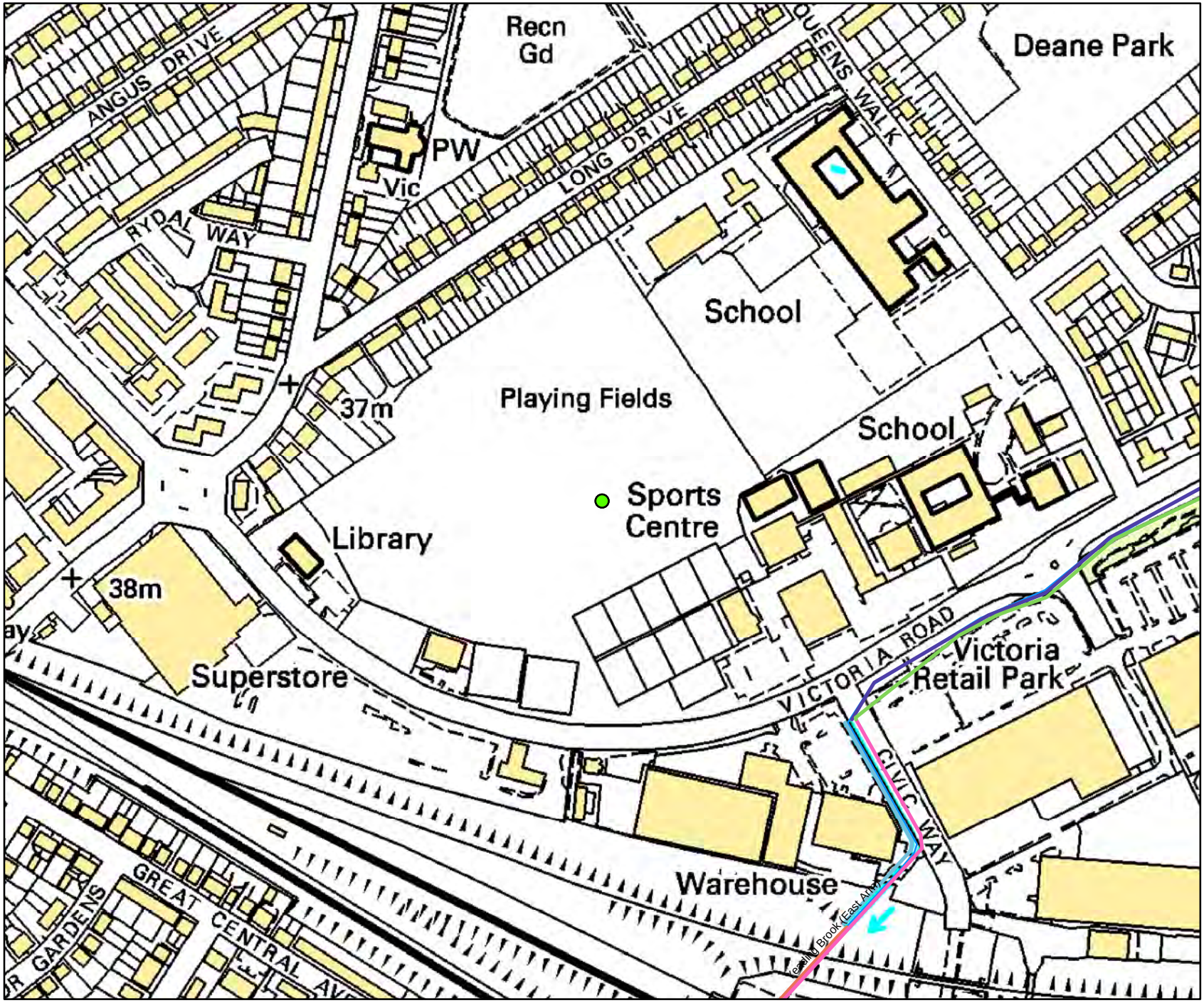
APPENDIX 6

ENVIRONMENT AGENCY MODELLED AND HISTORICAL FLOOD DATA

Structures and Defences centred on Queendmead School, Queens Walk, South Ruislip, HA4 0LS - 24/03/2018 - HNL82734BC



Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 45 90 180
Metres

Legend

Main Rivers

ASSET_ID

- 32399
- 32400
- 42577
- 154819
- 154820

The following information on defences has been extracted from the Asset Information Management System (AIMS)

Produced by:
Partnerships & Strategic Overview,
Hertfordshire & North London

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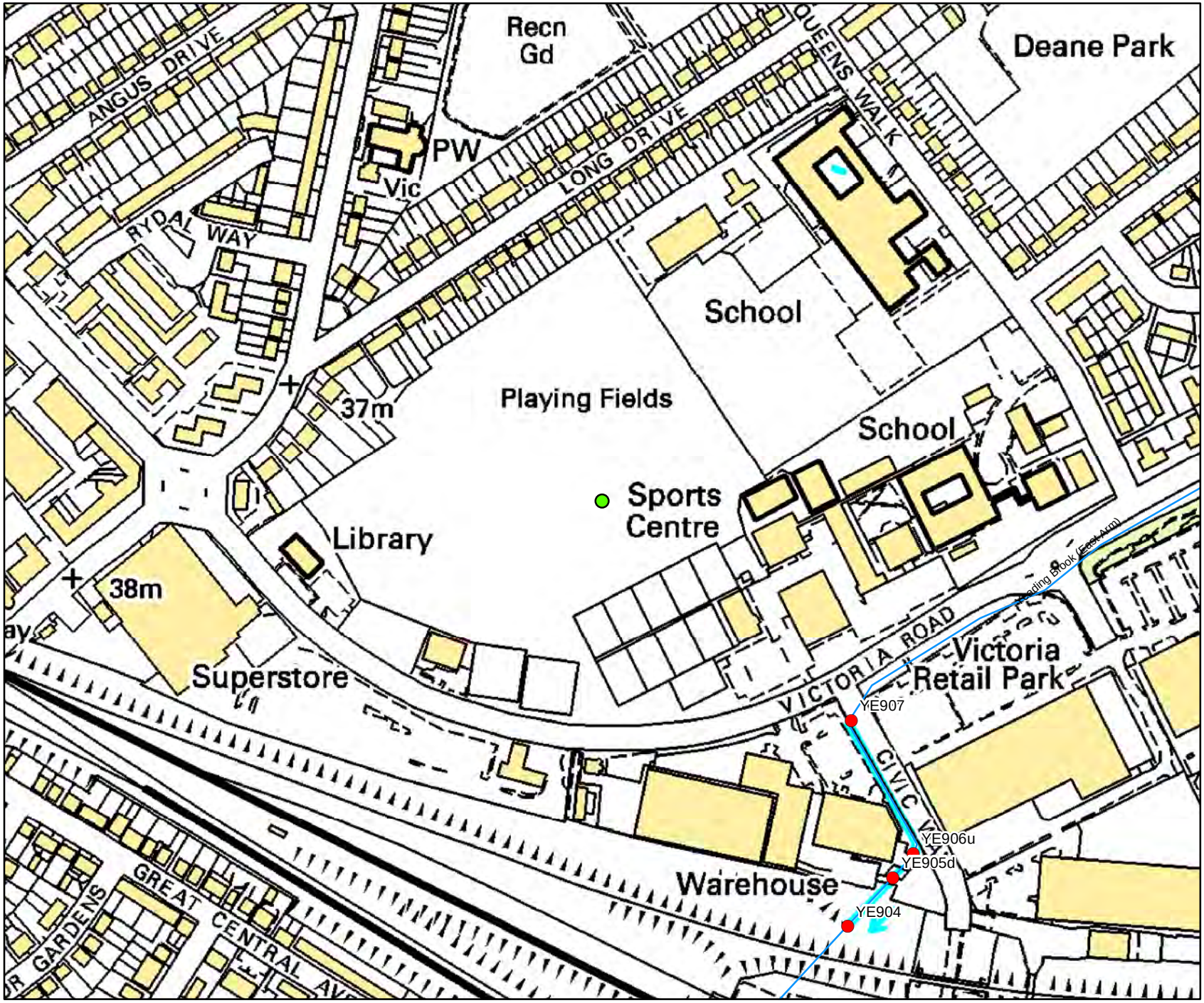
Environment Agency ref: HNL82734BC

The following information on defences has been extracted from the Asset Information Management System (AIMS)

Defences

Asset ID	Asset Type	Asset Protection	Asset Comment	Asset Description	Design Standard of protection (years)	Downstream Crest Level	Upstream Crest Level	Condition of Defences (1=Good, 5 = Poor)
42577	simple_culvert	fluvial	Brick barrel culvert with cast insitu concrete extension to U/S end built to the same dimensions. Concrete headwalls and wingwalls U/S, Brick D/S.	Railway Culvert	100	No data	No data	3
154819	high_ground	fluvial	Cast insitu concrete channel walls with railing and Crash barrier to crest.	Lined Channel	2	35.55	34.23	2
154820	high_ground	fluvial	Earth banks, probably backed by retaining wall to protect retail park.	Natural Bank	2	35.98	34.24	3
32400	simple_culvert	fluvial	Concrete box culvert with concrete headwall and wingwalls U/S and D/S. U/S end protected by Field End screen	Victoria Road Culvert	200	No data	No data	2
32399	high_ground	fluvial	Left bank of Culvert	Left bank of Victoria Road Culvert	100	No data	No data	No data

Detailed FRA centred on Queendmead School, Queens Walk, South Ruislip, HA4 0LS - 24/03/2018 - HNL82734BC



Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 45 90 180
Metres

Legend

Main Rivers

1D Node Results

Node Results

The data in this map has been extracted from the River Crane Mapping Study (Halcrow 2008).
This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites withinthe catchment.
Modelled outlines take into account catchment wide defences.
Flood risk data requests including an allowance for climate change will be based on the 1 in 100 flood plus 20% allowance for climate change, unless otherwise stated. You should refer to 'Flood risk assessments: climate change allowances' to check if this allowance is still appropriate for the type of development you are proposing and its location. You may need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence. https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Produced by:
Partnerships & Strategic Overview,
Hertfordshire & North London

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Environment Agency ref: HNL82734BC

The following information has been extracted from the River Crane Mapping Study (Halcrow 2008)

Flood risk data requests including an allowance for climate change will be based on the 1 in 100 flood plus 20% allowance for climate change, unless otherwise stated. You should refer to 'Flood risk assessments: climate change allowances' to check if this allowance is still appropriate for the type of development you are proposing and its location. You may need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence.
https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Caution:
The modelled flood levels and extents are appropriate for catchment wide strategic flood risk mapping. However, for more detailed flood risk assessment it is recommended that each of the underlying flood mapping, hydraulic modelling and hydrological assumptions are re-evaluated to determine the appropriateness in a more detailed analysis.

All flood levels are given in metres Above Ordnance Datum (mAOD)
All flows are given in cubic metres per second (cumecs)

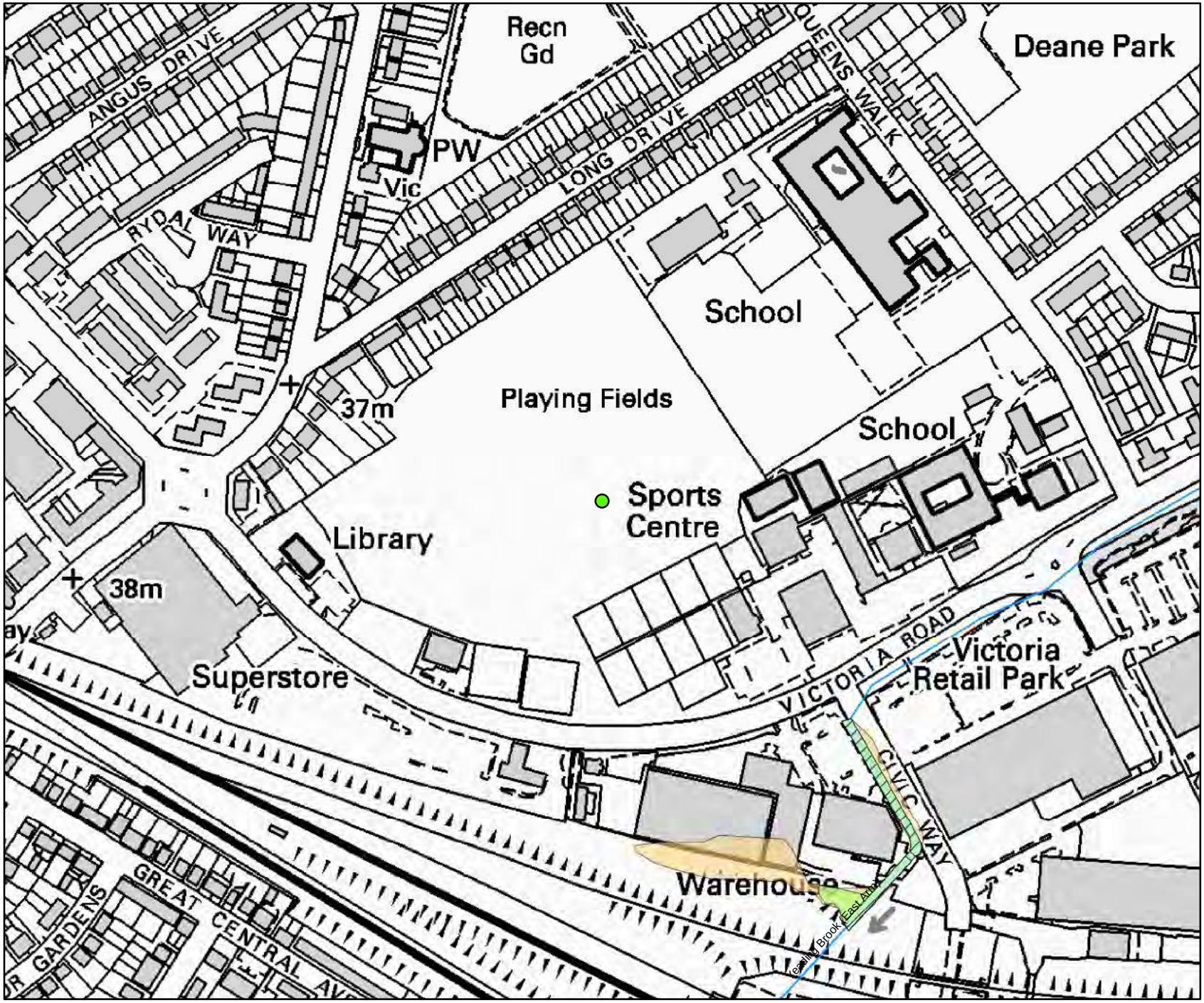
MODELLED FLOOD LEVEL

			Return Period									
Node Label	**Easting**	**Northing**	**5 yr**	**10 yr**	**20 yr**	**50 yr**	**100 yr**	**100yr + 20%**	100yr +25%	100yr + 35%	100yr + 70%	**1000yr**
YE907	511723	185385	33.79	33.89	33.96	34.05	34.16	34.33	34.37	34.45	34.65	35.34
YE906u	511762	185296	33.76	33.86	33.93	34.02	34.13	34.30	34.34	34.43	34.63	35.34
YE905d	511749	185282	33.75	33.85	33.92	34.01	34.10	34.29	34.33	34.40	34.55	35.30
YE904	511721	185249	33.63	33.73	33.83	33.97	34.09	34.28	34.32	34.39	34.54	35.30

MODELLED FLOWS

			Return Period									
Node Label	**Easting**	**Northing**	**5 yr**	**10 yr**	**20 yr**	**50 yr**	**100 yr**	**100yr + 20%**	Q100p25	Q100p35	Q100p70	**1000yr**
YE907	511723	185385	2.32	2.66	3.02	3.51	3.93	4.69	4.82	5.25	6.52	8.31
YE906u	511762	185296	4.65	5.31	6.01	7.04	7.90	9.30	9.61	10.17	12.24	18.01
YE905d	511749	185282	4.65	5.31	6.01	7.04	7.90	9.30	9.61	10.17	12.24	18.01
YE904	511721	185249	4.65	5.31	6.01	7.03	7.88	9.19	9.50	10.04	12.08	17.14

Detailed FRA centred on Queendmead School, Queens Walk, South Ruislip, HA4 0LS - 24/03/2018 - HNL82734BC



Environment Agency

Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 45 90 180
Metres

Legend

Main Rivers

Defended Flood Outlines

- 1 in 5 (20%) Defended
- 1 in 10 (10%) Defended
- 1 in 20 (5%) Defended
- 1 in 50 (2%) Defended

The data in this map has been extracted from the River Crane Mapping Study (Halcrow 2008).
This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites withinthe catchment.
Modelled outlines take into account catchment wide defences.
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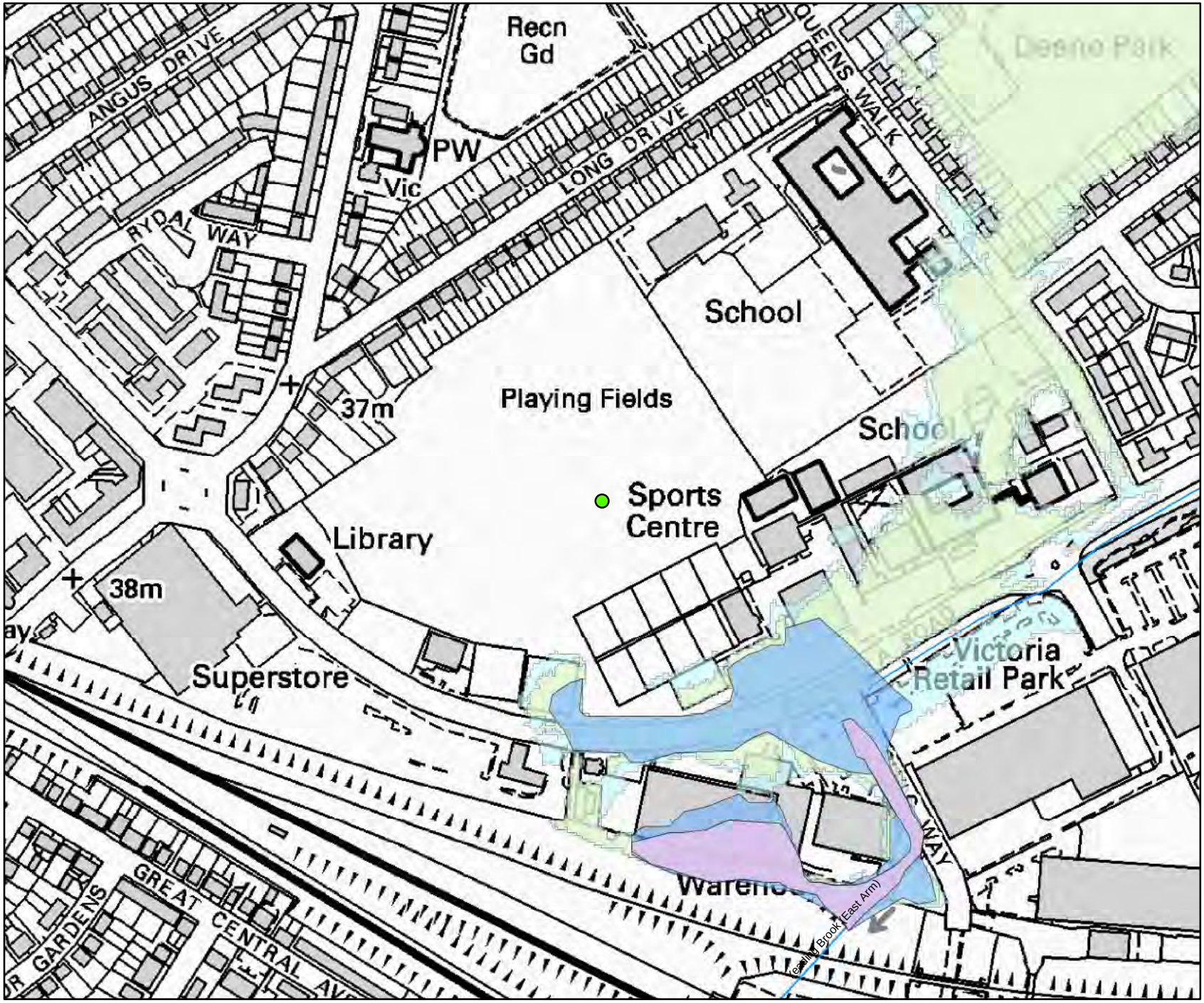
Detailed FRA centred on Queendmead School, Queens Walk, South Ruislip, HA4 0LS - 24/03/2018 - HNL82734BC



Environment Agency

Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 45 90 180
Metres

Legend

Main Rivers

Defended Flood Outlines

- 1 in 100 (1%) Defended
- 1 in 100+20% (*CC) Defended
- 1 in 100+25% (*CC) Defended
- 1 in 100+30% (*CC) Defended

The data in this map has been extracted from the River Crane Mapping Study (Halcrow 2008).
This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites withinthe catchment.
Modelled outlines take into account catchment wide defences.
Flood risk data requests including an allowance for climate change will be based on the 1 in 100 flood plus 20% allowance for climate change, unless otherwise stated. You should refer to 'Flood risk assessments: climate change allowances' to check if this allowance is still appropriate for the type of development you are proposing and its location. You may need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence. https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

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Partnerships & Strategic Overview,
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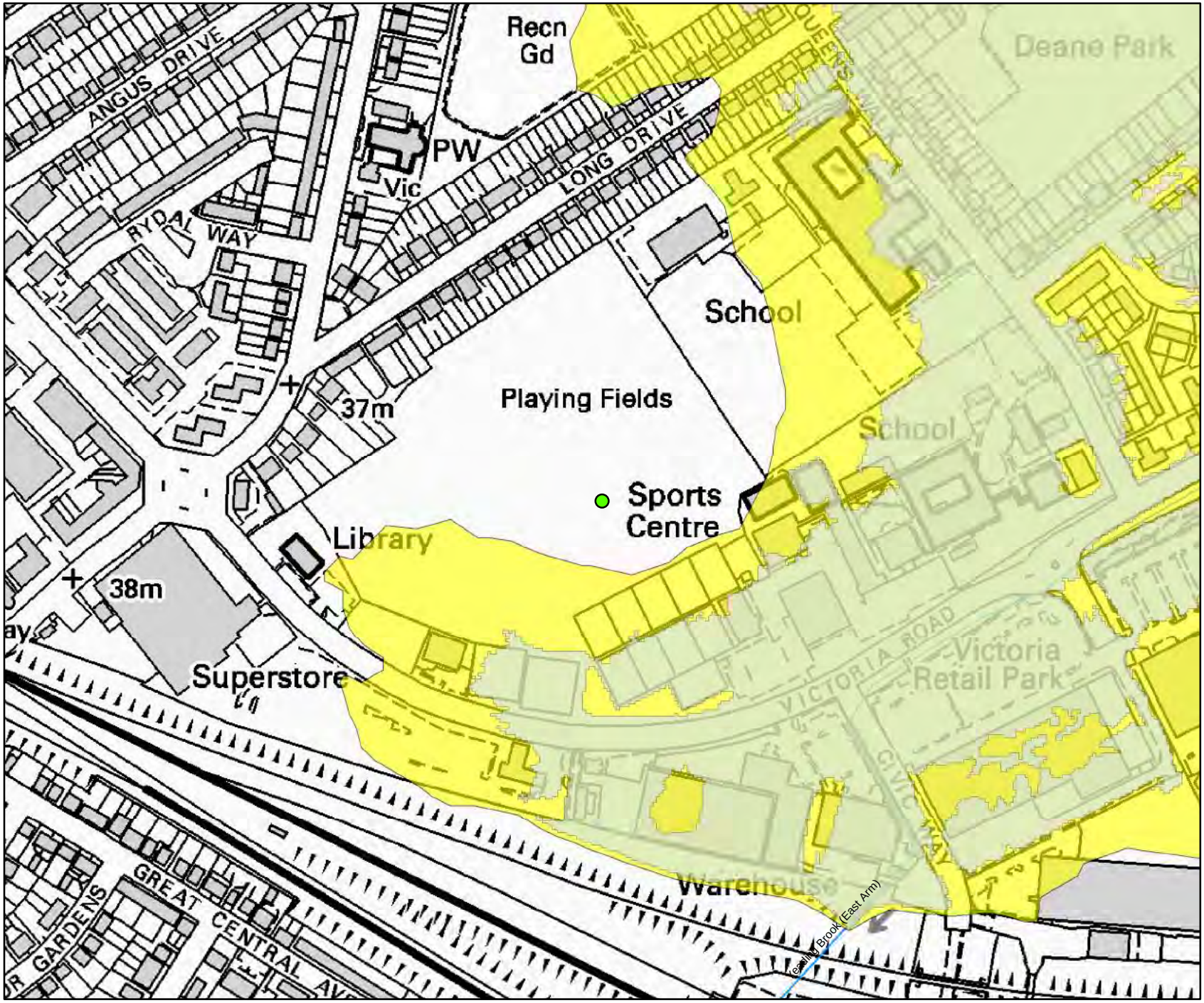
Detailed FRA centred on Queendmead School, Queens Walk, South Ruislip, HA4 0LS - 24/03/2018 - HNL82734BC



Environment Agency

Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 45 90 180
Metres

Legend

Main Rivers

Defended Flood Outlines

1 in 100+70% (*CC) Defended

1 in 1000 (0.1%) Defended

The data in this map has been extracted from the River Crane Mapping Study (Halcrow 2008).
This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites withinthe catchment.
Modelled outlines take into account catchment wide defences.
Flood risk data requests including an allowance for climate change will be based on the 1 in 100 flood plus 20% allowance for climate change, unless otherwise stated. You should refer to 'Flood risk assessments: climate change allowances' to check if this allowance is still appropriate for the type of development you are proposing and its location. You may need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence. https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

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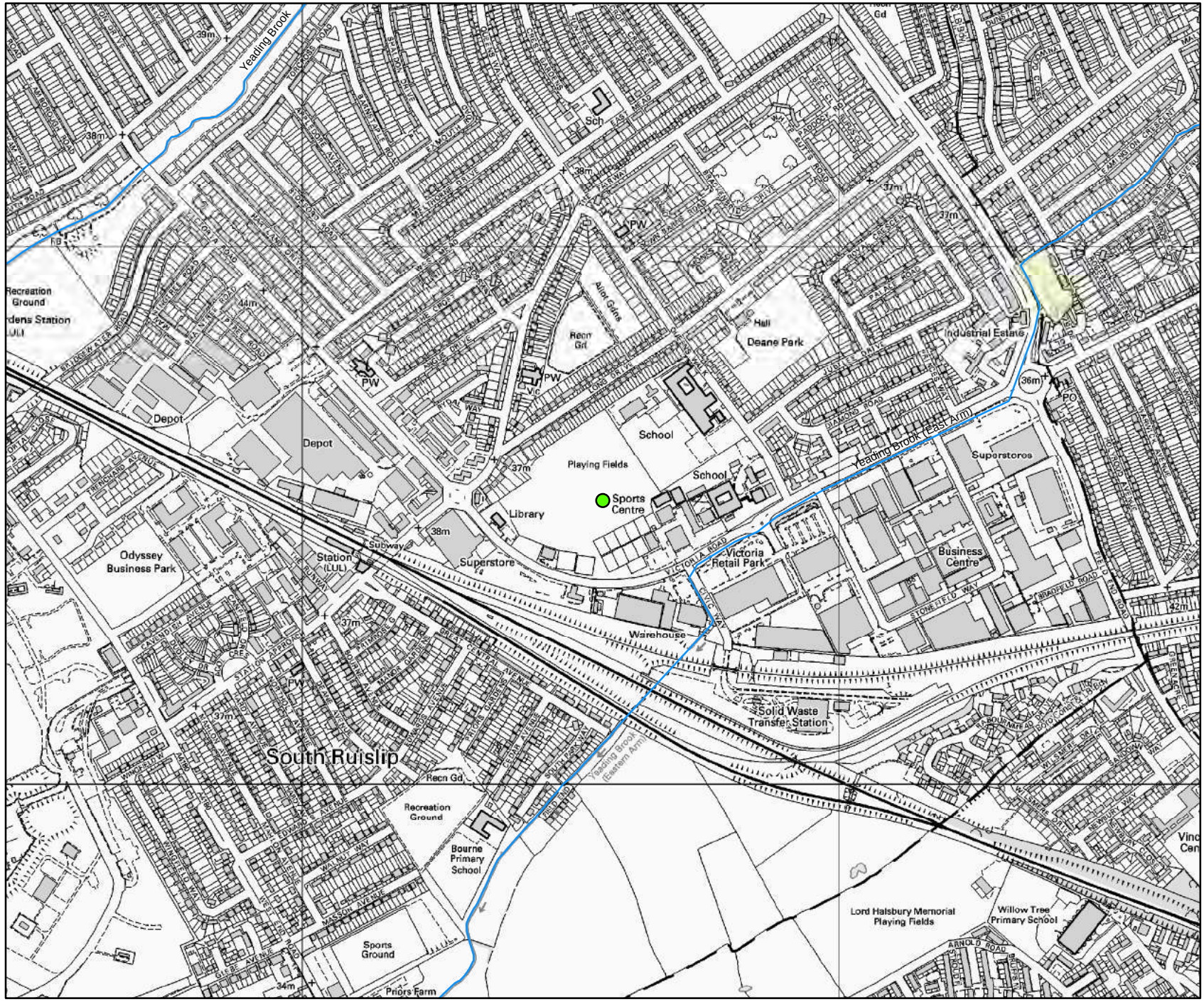
Historic Flood Map centred on Queendmead School, Queens Walk, South Ruislip, HA4 0LS - 24/03/2018 - HNL82734BC



Environment Agency

Environment Agency
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

N

0 135 270 540

Metres

Legend

Main Rivers

Flood Event Outlines

2007

1999

The historic flood event outlines are based on a combination of anecdotal evidence, Environment Agency staff observations and survey.
Our historic flood event outlines do not provide a definitive record of flooding.
It is possible that there will be an absence of datain places where we have not been able to record the extent of flooding.
It is also possible for errors occur in the digitisation of historic records of flooding.

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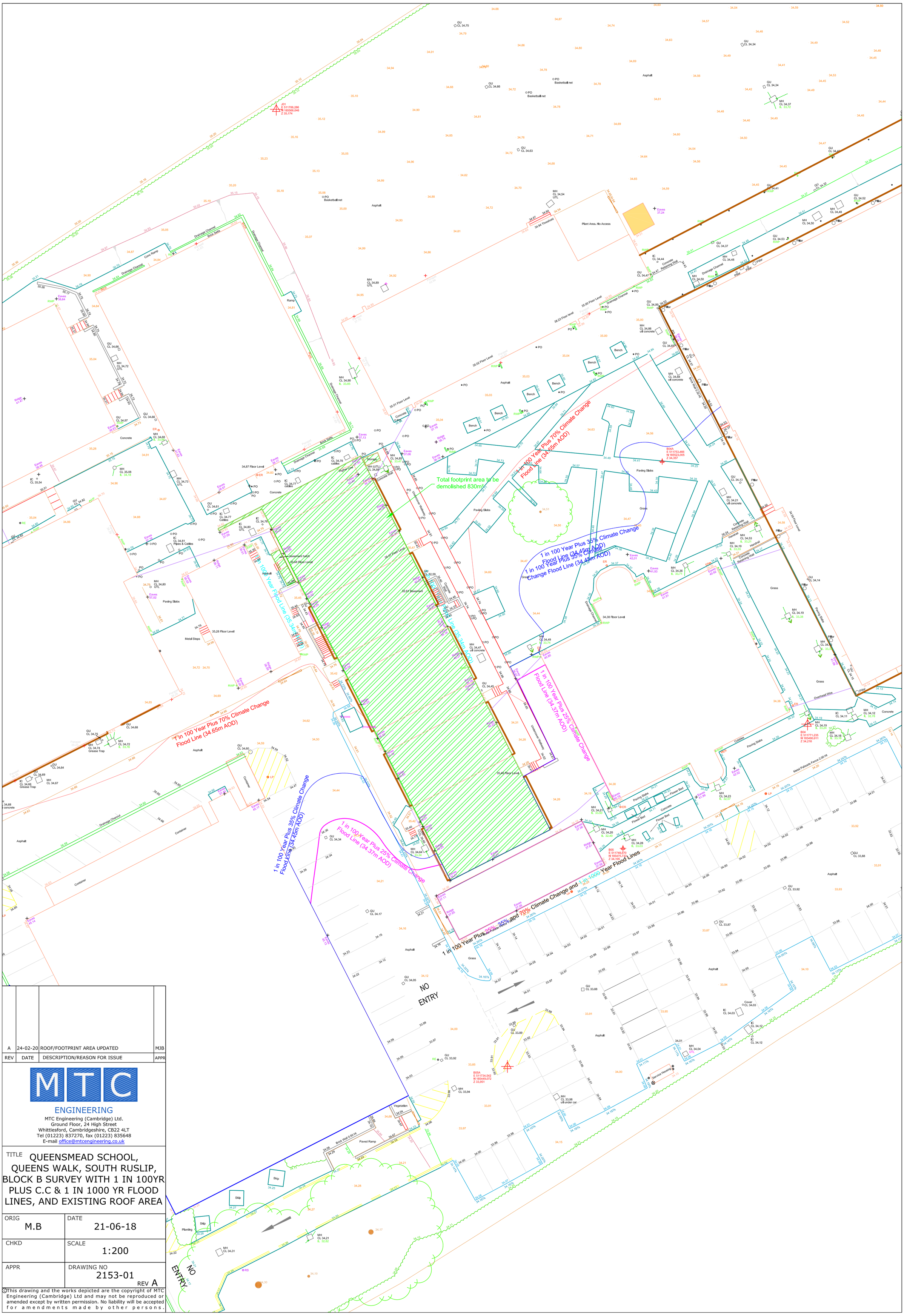
APPENDIX 7

BLOCK B SURVEY WITH FLOOD LINES AND BUILDING AREAS SHOWN



REV	DATE	DESCRIPTION/REASON FOR ISSUE	APPR
A	24-02-20	ROOF/FOOTPRINT AREA UPDATED	MJB

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

TITLE QUEENSMEAD SCHOOL, QUEENS WALK, SOUTH RUSLIP, BLOCK B SURVEY WITH 1 IN 100YR PLUS C.C & 1 IN 1000 YR FLOOD LINES, AND EXISTING ROOF AREA

ORIG	DATE
M.B	21-06-18
CHKD	SCALE 1:200
APPR	DRAWING NO 2153-01 REV A

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APPENDIX 8

SURFACE WATER FLOOD MAPPING

Basic view Detailed view

Location HA4 0LS

Flood risk from rivers or the sea

- Extent of flooding
- Depth and flow estimates at monitoring stations

Flood risk from surface water

- Extent of flooding
- High risk: depth
- High risk: velocity
- Medium risk: depth
- Medium risk: velocity
- Low risk: depth
- Low risk: velocity

Flood risk from reservoirs

- Extent of flooding
- Flood depth
- Flood speed

Flood risk

High

Medium

Low

Very low

Location you selected

Basic view Detailed view

Location HA4 0LS

Flood risk from rivers or the sea

- Extent of flooding
- Depth and flow estimates at monitoring stations

Flood risk from surface water

- Extent of flooding
- High risk: depth
- High risk: velocity
- Medium risk: depth
- Medium risk: velocity
- Low risk: depth
- Low risk: velocity

Flood risk from reservoirs

- Extent of flooding
- Flood depth
- Flood speed

High risk scenario

Flood depth (millimetres)

- Over 900mm
- 300 to 900mm
- Below 300mm
- Location you selected

Basic view Detailed view

Location HA4 0LS

Flood risk from rivers or the sea

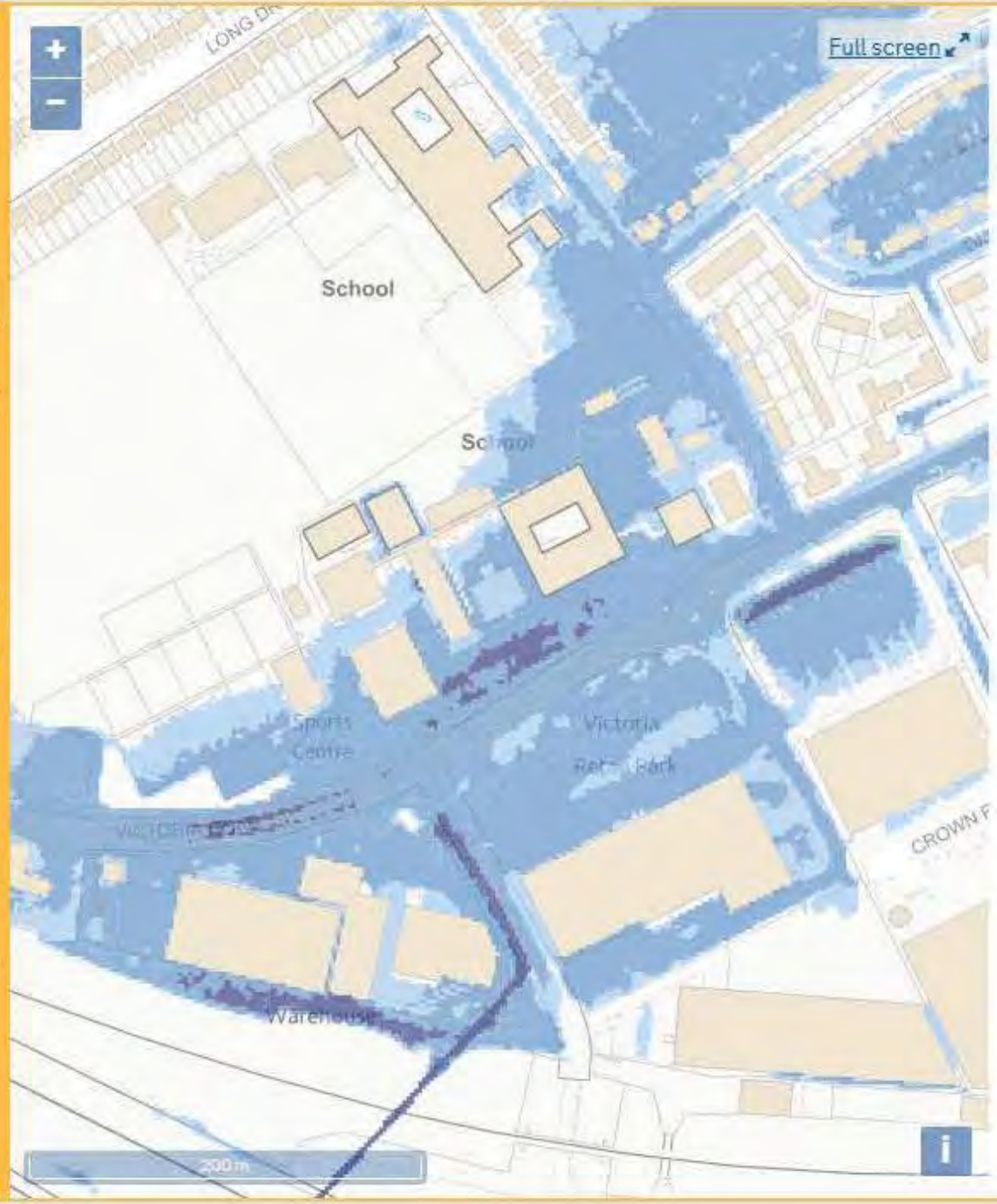
- Extent of flooding
- Depth and flow estimates at monitoring stations

Flood risk from surface water

- Extent of flooding
- High risk: depth
- High risk: velocity
- Medium risk: depth
- Medium risk: velocity
- Low risk: depth
- Low risk: velocity

Flood risk from reservoirs

- Extent of flooding
- Flood depth
- Flood speed



Medium risk scenario

Flood depth (millimetres)

Over 900mm

300 to 900mm

Below 300mm

Location you selected

Basic view Detailed view

Location HA4 0LS

Flood risk from rivers or the sea

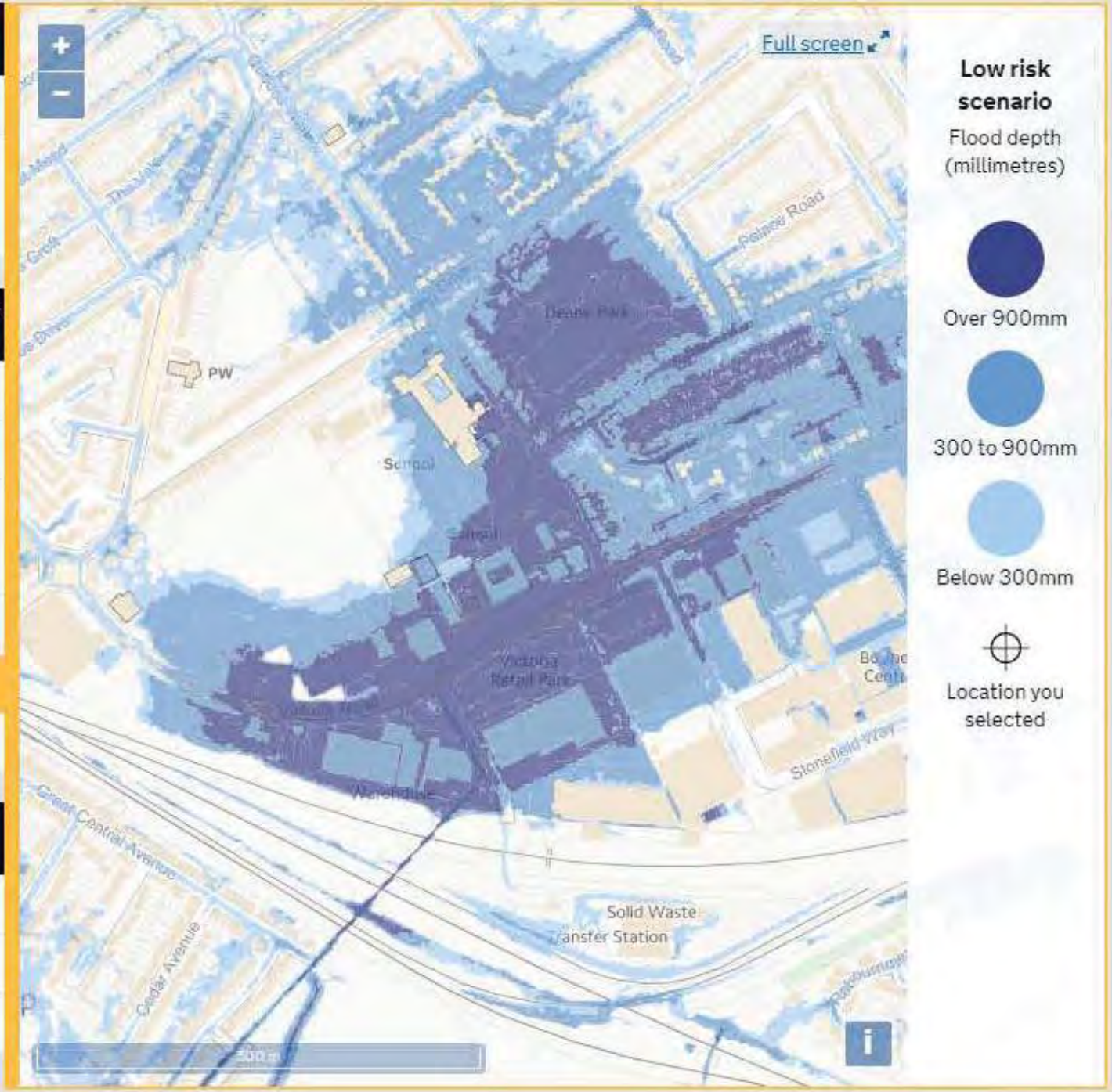
- Extent of flooding
- Depth and flow estimates at monitoring stations

Flood risk from surface water

- Extent of flooding
- High risk: depth
- High risk: velocity
- Medium risk: depth
- Medium risk: velocity
- Low risk: depth
- Low risk: velocity

Flood risk from reservoirs

- Extent of flooding
- Flood depth
- Flood speed



Basic view Detailed view

Location HA4 0LS

Flood risk from rivers or the sea

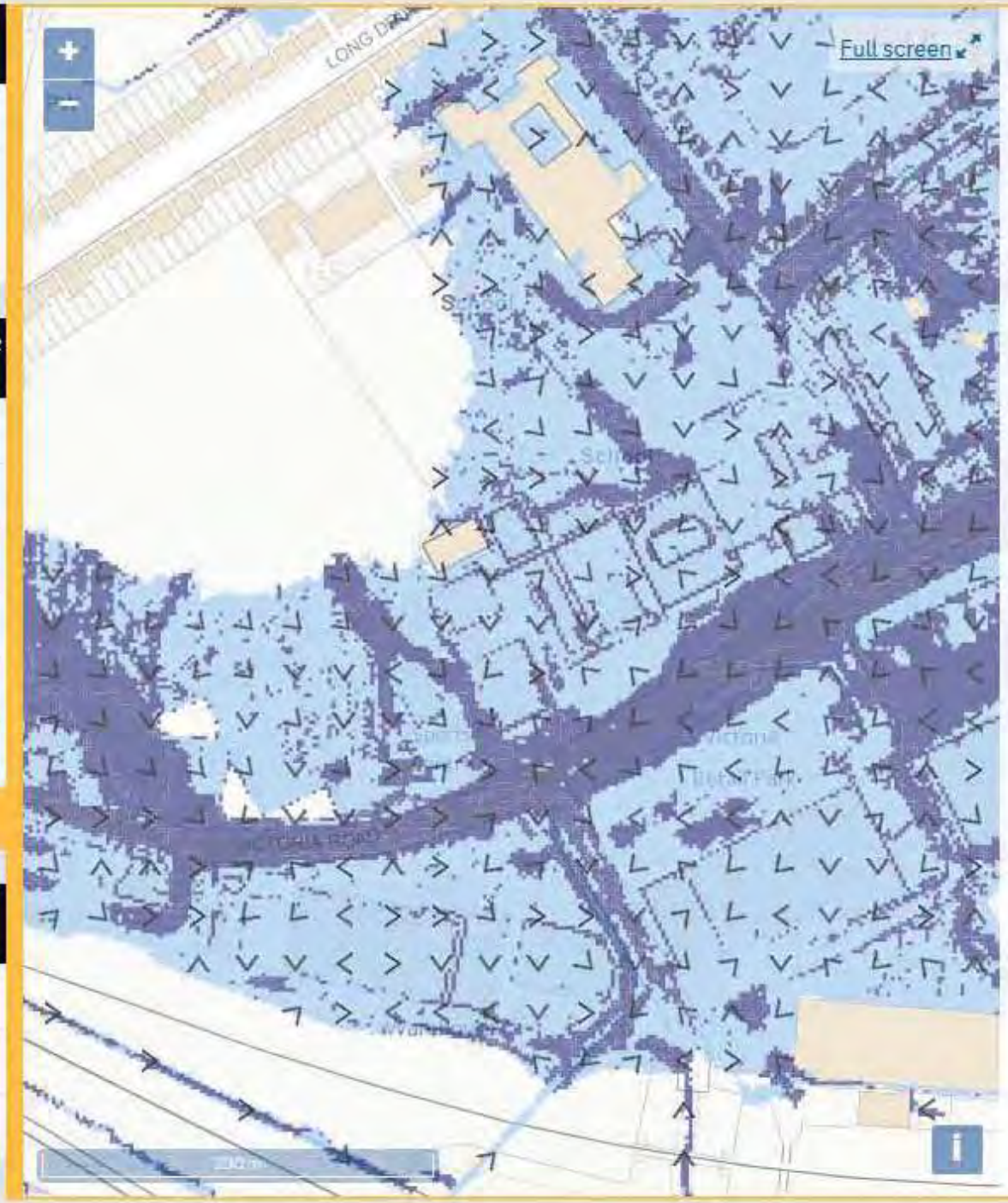
- Extent of flooding
- Depth and flow estimates at monitoring stations

Flood risk from surface water

- Extent of flooding
- High risk: depth
- High risk: velocity
- Medium risk: depth
- Medium risk: velocity
- Low risk: depth
- Low risk: velocity

Flood risk from reservoirs

- Extent of flooding
- Flood depth
- Flood speed



Low risk scenario

Flood velocity (metres/second)

Over 0.25 m/s

Less than 0.25 m/s

Direction of water flow

Location you selected

APPENDIX 9

REPLACEMENT BUILDING FLOOR PLANS AND ELEVATIONS

LUNGFISH

Lungfish Architects
2nd Floor, City Gate West
Tollhouse Hill
Nottingham
NG1 5AT
Tel: 0115 7841223
Fax: 0115 9583232
e-mail: hello@lungfish-architects.co.uk
Web: www.lungfish-architects.co.uk

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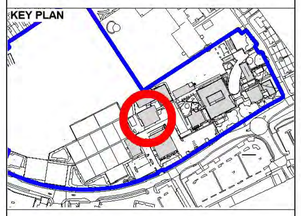
NOTES

1. Do not scale from this drawing.
2. All measurements are in millimetres unless stated otherwise.
3. This drawing is to be read in conjunction with the contract documentation, specification and all relevant Architectural, Electrical, Mechanical, Landscape and Structural drawings
4. Any discrepancies between documents to be reported to the architectural team for review and clarification, prior to works commencing on site.
5. All coordinates and dimensions to be checked and confirmed on site, prior to works commencing.
6. Lungfish drawings are provided as design intent. The detail shown is demonstrative of principle, all components, fixings and seals etc are to be provided and installed to the satisfaction of each relevant manufacturer's recommendations to maintain thermal, air and fire resistances where applicable.
The information on this drawing is subject to the final co-ordination of structure/sub-structure, M&E

HEALTH AND SAFETY RISKS:

We have reviewed health and safety risks associated with works associated with the content of this drawing and we do not believe there residual risks that a competent contractor would be aware of.

KEY PLAN



Rev	Description	Date	Drn.	Chk.
P01	Proposed Canopy Design development	07.02.2020	NW	CRT

CLIENT

CONTRACTOR
Morgan Sindall
1st floor, 1 Falcon Gate Shire Park
Welwyn Garden City
AL7 1TW

PROJECT
Queensmead Academy
Queens Walk
South Ruislip, Middlesex
HA4 0LS

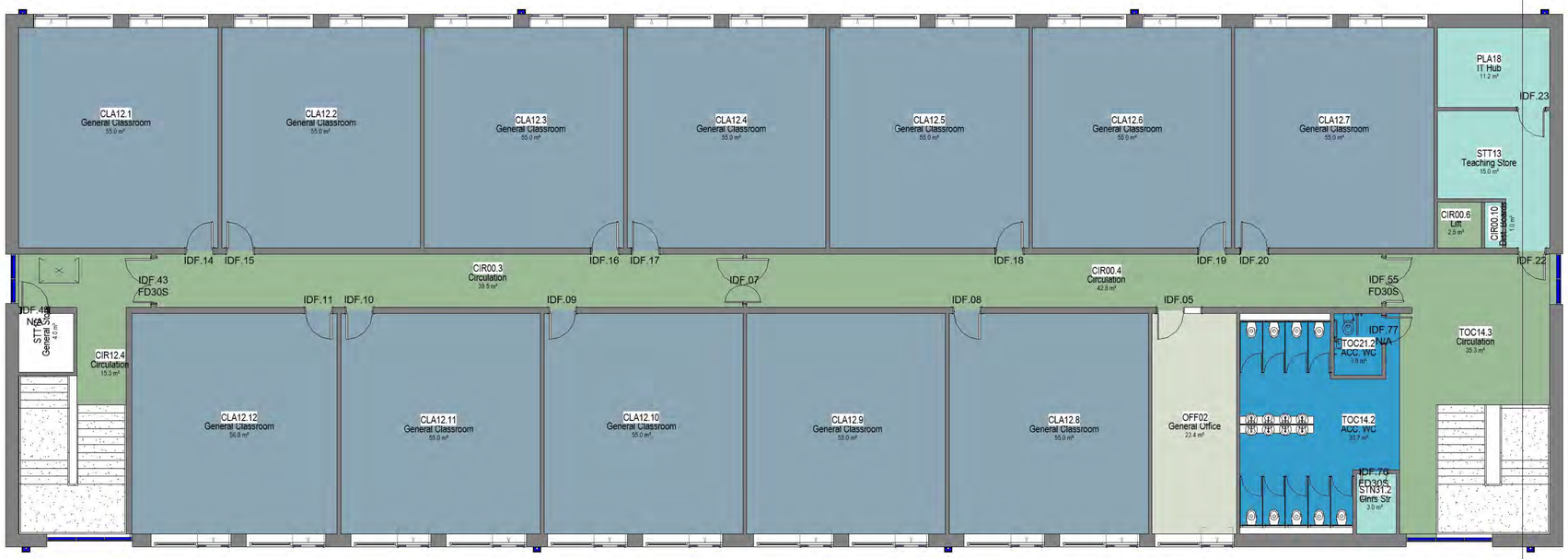
TITLE
Proposed Site Plan

DRAWN BY.	NW	DATE.	29/11/19
CHECKED BY.	YN	SCALE.	As indicated @ A1

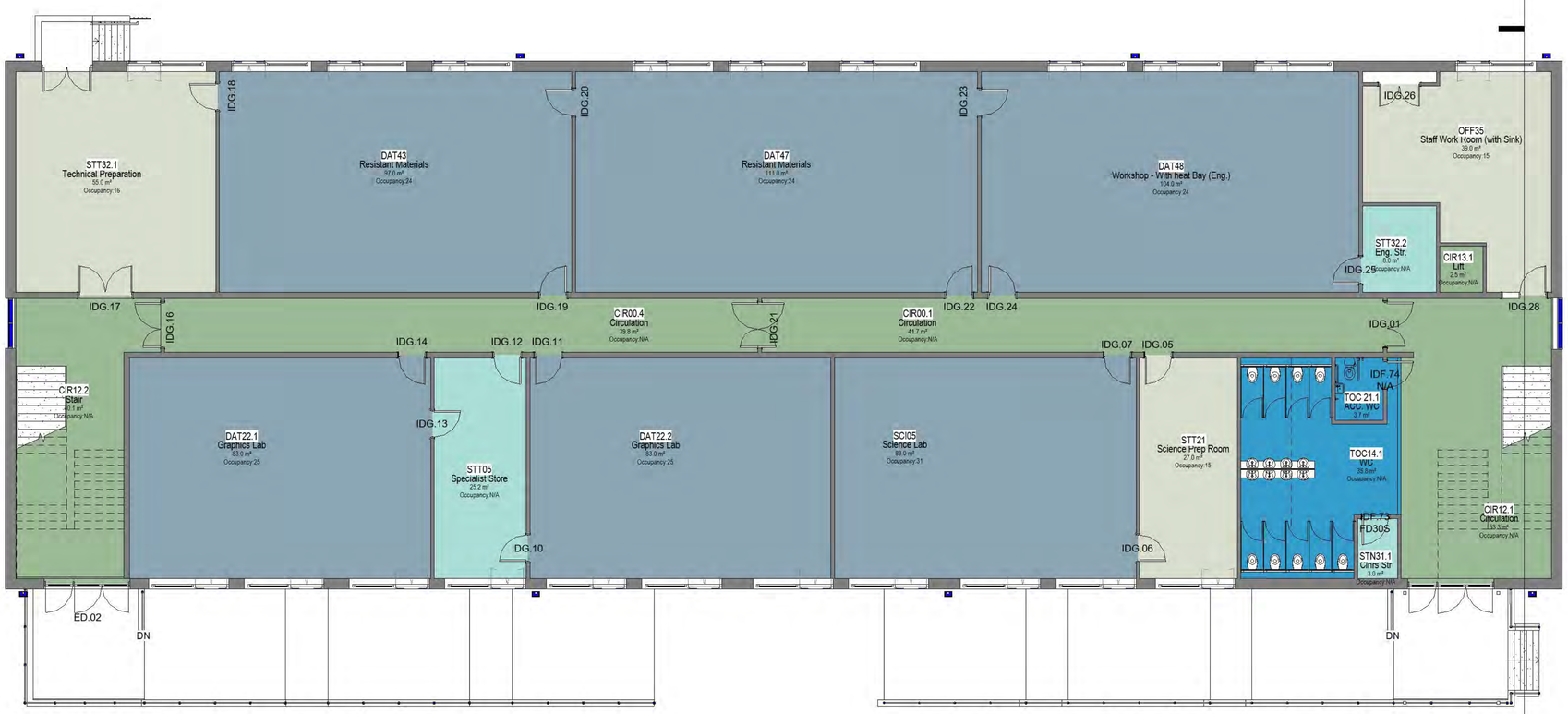
STATUS
FOR COMMENT

PROJ - ORIGIN - ZONE - LEVEL - TYPE - ROLE - NUMBER	STATU	REV
53X009 - LFA - ZZ - ZZ - DR - A - 0103	D2	P01

17/02/2020 10:01:56



First Floor
1 : 100



00 - Ground Floor
1 : 100

By Department Legend

- Ancillary
- Circulation
- Learning
- Staff
- WC & Cloaks

Scale 1 : 100

0 2 5 10 m

LUNGFISH

Lungfish Architects
2nd Floor, City Gate West
Tollhouse Hill
Nottingham
NG1 5AT
Tel: 0115 7841223
Fax: 0115 9583232
e-mail: hello@lungfish-architects.co.uk
Web: www.lungfish-architects.co.uk

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NOTES

1. Do not scale from this drawing.
2. All measurements are in millimetres unless stated otherwise.
3. This drawing is to be read in conjunction with the contract documentation, specification and all relevant Architectural, Electrical, Mechanical, Landscape and Structural drawings
4. Any discrepancies between documents to be reported to the architectural team for review and clarification, prior to works commencing on site.
5. All coordinates and dimensions to be checked and confirmed on site, prior to works commencing.
6. Lungfish drawings are provided as design intent. The detail shown is demonstrative of principle, all components, fixings and seals etc are to be provided and installed to the satisfaction of each relevant manufacturer's recommendations to maintain thermal, air and fire resistances where applicable.
The information on this drawing is subject to the final co-ordination of structure/sub-structure, M&E

Indicates extent of existing building that will be demolished

Name	Area
Ground Floor GIA	962.2 m²
First Floor GIA	962.2 m²
Plant GIA	56.5 m²
Total GIA	1981.0 m²

Rev	Description	Date	Drn.	Chk.
P04	Layout updated to accommodate Services zone	10.01.2020	NW	CRT
P03	Updated Layout Issue for Comment	09.01.2020	NW	CRT
P02	Issued for Pre-application advice	19.12.19	NW	CRT
P01	Issued for CEM 01	29.11.19	NW	CRT

CLIENT

CONTRACTOR
Morgan Sindall
1st floor, 1 Falcon Gate Shire Park
Welwyn Garden City
AL7 1TW

PROJECT
Queensmead Academy
Queens Walk
South Ruislip, Middlesex
HA4 0LS

TITLE
Proposed General Arrangement Floor Plans

DRAWN BY.	NW	DATE.	29/11/19
CHECKED BY.	YN	SCALE.	1 : 100 @ A1

STATUS
FOR COMMENT

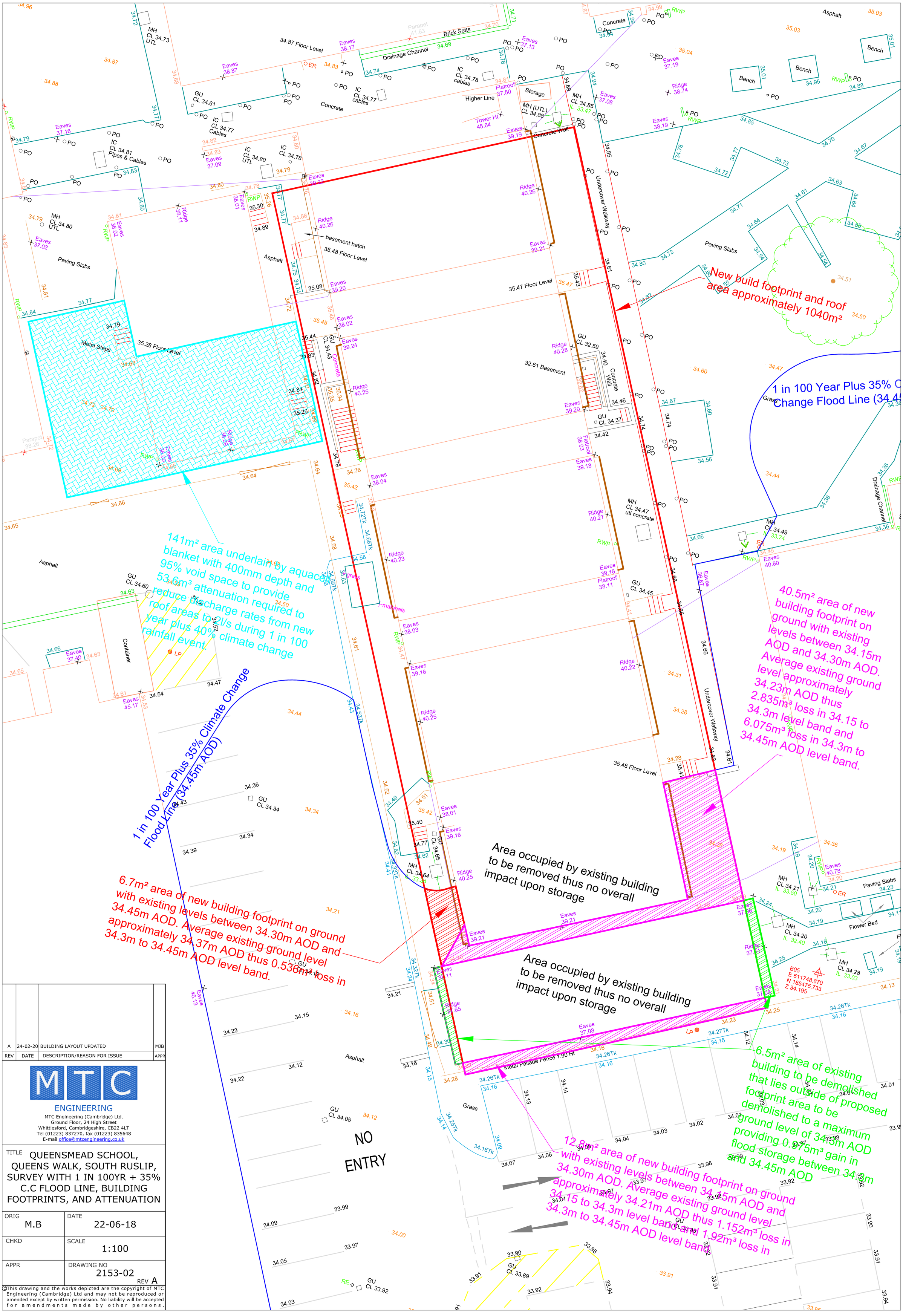
PROJ - ORIGIN - ZONE - LEVEL - TYPE - ROLE - NUMBER	STATU	REV
53X009 - LFA - 01 - ZZ - DR - A - 0200	D2	P04

17/02/2020 10:12:09

APPENDIX 10

EXISTING AND PROPOSED FOORPTINT,

1 IN 100 YR + 35% C.C FLOOD LINE, AND ATTENUATION



REV	DATE	DESCRIPTION/REASON FOR ISSUE	APPR
A	24-02-20	BUILDING LAYOUT UPDATED	MJB

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

TITLE QUEENSMEAD SCHOOL, QUEENS WALK, SOUTH RUSLIP, SURVEY WITH 1 IN 100YR + 35% C.C FLOOD LINE, BUILDING FOOTPRINTS, AND ATTENUATION

ORIG	DATE
M.B	22-06-18
CHKD	SCALE 1:100
APPR	DRAWING NO 2153-02 REV A

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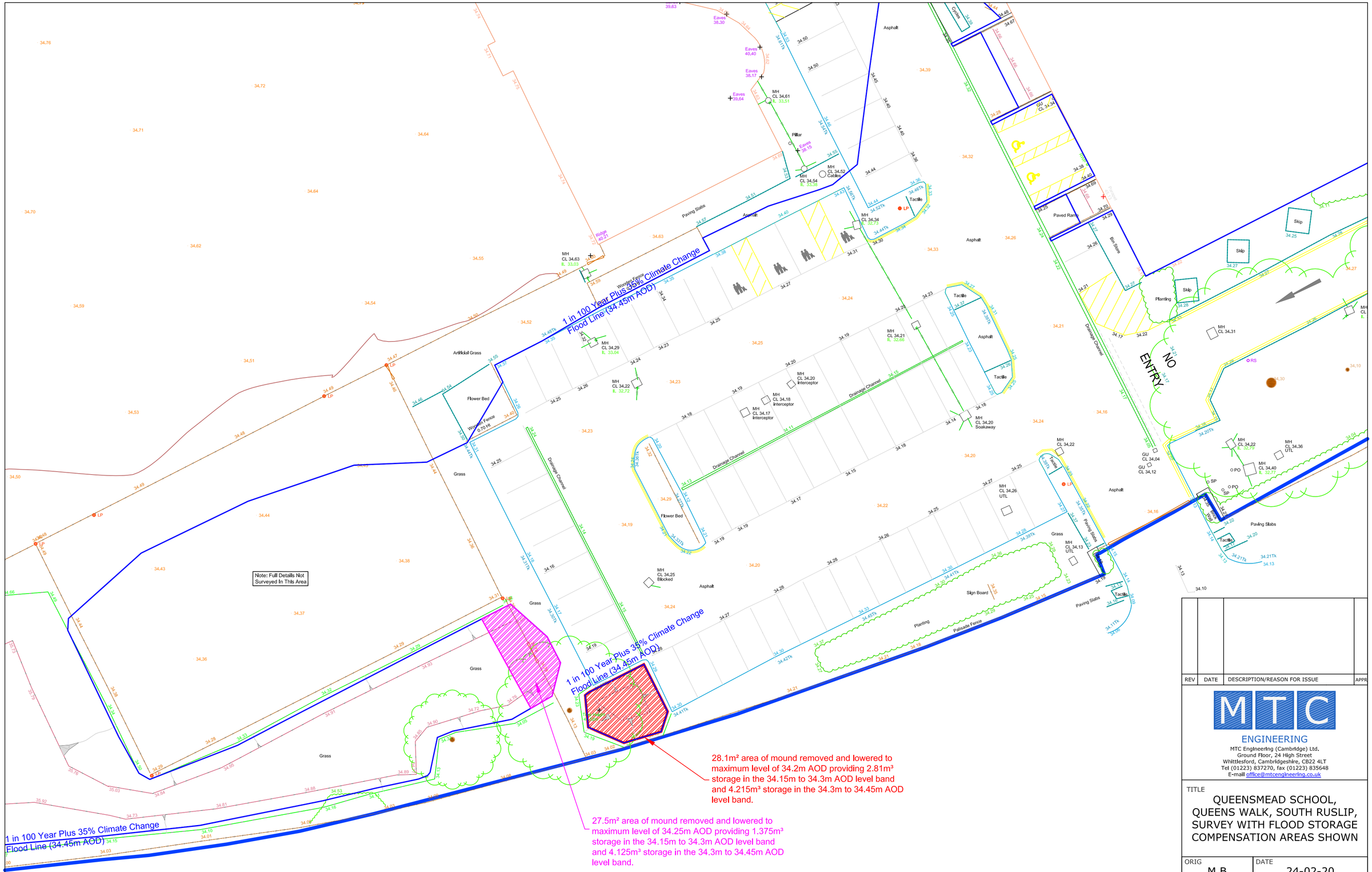
APPENDIX 11

FLOOD STORAGE COMPENSATION AREAS



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

TITLE

QUEENSMEAD SCHOOL, QUEENS WALK, SOUTH RUSLIP, SURVEY WITH FLOOD STORAGE COMPENSATION AREAS SHOWN

ORIG M.B	DATE 24-02-20
CHKD	SCALE 1:200
APPR	DRAWING NO 2153-04 REV -

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APPENDIX 12

MICRO DRAINAGE CALCULATIONS: EXISTING DISCHARGE RATES

Existing Network Details for Storm

* - Indicates pipe has been modified outside of System 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)	Section Type
* 1.000	10.000	0.100	100.0	0.083	3.00	0.600	o	225	Pipe/Conduit
1.001	10.000	0.100	100.0	0.000	0.00	0.600	o	225	Pipe/Conduit

PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
* 1.000	1	34.500	33.500	0.775	73.800	33.400	40.175		1200
1.001	2	73.800	33.400	40.175	34.500	33.300	0.975		1200

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	1	34.500	33.500	0.775	Open Manhole	1200
1.001	o	225	2	73.800	33.400	40.175	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	10.000	100.0	2	73.800	33.400	40.175	Open Manhole	1200
1.001	10.000	100.0		34.500	33.300	0.975	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.001		34.500	33.300	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	21.000	Storm Duration (mins)	30
Ratio R	0.439		

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1 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.439
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	21.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Summer	1	+0%	100/15 Summer				33.594
1.001	2	15 Summer	1	+0%	100/15 Summer				33.494

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.131	0.000	0.35		14.9	OK	
1.001	2	-0.131	0.000	0.35		15.1	OK	

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1 year Return Period Summary of Critical Results by Maximum Discharge Volume (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.439
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	21.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 0

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	1	10080 minute 1 year Winter I+0%	34.500	33.504	-0.221	0.000	0.00
1.001	2	10080 minute 1 year Winter I+0%	73.800	33.404	-0.221	0.000	0.00

PN	US/MH Name	Overflow (l/s)	Total Overflow Vol(m³)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
1.000	1			34.540	0.1	OK
1.001	2			34.538	0.1	OK

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30 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.439
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 21.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Summer	30	+0%	100/15 Summer				33.665
1.001	2	15 Summer	30	+0%	100/15 Summer				33.567

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.060	0.000	0.85		36.8	OK	
1.001	2	-0.058	0.000	0.85		36.6	OK	

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30 year Return Period Summary of Critical Results by Maximum Discharge Volume (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.439
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 21.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 0

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	1	10080 minute 30 year Winter I+0%	34.500	33.507	-0.218	0.000	0.01
1.001	2	10080 minute 30 year Winter I+0%	73.800	33.407	-0.218	0.000	0.01

PN	US/MH Name	Overflow (l/s)	Total Overflow Vol(m³)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
1.000	1			64.037	0.3	OK
1.001	2			64.035	0.3	OK

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100 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.439
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 21.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Summer	100	+0%	100/15 Summer				33.761
1.001	2	15 Summer	100	+0%	100/15 Summer				33.638

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.036	0.000	1.06		45.7	SURCHARGED	
1.001	2	0.013	0.000	1.07		46.5	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Discharge Volume (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.439
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 21.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 0

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	1	10080 minute 100 year Winter I+0%	34.500	33.508	-0.217	0.000	0.01
1.001	2	10080 minute 100 year Winter I+0%	73.800	33.408	-0.217	0.000	0.01

PN	US/MH Name	Overflow (l/s)	Total Overflow Vol(m³)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
1.000	1			78.664	0.3	OK
1.001	2			78.662	0.3	OK

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APPENDIX 13

MICRO DRAINAGE CALCULATIONS: GREENFIELD RUN OFF RATE

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.300
Area (ha)	0.104	Urban	0.000
SAAR (mm)	600	Region Number	Region 6

Results	**l/s**
QBAR Rural	0.2
QBAR Urban	0.2
Q1 year	0.1
Q1 year	0.1
Q30 years	0.4
Q100 years	0.5

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APPENDIX 14

MICRO DRIANAGE CALCULATIONS: ATTENUATION VOLUMES

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	33.710	0.210	2.0	27.8	O K
30 min Summer	33.767	0.267	2.0	35.3	O K
60 min Summer	33.815	0.315	2.0	41.8	O K
120 min Summer	33.844	0.344	2.0	45.5	O K
180 min Summer	33.845	0.345	2.0	45.7	O K
240 min Summer	33.838	0.338	2.0	44.8	O K
360 min Summer	33.825	0.325	2.0	43.0	O K
480 min Summer	33.810	0.310	2.0	41.0	O K
600 min Summer	33.793	0.293	2.0	38.8	O K
720 min Summer	33.775	0.275	2.0	36.4	O K
960 min Summer	33.741	0.241	2.0	31.9	O K
1440 min Summer	33.683	0.183	2.0	24.3	O K
2160 min Summer	33.624	0.124	2.0	16.4	O K
2880 min Summer	33.593	0.093	2.0	12.3	O K
4320 min Summer	33.571	0.071	1.5	9.4	O K
5760 min Summer	33.560	0.060	1.3	8.0	O K
7200 min Summer	33.553	0.053	1.0	7.1	O K
8640 min Summer	33.549	0.049	0.9	6.4	O K
10080 min Summer	33.545	0.045	0.8	6.0	O K
15 min Winter	33.736	0.236	2.0	31.3	O K
30 min Winter	33.801	0.301	2.0	39.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	149.695	0.0	28.7	18
30 min Summer	96.881	0.0	37.3	33
60 min Summer	59.609	0.0	46.3	62
120 min Summer	35.406	0.0	55.0	122
180 min Summer	25.760	0.0	60.0	176
240 min Summer	20.438	0.0	63.5	202
360 min Summer	14.757	0.0	68.8	264
480 min Summer	11.701	0.0	72.7	332
600 min Summer	9.767	0.0	75.9	404
720 min Summer	8.423	0.0	78.6	468
960 min Summer	6.664	0.0	82.9	596
1440 min Summer	4.783	0.0	89.2	840
2160 min Summer	3.429	0.0	96.1	1188
2880 min Summer	2.705	0.0	101.1	1500
4320 min Summer	1.934	0.0	108.3	2208
5760 min Summer	1.523	0.0	114.0	2936
7200 min Summer	1.265	0.0	118.3	3672
8640 min Summer	1.087	0.0	121.9	4408
10080 min Summer	0.955	0.0	124.9	5136
15 min Winter	149.695	0.0	32.2	18
30 min Winter	96.881	0.0	41.8	33

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	33.855	0.355	2.0	47.1	O K
120 min Winter	33.890	0.390	2.0	51.7	O K
180 min Winter	33.894	0.394	2.0	52.2	O K
240 min Winter	33.887	0.387	2.0	51.2	O K
360 min Winter	33.868	0.368	2.0	48.8	O K
480 min Winter	33.847	0.347	2.0	46.0	O K
600 min Winter	33.825	0.325	2.0	43.0	O K
720 min Winter	33.801	0.301	2.0	39.9	O K
960 min Winter	33.747	0.247	2.0	32.8	O K
1440 min Winter	33.661	0.161	2.0	21.4	O K
2160 min Winter	33.592	0.092	2.0	12.2	O K
2880 min Winter	33.574	0.074	1.6	9.8	O K
4320 min Winter	33.557	0.057	1.2	7.6	O K
5760 min Winter	33.549	0.049	0.9	6.5	O K
7200 min Winter	33.544	0.044	0.8	5.8	O K
8640 min Winter	33.540	0.040	0.7	5.3	O K
10080 min Winter	33.537	0.037	0.6	5.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	59.609	0.0	51.8	62
120 min Winter	35.406	0.0	61.6	118
180 min Winter	25.760	0.0	67.3	174
240 min Winter	20.438	0.0	71.2	226
360 min Winter	14.757	0.0	77.1	280
480 min Winter	11.701	0.0	81.5	358
600 min Winter	9.767	0.0	85.0	436
720 min Winter	8.423	0.0	88.0	512
960 min Winter	6.664	0.0	92.8	646
1440 min Winter	4.783	0.0	99.9	882
2160 min Winter	3.429	0.0	107.7	1168
2880 min Winter	2.705	0.0	113.2	1512
4320 min Winter	1.934	0.0	121.3	2244
5760 min Winter	1.523	0.0	127.6	2944
7200 min Winter	1.265	0.0	132.5	3664
8640 min Winter	1.087	0.0	136.5	4408
10080 min Winter	0.955	0.0	139.9	5144

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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)	21.000	Shortest Storm (mins)	15
Ratio R	0.432	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.104

Time (mins) From:	To:	Area (ha)
0	4	0.104

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Model Details

Storage is Online Cover Level (m) 34.500

Tank or Pond Structure

Invert Level (m) 33.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	132.5	0.400	132.5	0.401	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0076-2000-0400-2000
Design Head (m)	0.400
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	76
Invert Level (m)	33.500
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.400	2.0
Flush-Flo™	0.124	2.0
Kick-Flo®	0.286	1.7
Mean Flow over Head Range	-	1.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0	1.200	3.3	3.000	5.1	7.000	7.6
0.200	1.9	1.400	3.5	3.500	5.4	7.500	7.9
0.300	1.8	1.600	3.8	4.000	5.8	8.000	8.2
0.400	2.0	1.800	4.0	4.500	6.1	8.500	8.4
0.500	2.2	2.000	4.2	5.000	6.5	9.000	8.7
0.600	2.4	2.200	4.4	5.500	6.8	9.500	8.9
0.800	2.7	2.400	4.6	6.000	7.1		
1.000	3.0	2.600	4.7	6.500	7.4		

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