

Hough End Sports Village, Manchester

Flood Risk Assessment and Drainage Strategy

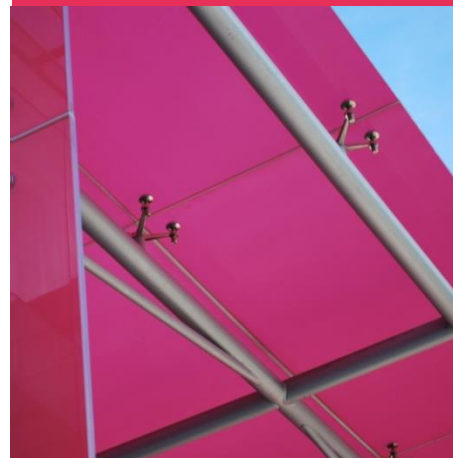
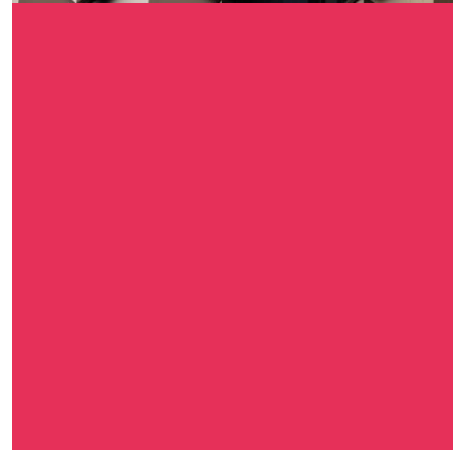
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1.0 Introduction

1.1 Project Background

- 1.1.1 Curtins was appointed by ISG Ltd to provide a Flood Risk Assessment (FRA) and Drainage Strategy for a proposed development at the Hough End Sports Village, Princess Road, Manchester.
- 1.1.2 The report provides information on the nature of flood risk at the site and follows Government guidance regarding development and flood risk.
- 1.1.3 The report is based on currently available information and preliminary discussions.
- 1.1.4 Proposals contained or forming part of this report represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material deviation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.
- 1.1.5 Where the proposed works to which this report refers are undertaken more than twelve months following the issue of this report, Curtins shall reserve the right to re-validate the findings and conclusions by undertaking appropriate further investigations at no cost to Curtins.

1.2 Scope of Assessment

- 1.2.1 The assessment is to be undertaken in accordance with the standing advice and requirements of the Environment Agency (EA) for Flood Risk Assessments as outlined in the Communities and Local Governments Planning Policy Guidance to the National Planning Policy Framework (NPPF).
- 1.2.2 The assessment will:
 - Investigate all potential risks of flooding to the site,
 - Consider the impact the development may have elsewhere with regards to flooding,
 - Consider design proposals to mitigate any potential risk of flooding determined to be present; and
 - Consider foul & surface water drainage proposals for the proposed development.
- 1.2.3 The total site area is approximately 4.88 hectares and following scrutiny of the Environment Agency flood maps it has been identified that site lies within Flood Zone 1. According to local council Strategic Flood Risk Assessment the site lies within a Critical Drainage Area (CDA). A Flood Risk Assessment is therefore required to support a planning application.
- 1.2.4 In April 2015, the Government made changes to the National Planning Policy Framework which made Sustainable Urban Drainage Systems (SuDS) a material consideration in the determination of planning applications for 'major' developments.

- 1.2.5 A Drainage Strategy will therefore be required as part of the Planning Application for the development, as the site is considered to be 'major' development by the Town and Country Planning Order 2015.
- 1.2.6 This Flood Risk Assessment and Drainage Strategy reviews the following information:
- Environment Agency flood maps for rivers and sea flooding.
 - UK Government Flood Warning Information Service maps for surface water flooding and reservoir flooding.
 - Manchester City, Salford City and Trafford Councils Level 1 Hybrid Strategic Flood Risk Assessment (SFRA) published in March 2010.
 - Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA, User Guide, Final, dated May 2010.
 - Manchester City, Salford City and Trafford Councils Level 2 Hybrid Strategic Flood Risk Assessment (SFRA) published in March 2011.
 - Preliminary Flood Risk Assessment (PFRA) for Manchester County Council dated May 2011.
 - Manchester City Council SuDS Requirements for New Developments.
 - United Utilities Public Sewer Records dated October 2020.
 - CCTV Drainage Survey by Amber Surveys dated March 2021.

1.3 Proposed Development

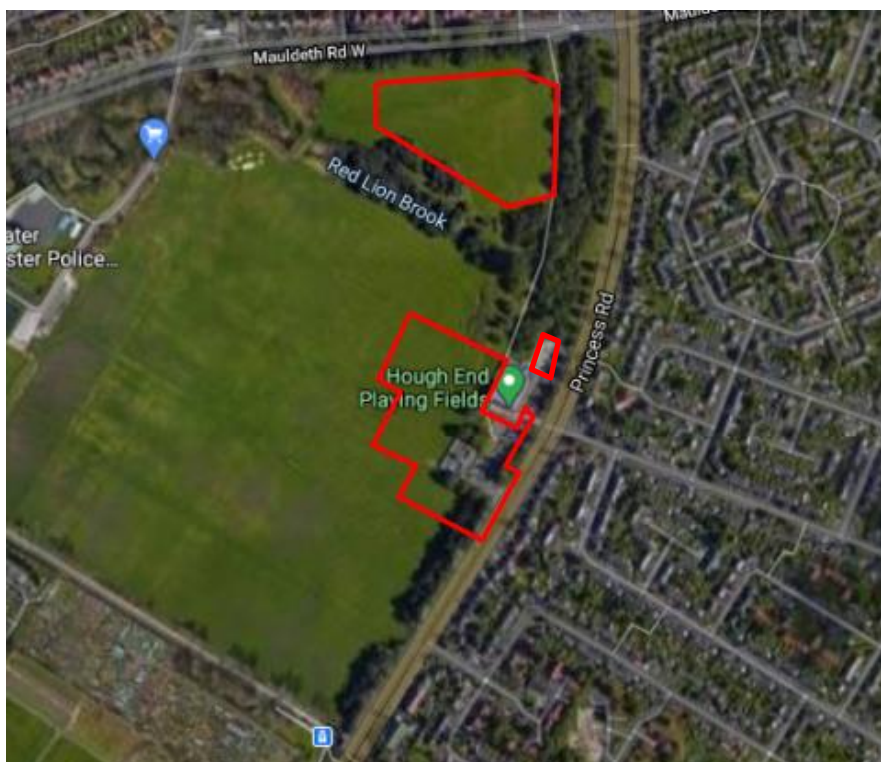
- 1.3.1 The development is expected to comprise the following:
- Proposed Extension to the existing Leisure Centre
 - Proposed Car Parking
 - Proposed Overspill Car Parking (0.32 Ha)
 - Landscaping
 - Proposed 3D FTP All Weather Pitch (2.02 Ha)
 - Proposed Softball & Baseball Lining (2.0 Ha)
- 1.3.2 The Proposed Site Layout is enclosed in *Appendix A*.
- 1.3.3 The proposals are to upgrade two areas within the existing sports centre site, see Figure 1. For this report, the areas will be referred to as the 'northern area' and 'southern area'.
- The northern area consists of: Proposed Softball & Baseball Lining.
 - The southern area consists of: Proposed Extension to the existing Leisure Centre, Proposed Car Parking (including upgrade to existing overspill car park), Proposed Overspill Car Parking, Landscaping and the Proposed 3D FTP All Weather Pitch.

2.0 Existing Site Details

2.1 History and Current Use

- 2.1.1 The site is located approximately 4.8km south of Manchester City Centre, in the Withington area of Manchester.
- 2.1.2 The wider site is bordered by Mauldeth Road West to the north, Princess Street to the east, and the existing playing fields to the south and west. The wider area consists primarily of residential use and there is a tramline approximately 290m south-west of the site (see Figure 1).
- 2.1.3 The site is currently occupied by the existing sports centre buildings, car parking and playing fields.

Figure 1: Aerial Photograph (© Google 2020)



2.2 Existing Watercourses and Other Waterbodies

- 2.2.1 No above ground watercourses have been identified within the proposed site.
- 2.2.2 The Red Lion Brook is located through the existing sport centre site, although it falls outside of the proposed development redline boundaries. The brook is approximately 50m south of the northern area redline boundary and approximately 165m north of the southern area redline boundary.

2.3 Existing Drainage

2.3.1 An extract from the public sewer records has been obtained for the development site and is shown in Figure 2.

Figure 2: United Utilities Public Sewer Record (extract)



2.3.2 The public sewer records indicate that there are no recorded public sewers located within the development site boundary.

2.3.3 The following public sewers are recorded within the vicinity of the site:

- There is a 375mm (upsizing to a 450mm) combined water sewer flowing north to south along Princess Road (east of the site).
- There is a 225mm combined water sewer parallel to the above noted sewer, within Princess Road and this appears to connect into the 450mm sewer adjacent to the site.

2.3.4 There are further public sewers identified on the public sewer records within the wider vicinity of the site, but these are not considered relevant to the scheme.

2.3.5 A CCTV Drainage Survey has been completed to confirm the location, route, size, depth, condition, of the surrounding public sewer network. The survey information is enclosed in *Appendix C*.

2.3.6 The CCTV Drainage Survey confirms that the existing site is served by a partially separate foul and surface water drainage system.

2.3.7 The existing foul system consists of:

- The existing main building connects to the east of the site into the existing 450mm combined public sewer in Princess Road at Manhole 8301.
- The existing building to the south-west corner connects to the east of the site into the existing 450mm combined sewer in Princess Road at Manhole 7100.

2.3.8 The existing surface water system consists of:

- The main building connects to a 300mm pipe along the eastern, northern and western elevations and discharges to an existing attenuation tank to the north of the building. The outfall from the tank discharges to the Red Lion Brook via a flow control chamber.
- The car park connects to a 450mm piped system, in which the existing outfall is unconfirmed. It is anticipated that the existing network either connects directly to the Red Lion Brook with an independent flow control or it connect to the attenuation tank.
- There is an existing land drain system along the northern section of the car park which appears to serve the adjacent landscaping and footpath and this discharges around the northern elevation of the building and connects to the above mentioned 300mm building surface water system prior to entering the attenuation tank.

2.4 Topography

2.4.1 A Topographical Survey has been completed at the site and included in *Appendix B*.

2.4.2 The Topography has been assessed across the site and is summarised as follows:

2.4.3 The levels around the car park and the proposed building extension are generally falling from north-east to south-west, with levels falling from approximately 31.6m to 30.8m AoD.

2.4.4 The levels within the area proposed for the All-Weather Pitch appear to fall in a south-east to north-west direction. The level to the east is approximately 31.31m AoD, south approximately 30.9m AoD, west approximately 30.5m AoD and north approximately 30.83m AoD.

2.4.5 The levels within the area proposed of the overspill Car Park appear to fall from west to east with levels falling from approximately 31.03m to 30.63m AoD.

2.4.6 The levels within the Softball and Baseball area generally fall from west to east with levels falling from approximately 31.7m to 31.1m AoD.

2.5 Geology

2.5.1 The British Geological Survey (BGS) map confirms that the superficial deposits are listed as Glaciofluvial Sheet Deposits, Devensian as Sand and Gravel.

- 2.5.2 The bedrock geology is described as Wilmslow Sandstone Formation – Sandstone, however the nearby boreholes available on the BGS online mapping suggest that the primary material identified is fill over clay.
- 2.5.3 The site is not located within a Groundwater Source Protection Zone.

3.0 Development and Flood Risk

3.1 National Planning Policy Framework (NPPF) and Planning Practice Guidance

- 3.1.1 In July 2021, the Department of Communities and Local Government published the National Planning Policy Framework document (NPPF) and the Planning Practice Guidance was published in March 2014 which provides guidance on how flood risk should be assessed during the planning and development process.

Table 1: (Extract from Planning Practice Guidance) Flood Zone Classifications

These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's [Flood Map for Planning \(Rivers and Sea\)](#), available on the Environment Agency's web site, as indicated in the table below.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Table 2: (Extract from Planning Practice Guidance) Flood Risk Vulnerability Classification

Essential Infrastructure • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly Vulnerable • Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as ‘Essential Infrastructure’).
More Vulnerable • Hospitals • Residential institutions such as residential care homes, children’s homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non-residential uses for health services, nurseries and educational establishments. • Landfill* and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

Less Vulnerable

- Police, ambulance and fire stations which are **not** required to be operational during flooding.
- Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'More Vulnerable' class; and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill* and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do not need to remain operational during times of flood.
- Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.

Water-Compatible Development

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Table 3: (Extract from Planning Practice Guidance) Flood Risk Vulnerability and Flood Zone Compatibility

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	x	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	x	x	x	✓*

Key:

✓ Development is appropriate

x Development should not be permitted.

Notes to table 3:

- This table does not show the application of the Sequential Test which should be applied first to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
- The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;
- Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

* In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

3.2 Site Specific NPPF Flood Risk Categorisation

- 3.2.1 To assess the NPPF flood risk classification for the site, the first step was to inspect the UK Government web based 'Flood Map for Planning' which is used to inform planning of a site's Flood Zone(s) and the probability of flooding from rivers or sea (not taking into account the presence of flood defences or climate change). However, the web based 'Long Term Flood Risk Assessment for Locations in England' should also be used to identify the long-term flood risks from rivers and seas, surface water and reservoirs.
- 3.2.2 The Flood Map for Planning report is enclosed in *Appendix D*, and it can be seen that the areas within the redline boundaries is classified as Flood Zone 1.
- 3.2.3 Further site-specific review of the flood risk to the site is provided in section 4.

3.3 Site Specific Flood Zone Compatibility

- 3.3.1 The proposals for the development site are likely to fall within the following category:
- Buildings used for other services.
- 3.3.2 Buildings used for other services are classed as 'Less Vulnerable' development in the Flood Risk Vulnerability Classification (Table 2).
- 3.3.3 The site is located within Flood Zone 1 for which 'Less Vulnerable' development is deemed to be appropriate. Therefore, the development passes the sequential test and an exception test is not required (refer to the Flood Zone compatibility table in the NPPF technical guidance).

3.4 Sequential Test

- 3.4.1 The site is categorised as a 'Less Vulnerable' development (shown in table 2) and is within Flood Zone 1 therefore the sequential test is not required to be applied (see table 3).

4.0 Hydrological Assessment

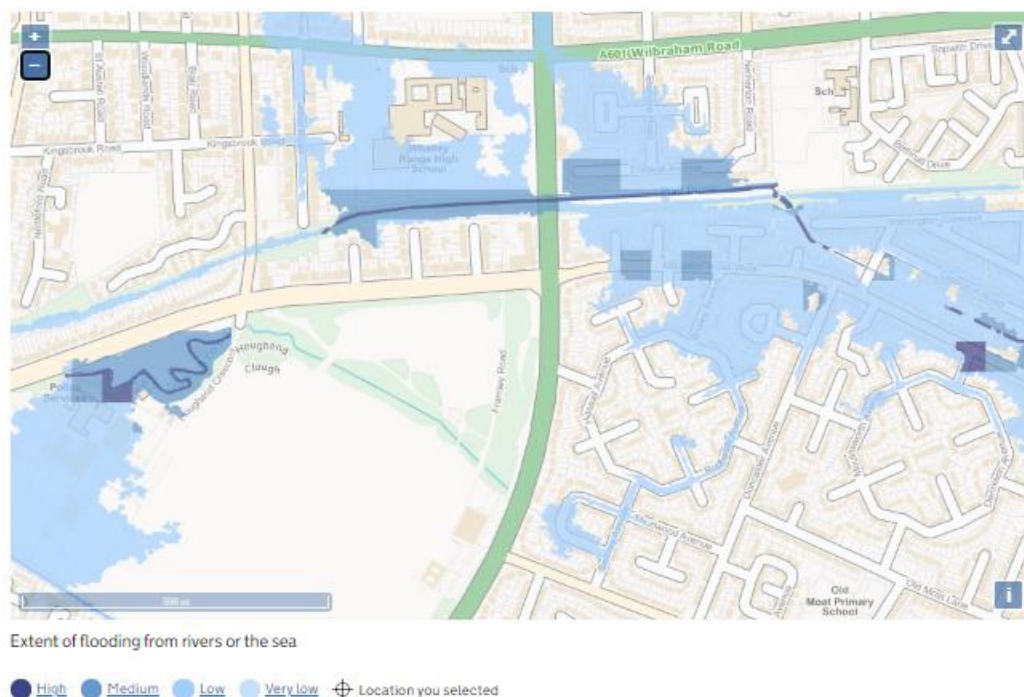
4.1 Sources of Flood Risk

- 4.1.1 This study assesses the risk from different types of flooding to the development and the risk of flooding from the development, taking into consideration climate change, as well as how flood risks should be managed. The approach to assessing flood risk at the development site was informed by the requirements of NPPF in conjunction with the client and Environment Agency requirements.

4.2 Fluvial Flooding (Rivers and Streams)

- 4.2.1 Flooding to the site from rivers and sea is indicated below in Figure 3, taken from the UK Government's Long-Term Flood Risk Information.

Figure 3: Long Term Flood Risk Assessment Map – Flood Risk from Rivers or Sea (© Crown Copyright)



- 4.2.2 It can be seen that the entire area of the site is at a 'Very Low' risk of fluvial flooding. The site is not shown to be in an area which benefits from flood defences. The site has less than a 0.1% chance of fluvial flooding each year. Therefore, the proposed site is considered to be at a very low residual risk from fluvial flooding.

Figure 4: Long Term Flood Risk Assessment (Detailed Information) – Flood Risk from Rivers or Sea (© Crown Copyright)

Flood risk from rivers or the sea

Very low risk means that each year this area has a chance of flooding of less than 0.1%. This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.

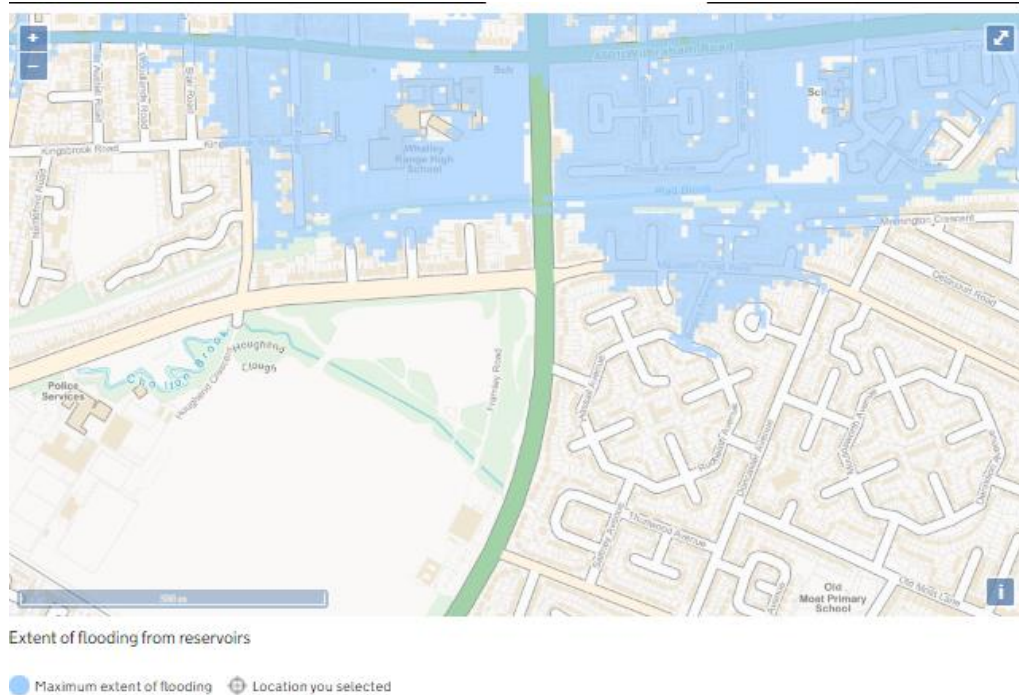
4.3 Tidal Flooding (Coastal or Estuarine)

- 4.3.1 There is currently no flood risk identified on the Environment Agency flood maps for the site and it is therefore regarded to be at low risk from tidal flooding.

4.4 Reservoir Flooding

- 4.4.1 Reservoir flooding is extremely unlikely to happen and there has been no loss of life in the UK from reservoir flooding since 1925. The Environment Agency is the enforcement authority and ensures that reservoirs are inspected regularly, and essential safety work is carried out.
- 4.4.2 The Long-Term Flood Risk Assessment (Flood Risk from Reservoirs) map shows the largest area that might be flooded if a reservoir were to fail and release the water it holds (see Figure 5).

Figure 5: Long Term Flood Risk Assessment Map – Flood Risk from Reservoirs (© Crown Copyright)



- 4.4.3 The site is located outside of the area that could be affected by reservoir flooding; therefore, the site is regarded to be at low risk from reservoir flooding.

4.5 Canal Flooding

- 4.5.1 The nearest canal to the site is the Bridgewater Canal which is located approximately 4 km west of the site.
- 4.5.2 The canals are identified in the SFRA as not generally posing a direct flood risk as they are a controlled water body. Therefore, the residual risk of canal flooding is usually associated with lower probability events such as overtopping and/or the breaching of embankments.
- 4.5.3 Given the above information, it is considered that there is low risk of canal flooding to the site.

4.6 Groundwater Flooding

- 4.6.1 According to the Manchester, Salford and Trafford SFRA, there are no known reports of groundwater flooding in the Manchester, Trafford and Salford authorities.
- 4.6.2 The site is not shown to be within an area at risk of groundwater flooding according to the groundwater flooding map shown within the Manchester, Salford and Trafford SFRA.

4.6.3 The ground investigation report confirms that existing groundwater levels were encountered across the site between 0.8m – 2.4m below ground level in the boreholes and during gas monitoring, levels recorded were between 0.48m and 1.3m below ground level.

- The boreholes under the proposed building area (WS101, WS102 and WS103) confirmed levels recorded during gas monitoring were at 0.68m – 0.95m below ground levels.
- The boreholes below the proposed car park area confirmed levels recorded during gas monitoring were at a maximum of 0.64m – 0.65m below ground levels.
- The boreholes within the proposed overspill car park area confirmed levels recorded during gas monitoring were at a maximum of 0.48m – 1.23m below ground levels.

4.6.4 Proposed ground levels are generally to remain local to existing ground levels, with the proposed building being set above existing ground levels to tie into existing building levels.

4.6.5 The shallowest groundwater level at 0.48m was identified in the far north-west corner of the overspill car park where existing levels slope away from the main development area.

4.6.6 Based on the current information it is overall assumed that the site is at a low risk of groundwater flooding. However, as a precaution, mitigation measures are proposed in section 5.

4.7 Public Sewers or Highway Drainage Flooding (Infrastructure Failure)

4.7.1 There are no highway drains recorded within the site. It is likely that there will be localised highway drainage surrounding the site (such as gullies and connections).

4.7.2 There are no public sewers recorded within the site. There are public sewers in the surrounding highways to the site.

4.7.3 Manchester City Council have not provided any records of flooding to the site or the vicinity.

4.7.4 United Utilities pre-development enquiry response is yet to be received.

4.7.5 Providing United Utilities and Manchester City Council maintain their drainage assets within and in the vicinity of the site, the risk of flooding to the proposed development site from public sewers or highway drainage is considered as low.

4.8 Surface Water Flooding to the site

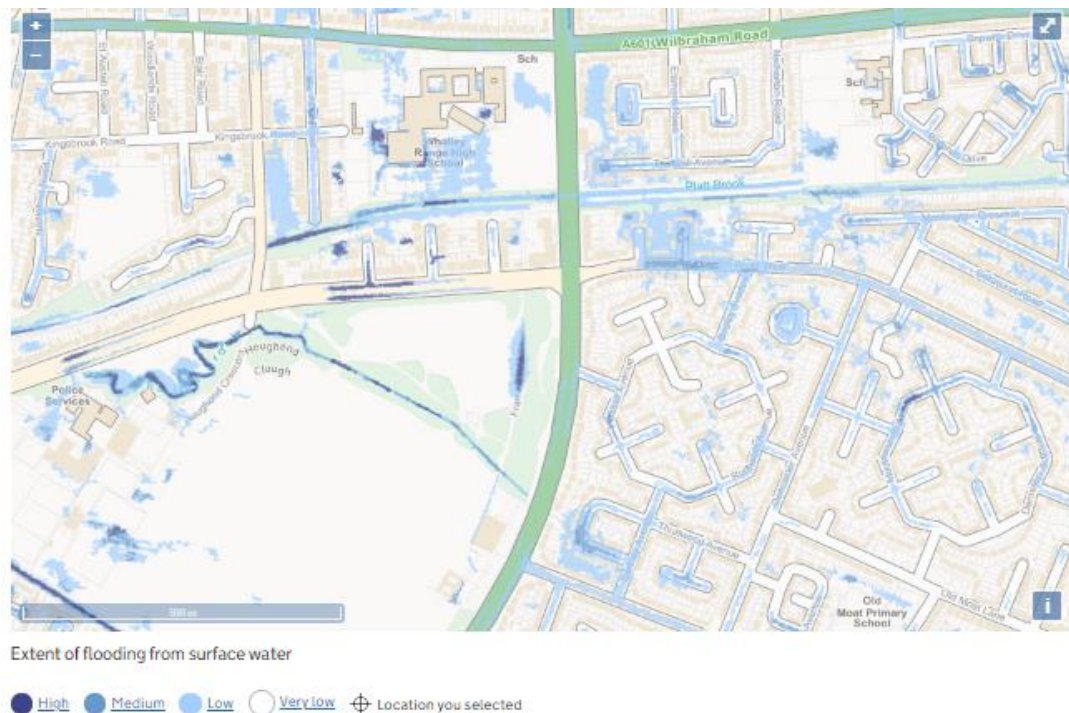
4.8.1 Surface water flooding can be caused when rainwater during extreme rainfall events does not drain away through the normal drainage system or soak into the ground with flooding occurring, principally from manholes and gullies. Surcharging sewers can result in overland flows which if originating at a higher elevation than a development site can potentially pose a flood risk.

4.8.2 From the UK Government's Flood Risk from Surface Water (extent of flooding) map;

- Where a site is located in a dark blue shaded zone, this indicates that the site is at high risk of flooding, where flooding occurs as a result of rainfall with a greater than 1 in 30 (3.3%) chance in any given year.
- Where a site is located in a mid-blue shaded zone, this indicates that the site is at medium risk of flooding, where flooding occurs as a result of rainfall of between 1 in 100 (1%) and 1 in 30 (3.3%) chance in any given year.
- Where a site is located in a light blue shaded zone, this indicates that the site is at low risk of flooding, where flooding occurs as a result of rainfall of between 1 in 1000 (0.1%) and 1 in 100 (1%) chance in any given year.
- Where a site is located in a clear (unshaded) area; this indicates that the site is at very low risk of flooding, where flooding occurs as a result of rainfall with less than 1 in 1000 (0.1%) chance in any given year.

4.8.3 The extent of flooding to the site from surface water is indicated in Figure 6 and it can be seen that the majority of the site is identified as being at a 'very low' risk of flooding from surface water. There is an isolated area along the eastern boundary of the proposed soft ball & baseball area which is considered to be a low point along the boundary and is considered to be at 'medium' risk.

Figure 6: Risk of Flooding from Surface Water - Extent of Flooding



- 4.8.4 Considering the above information, the risk of surface water flooding to the site is generally considered very low. As such, mitigation measures are proposed in Section 5 to ensure that the 'very low' risk can be maintained through development.

4.9 Surface Water Flooding from the site

- 4.9.1 Developers are responsible for ensuring that new development does not increase the flood risk elsewhere. Where new development is proposed, the proposed surface water drainage network shall be designed to not flood for the critical 1 in 30-year storm event and flood water generated up to the critical 1 in 100-year plus climate change storm event shall be constrained within areas on site so as not to cause damage to buildings, essential services or adjoining developments and services.
- 4.9.2 The development has the potential to increase flood risk where additional run-off from proposed roads, paved areas and building roofs are discharged freely into the downstream drainage network. It is therefore encouraged to propose permeable areas, landscaping areas and incorporate sustainable drainage features utilising infiltration or attenuation where possible.
- 4.9.3 An assessment of the proposed surface flows is carried out within the drainage strategy within section 6 of this report.

4.10 Historical Flooding

- 4.10.1 United Utilities and Manchester City Council have not provided any records of flooding to the site or the vicinity.

4.11 Summary of Flood Risk

- 4.11.1 From the evidence collated and subsequent negotiations the main types of flooding that may apply to the proposed development site are as follows:
- Groundwater flooding (potential)
 - Surface water flooding to the site
 - Surface water flooding from the site

5.0 Mitigation

5.1 Groundwater Flood Mitigation

- 5.1.1 Groundwater flooding tends to be more persistent than other sources of flooding, typically lasting for weeks or months rather than hours or days. Groundwater flooding does not generally pose a significant risk to life due to the slow rate at which the water level rises; however, it can cause significant risk to property.
- 5.1.2 Generally, the site has a potential for groundwater flooding for any properties set below the ground level.
- 5.1.3 Groundwater levels are reported in section 4.6 which confirms:
- The boreholes under the proposed building area (WS101, WS102 and WS103) confirmed levels recorded during gas monitoring were at 0.68m – 0.95m below ground levels.
 - The boreholes below the proposed car park area confirmed levels recorded during gas monitoring were at a maximum of 0.64m – 0.65m below ground levels.
 - The boreholes within the proposed overspill car park area confirmed levels recorded during gas monitoring were at a maximum of 0.48m – 1.23m below ground levels.
- 5.1.4 The proposed development does not include any below ground basement areas and generally, floor levels are at or above existing ground levels therefore the risk of groundwater flooding to the area is considered low.
- 5.1.5 Finished floor levels for the development are set above the highest groundwater level.
- 5.1.6 External ground levels across the site should fall away from the proposed buildings and ensure that the creation of low points is avoided (other than those used intentionally for drainage features) in order that in the unlikely event of groundwater flooding, the flood water is safely routed away from the buildings on site.
- 5.1.7 Providing the above mitigation measures were imposed, the risk from groundwater flooding would therefore be considered low post development.

5.2 Surface Water Flooding to the site Mitigation

- 5.2.1 The UK Government Long Term Flood Risk Assessment surface water flood maps indicate that the site is at very low to low risk of surface water flooding. However, the site topography is likely to be partially reprofiled as part of the development proposals. Therefore, measures outlined in this section are recommended in order to ensure that the risk of surface water flooding to the post-development site shall not be increased and shall be reduced where possible.

- 5.2.2 Section 4.8 of the report confirms that the risk of surface water flooding to the site is generally considered very low, however, to ensure that the 'very low' risk can be maintained through development it is recommended that proposed external ground levels across the site should fall away from the proposed buildings in a manner which does not create low points where water might collect unintentionally. This will ensure that any surface water will not flow towards the proposed buildings. The proposed surface water drainage network shall be designed to accommodate flows generated from within the site.
- 5.2.3 It is assumed that the surface water drainage outside of the site boundary will be subject to the relevant landowner's regular drainage maintenance schedule.
- 5.2.4 Providing the above measures are implemented the flooding risk to the development site from surface water is therefore considered low post development.

5.3 Surface Water Flooding from the site Mitigation

- 5.3.1 Any new development site drainage should be designed in accordance with current best practice to provide adequate capacity not to flood for the critical 1 in 30-year storm event and flood water generated from up to the critical 1 in 100-year plus climate change storm event shall be constrained within the areas on site so not to cause damage to buildings, essential services or adjoining developments & services.
- 5.3.2 In February 2016, the Environment Agency released updated climate change allowances for peak rainfall intensities which should be applied to new developments. Table 4 demonstrates the climate change allowances with central and upper end allowances being considered.
- 5.3.3 Based on the nature of the development, a lifespan in excess of 60 years is anticipated. Therefore, the potential climate change allowance for 2070-2115 ranges between 20% for the central allowance and 40% for the upper end allowance. As such, an allowance of 20% for climate change on peak rainfall intensity will be included in calculations, however the 40% allowance will also be considered.

Table 4: (Extract Environment Agency Guidance) Peak Rainfall Intensity Allowance in small and urban catchments

Applies across all of England	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	10%	20%	40%
Central	5%	10%	20%

- 5.3.4 Section 6 reviews the surface water discharge options, and it is proposed that the surface water will outfall into the existing private surface water system on site which discharges to the Red Lion Brook.
- 5.3.5 To minimise localised flooding within the site, the drainage design should ensure that gullies, drainage channels and drains are all suitably sized to accommodate peak storm flows. Also, all inlet features should have suitably sized sumps to catch silts and should be subject to a documented routine maintenance and cleansing regime.
- 5.3.6 Flood water exceedance routes should be identified, both on and off site.
- 5.3.7 For any sustainable drainage systems employed in the development, an appropriate management and maintenance plan for the sustainable drainage system for the lifetime of the development should be submitted which should include:
- Any arrangements for adoption by an appropriate public body or statutory undertaker, management and maintenance by a Residents' Management Company
 - Arrangements concerning appropriate funding mechanisms for its on-going maintenance of all elements of the sustainable drainage system (i.e. inspections, regular maintenance)
 - Means of access for maintenance and easements where applicable
- 5.3.8 Assuming that the proposed drainage system is designed to provide adequate capacity, and that the private and adopted sewers will be maintained by their adopted authority, it can be assumed risk of flood from blockage or overloading is minimal.
- 5.3.9 The final design of the drainage networks shall be in accordance with the legislation set by the Environment Agency, Manchester City Council and United Utilities.

6.0 Drainage Strategy

6.1 Existing Drainage

6.1.1 The public sewer records have been obtained for the development site.

6.1.2 The public sewer records indicate that there are no recorded public sewers located within the development site boundary.

6.1.3 The following public sewers are recorded within the vicinity of the site:

- There is a 375mm (upsizing to a 450mm) combined water sewer flowing north to south along Princess Road (east of the site).
- There is a 225mm combined water sewer parallel to the above noted sewer, within Princess Road and this appears to connect into the 450mm sewer adjacent to the site.

6.1.4 There are further public sewers identified on the public sewer records within the wider vicinity of the site, but these are not considered relevant to the scheme.

6.1.5 A CCTV Drainage Survey has been completed to confirm the location, route, size, depth, condition, of the surrounding public sewer network. The survey information is enclosed in *Appendix C*.

6.1.6 The CCTV Drainage Survey confirms that the existing site is served by a partially separate foul and surface water drainage system.

6.1.7 The existing foul system consists of:

- The existing main building connects to the east of the site into the existing 450mm combined public sewer in Princess Road at Manhole 8301.
- The existing building to the south-west corner connects to the east of the site into the existing 450mm combined sewer in Princess Road at Manhole 7100.

6.1.8 The existing surface water system consists of:

- The main building connects to a 300mm pipe along the eastern, northern and western elevations and discharges to an existing attenuation tank to the north of the building. The outfall from the tank discharges to the Red Lion Brook via a flow control chamber.
- The car park connects to a 450mm piped system, in which the existing outfall is unconfirmed. It is anticipated that the existing network either connects directly to the Red Lion Brook with an independent flow control or it connect to the attenuation tank.
- There is an existing land drain system along the northern section of the car park which appears to serve the adjacent landscaping and footpath and this discharges around the northern elevation of the building

and connects to the above mentioned 300mm building surface water system prior to entering the attenuation tank.

- 6.1.9 There is an existing foul drain below the proposed building footprint, and this will require relocating in co-ordination with the proposed foundation arrangement.
- 6.1.10 There is an existing land drain below the proposed building footprint, and this will require relocating in co-ordination with the proposed foundation arrangement.
- 6.1.11 There are further investigations required to fully confirm the existing network principles and condition.

6.2 Proposed Foul Water Drainage

- 6.2.1 A separate foul and surface water system is proposed.
- 6.2.2 There are no foul drainage proposals for the Proposed Overspill Car Parking, Proposed 3D FTP All Weather Pitch and the Proposed Softball & Baseball area, therefore this section reviews the Proposed Extension to the existing Leisure Centre and external bin storage areas only.
- 6.2.3 The proposed foul drainage is currently based on two options:
 - Option 1 – Foul Drainage is to be collected by gravity and outfall into the existing private drainage system serving the existing building at manhole referenced MH15, which ultimately discharges to the public sewer network in Princess Road. This option requires upgrading of the existing system from 150mm to 225mm to increase capacity and remediate the existing pipe condition.
 - Option 2 – Foul Drainage is to discharge by gravity direct to the public sewer in Princess Road directly east of the site.
- 6.2.4 The proposed option to be installed will be subject to constraints and cost, however ultimately both outfall connection points to the public sewer are collected by the same sewer in Princess Road.
- 6.2.5 The peak flow rate for the development has been calculated based on the 'Design and Construction Guidance for foul and surface water sewers' Sewerage Sector Guidance Appendix C.
- 6.2.6 The commercial element of the development is based on the sum of the domestic design flow and the trade effluent design flow. However, in the absence of appropriate information, 0.6 litres per second per hectare of developable land for the domestic element and 0.5 litres per second per hectare for normal industry is assumed. The peak foul discharge is therefore estimated at 0.04l/s based on 0.035ha of commercial space.
- 6.2.7 The total foul peak flow based on the discharge unit (peak flow) is estimated at 14 l/s.
- 6.2.8 United Utilities have confirmed that they have no objection to the proposal to drain foul via the existing private drainage which connects to UUMH 8301, at an unrestricted rate.

6.2.9 If option 2 is proposed this will be downstream of UUMH 8301.

6.2.10 Outfall connection (either option) will be subject to a Section 106 Agreement with United Utilities.

6.2.11 The proposed drainage strategy is enclosed in *Appendix G*.

6.3 Proposed Surface Water Drainage

6.3.1 Any new development site drainage should be designed in accordance with current best practice to provide adequate capacity not to flood for the critical 1 in 30-year storm event and flood water generated for up to the critical 1 in 100-year plus climate change storm event shall be constrained within the areas on site so not to cause damage to buildings, essential services or adjoining developments and services.

6.3.2 In following the standard hierarchy of drainage solutions, consideration should firstly be given to the discharge of surface water runoff by sustainable methods such as infiltration.

Infiltration

6.3.3 The Phase 2 Intrusive Site Investigation confirms that the existing site contains depths of made ground. Infiltration tests were completed during the investigation works and provided the following results at SA01:

1) 1.33×10^{-5} m/s (0.047m/hr)

2) 1.34×10^{-5} m/s (0.048m/hr)

3) 1.28×10^{-5} m/s (0.046m/hr)

6.3.4 Based on the above infiltration results, it would not be a sufficient rate to drain via an infiltration only based system.

6.3.5 Further Soakaway tests have been completed across the car park area to determine whether additional locations may prove more sufficient infiltration rates:

SA103

1) 1.16×10^{-5} m/s (0.041m/hr)

2) 9.72×10^{-6} m/s (0.035m/hr)

3) 9.48×10^{-6} m/s (0.034m/hr)

SA104

1) 1.43×10^{-5} m/s (0.051m/hr)

2) 1.40×10^{-5} m/s (0.050m/hr)

3) 1.23×10^{-5} m/s (0.044m/hr)

SA105

1) 2.51×10^{-5} m/s (0.090m/hr)

2) 2.52×10^{-5} m/s (0.090m/hr)

3) 2.35×10^{-5} m/s (0.084m/hr)

- 6.3.6 Based on the above infiltration results, it would not be a sufficient rate to drain via an infiltration only based system and therefore a hybrid solution was also reviewed.
- 6.3.7 With cross reference to the groundwater levels reported in section 4.6, groundwater levels were generally encountered across the site within 0.5 – 1.3m below ground level and therefore on this basis infiltration components as a hybrid system would also not be compatible.
- 6.3.8 On this basis, infiltration has been discounted from the design.

Watercourse

- 6.3.9 The nearest watercourse to the site is the Red Lion Brook which is located approximately 165m to the north of the southern area redline boundary. The existing drainage system connects to the Red Lion Brook, therefore initially it was proposed to utilise connection to the existing system and connect to the brook, however levels and restrictions on attenuation depths is unlikely to allow this, therefore a new connection to the brook will be required.

Surface Water Sewer

- 6.3.10 There are no existing surface water public sewers in the wider area and based on the SuDS hierarchy, discharge to watercourse is preferred.

Combined Water sewer

- 6.3.11 There are various combined sewers in the vicinity of the site, however, based on the SuDS hierarchy, discharge to watercourse is preferred.
- 6.3.12 Table 5 summarises the options for surface water disposal.

Table 5: Surface Water Disposal

Surface Water Disposal	Potential	Description
Infiltration	X	Incompatible – poor infiltration and high groundwater (within 1m of ground levels)
Watercourse	✓	The Red Lion Brook is located approximately 165m north of the site.

		A new connection to the watercourse is the most viable option.
Surface Water Public Sewer	X	No surface water public sewers in the vicinity of the site.
Combined Public Sewer	X	There are various combined water sewers in the vicinity of the sites. However, in line with the drainage hierarchy the site is proposed to the watercourse.

Main Site and Car Park Area

- 6.3.13 As the existing system serving the existing building has its own attenuation and flow control, and it is likely that the existing 450mm pipe system serving the car park area also has its own flow control with designed maximum capacity, the proposals should be to maintain the outfalls from the current catchments draining to not increase flood risk to the existing system. We have completed an assessment of the existing catchments (enclosed in *Appendix F*) and this confirms that the majority of the area discharges to the existing 450mm surface water system in the Car Park. Proposals should therefore be to connect to the existing 450mm surface water drainage to mimic the existing design.
- 6.3.14 However, in assessing the potential to connect to the existing system, levels of the system are generally shallow and therefore it would not be possible to connect to the existing system and provide adequate attenuation, therefore proposals should be to connect directly to the Brook via a new outfall.
- 6.3.15 Invert levels of the brook are relatively shallow given the distance from the development works and therefore pipework will need to be oversized to allow gradients to be shallower.
- 6.3.16 Based on Manchester City Council guidance, development should restrict existing brownfield flow rates to a maximum of 50% of existing flows, refer to the correspondence enclosed in *Appendix E*.
- 6.3.17 Therefore, we have generated an existing model to determine the likely flows being discharged to the 450mm drainage system from the car park area within the development boundary. The existing flows are calculated as:
- 1 Year = 10.3 l/s
 - 30 Year = 27.6 l/s
 - 100 Year = 35.6 l/s
- 6.3.18 In accordance with the LLFA advice, flows should be limited to:
- 1 Year = 5.1 l/s
 - 30 Year = 13.8 l/s

- 100 Year = 17.8 l/s

6.3.19 Therefore, we propose to limit the outfall to the above flows, which would require a complex flow control to ensure a variable outflow could be achieved.

6.3.20 Attenuation provision is provided within an attenuation tank, oversized pipes and permeable paving areas to the car parking bays.

6.3.21 Refer to the Drainage Layouts enclosed in *Appendix G*.

Existing Overspill Car Park (upgraded to frequent use Car Park)

6.3.22 The existing overspill car park is a gravel overlay with no formal drainage provision. Proposals are to install a new tarmac construction with formal connection to the existing outfall to the brook (downstream to the flow control). The car park area is proposed to be limited to a maximum of 5 l/s and attenuation provision within a permeable construction. Attenuation provision has been sized based on the worst-case infiltration rate achieved during investigation works and capacity provision for up to the 100 year +40% climate change event.

6.3.23 Refer to the Car Park Drainage Layout enclosed in *Appendix G*.

Proposed Overspill Car Park

6.3.24 There is allowance in the design for the Proposed Overspill Car Parking and it is assumed the car park construction will have sub surface drains collecting run-off through a 'grasscrete' type surface. The proposal to this area is to mimic the proposals as its current 'grass' state therefore no formal drainage connections are proposed, and outfall potential is limited given the low-lying land. Proposals are therefore to construct the sub-base as permeable construction to allow surface run-off to be managed as it does in its current condition. Attenuation provision has been sized based on the worst-case infiltration rate achieved during investigation works and capacity provision for up to the 100 year +40% climate change event.

6.3.25 Refer to the Overspill Car Park Drainage Layout enclosed in *Appendix G*.

All Weather Pitch

6.3.26 The All-weather pitch drainage will be designed by pitch specialist - assumed to have sub surface drains collecting run-off through surface. No allowance has been made for connection to the proposed system based on the existing ground levels within the proposed pitch areas falling to the north-west. It is assumed that a new connection will be installed either directly to the brook or via the new connection proposed in this strategy (downstream of the flow control). Greenfield run-off rates for the boundary of the All-Weather Pitch works (2.02ha.) is 4.6 l/s, therefore any new outfall from the pitch should be limited to greenfield run-off rate.

6.3.27 The Proposed Softball & Baseball area is proposed to be white lined and no drainage provision.

SuDs Assessment

6.3.28 It is recommended that sustainable methods of attenuation are implemented where possible.

As part of the sitewide proposals, we completed an assessment of compatibility of various SuDS components:

Rain Gardens/Tree Pits – Opportunities for rain gardens are limited and tree root protection zones limit the introduction of capacity within the existing soft landscaped zones.

Bioretention Areas - Depths would be in excess of 1m to allow connections from the building and/or external areas based on the available locations north of the building, therefore the base of the swale would be within the groundwater level zone and therefore incompatible for infiltration.

Blue Roof/Green Roof - A green roof would provide some retention of run-off (typically 5mm), however the use would generally slow the rate at which the run-off discharges as opposed to storing the water. A blue roof would provide attenuation at roof level and would slow the rate at which the run-off discharges to the wider drainage network. Based on the development of the current structural design and roof design, the proposal was confirmed as potentially a significant design change to the structural design.

Shallow Swale – Swale depths would be in excess of 1m to allow connections from the building and/or external areas based on the available locations north of the building, therefore the base of the swale would be within the groundwater level zone and therefore incompatible for infiltration.

Permeable Paving – Infiltration rates are insufficient as a standalone discharge mechanism, Shallow permeable paving was considered, however due to high groundwater the permeable paving system would need to be lined with a positive outfall discharge.

In summary, the attenuation provision is proposed as follows:

6.3.29 Attenuation provision is provided within an attenuation tank, oversized pipes and permeable paving areas to the car parking bays.

Proposed Main Development - Attenuation provision has been sized based on a restricted outfall of up to 17.8/s with capacity provision for up to the 100 year +40% climate change event to be provided within an attenuation tank, oversized pipes and permeable construction within new car parking bays.

Existing Overspill - Proposed Car Park - Attenuation provision has been sized based on a restricted outfall of 5 l/s with capacity provision for up to the 100 year +40% climate change event to be provided entirely within a permeable construction.

Overspill Car Park - Attenuation provision has been sized based on the worst-case infiltration rate achieved during investigation works and capacity provision for up to the 100 year +40% climate change event to be provided entirely within a permeable construction.

6.3.30 Surface water run-off from hard paved areas at risk of contamination should receive water quality treatment. Access roads are considered as a low hazard in terms of contamination. Figure 8 illustrates the pollution hazard indices for different land use classifications from The CIRIA SuDS Manual C753 (2015).

Figure 8: Pollution Hazard indices for land use classification (Table 26.2 the CIRIA SuDS manual 2015)

TABLE 26.2 Pollution hazard indices for different land use classifications				
Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

6.3.31 Figure 9 illustrates the SuDS Component mitigation indices from The CIRIA SuDS Manual C753 (2015).

Figure 9: Indicative SuDS mitigation indices (Table 26.3 the CIRIA SuDS manual 2015)

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters				
Type of SuDS component	Mitigation indices¹			
	TSS	Metals	Hydrocarbons	
Filter strip	0.4	0.4	0.5	
Filter drain	0.4 ²	0.4	0.4	
Swale	0.5	0.6	0.6	
Bioretention system	0.8	0.8	0.8	
Permeable pavement	0.7	0.6	0.7	
Detention basin	0.5	0.5	0.6	
Pond ⁴	0.7 ³	0.7	0.5	
Wetland	0.8 ³	0.8	0.8	
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.			

Notes

- 1 SuDS components only deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters.
- 2 Filter drains can remove coarse sediments, but their use for this purpose will have significant implications with respect to maintenance requirements, and this should be taken into account in the design and Maintenance Plan.
- 3 Ponds and wetlands can remove coarse sediments, but their use for this purpose will have significant implications with respect to the maintenance requirements and amenity value of the system. Sediment should normally be removed upstream, unless they are specifically designed to retain sediment in a separate part of the component, where it cannot easily migrate to the main body of water.
- 4 Where a wetland is not specifically designed to provide significantly enhanced treatment, it should be considered as having the same mitigation indices as a pond.
- 5 See **Chapter 14** for approaches to demonstrate product performance. A British Water/Environment Agency assessment code of practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: <http://tinyurl.com/qf7yuj7>
- 6 SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. SEPA (2014) also provides a flowchart with a summary of checks on suitability of a proprietary system.

- 6.3.32 The selection of treatment should ensure that the SuDS mitigation component index (Figure 9) exceeds the pollution hazard index (Figure 8).
- 6.3.33 Currently proposals are to capture some of the car parking areas via a below ground filter drain which intercepts flows via kerb inlets, which follows the principles of the existing car park. The remainder of the car parking areas will be connected to a Petrol Interceptor or Filter Chamber prior to discharge to the downstream drainage network.
- 6.3.34 The proposals for pollution protection should be agreed with The Environment Agency and Manchester City Council.
- 6.3.35 The proposed drainage strategy is enclosed in *Appendix G*.
- 6.3.36 The final design of the drainage networks shall be in accordance with the legislation set by the Environment Agency, Manchester City Council and United Utilities.

6.4 Maintenance

- 6.4.1 A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.
- 6.4.2 It is recommended that the drainage system is inspected as a minimum twice a year, with the system also being inspected after any major storm event. Significant sediment deposition is likely in areas used for storage, so a post clean-up operation may be required including the removal of litter, vegetation, sewerage debris and larger objects.
- 6.4.3 A management company may be required for maintenance of attenuation facilities.
- 6.4.4 For any sustainable drainage systems employed in the development, an appropriate management and maintenance plan for the sustainable drainage system for the lifetime of the development should be submitted which should include:
 - Arrangements concerning appropriate funding mechanisms for its on-going maintenance of all elements of the sustainable drainage system (i.e. inspections, regular maintenance)
 - Means of access for maintenance and easements where applicable.

Appendix A

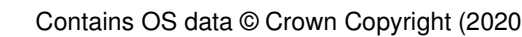
Proposed Redline Boundary

Proposed Site Layout

Proposed Ground Floor Plan

Proposed First Floor Plan

Proposed Roof Plan



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ARCHITECTS

HOUGH END LEISURE CENTRE SITE LOCATION PLAN

REV P4

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STATUS | 00 SCALE | 1:1250 @ A0
DRAWN BY | RFP DATE | 15.12.20
HEV-EWA-ZZ-XX-DR-L-49040



1. ENTRANCE TO PROPOSED EXTENSION TO LEISURE CENTRE BUILDING

2. EXISTING CHANGING PAVILION TO BE DEMOLISHED

3. EXISTING PARKING BAYS REMOVED

4. EXISTING TREES OR GROUPS OF TREES PROPOSED AS REMOVED

5. EXISTING COACH SET-DOWN/PICK-UP RELOCATED

6. PROPOSED NEW CAR PARKING, CONCRETE ASPHALT SURFACE

7. EXISTING OVERSPILL PARKING REPLACED WITH NEW CONCRETE ASPHALT SURFACE AND NEW PERIMETER KERBS & END TURNING SPACE

8. PROPOSED OVERSPILL PARKING, SURFACED IN REINFORCED GRASS SYSTEM: FOR NEW AND EXISTING

9. RE-POSITIONED AND NEW ACCESSIBLE & ENLARGED PARKING BAYS

10. PROPOSED NEW CYCLE STORAGE CANOPY; FOR NEW & EXISTING

11. PROPOSED MOTORCYCLE PARKING: FOR NEW AND EXISTING

12. PROPOSED LOUVRED ENCLOSURES FOR NEW ASHP PLANT

13. PROPOSED NEW AMENITY SEATING AREA OUTSIDE CAFE

14. PROPOSED NEW EXTERNAL CAFE SERVING HATCH

15. ONE-WAY CIRCULATION MARKINGS AROUND CAR PARK

16. EXISTING PEDESTRIAN PAVING TO ENTRANCE PLAZA RETAINED

17. NEW PEDESTRIAN PAVING T.M.E. SERVING ENLARGED PARKING BAYS

18. PROPOSED ELECTRIC VEHICLE CHARGING POINT

19. PROPOSED DROP DOWN OR SWING BARRIER AT ENTRANCE TO OVERSPILL

20. EXISTING SUB-STATION REPLACED WITH ENLARGED ENCLOSURE

21. PROPOSED CHANGING ROOM ENTRANCE FOR 3G FTP FACILITIES

22. PROPOSED CHANGING ROOM ENTRANCE FOR GRASS PITCHES

23. REMODELLED/ENLARGED REFUSE & RECYCLING STORE COMPOUND

24. PROPOSED NEW CONCRETE ASPHALT PEDESTRIAN FOOTWAYS

25. PROPOSED DROPPED BOLLARD MAINTENANCE ACCESS TO PITCHES

26. NEW ALL-WEATHER 3G FOOTBALL PITCH, LIGHTING & PERIMETER FENCE

27. EXISTING WOODLAND RETAINED

28. FEATURE TREE, GRASSES & SHRUB PLANTING

29. PROPOSED SEMI-MATURE TREE PLANTING

30. EXISTING MATURE CATEGORY A TREE RETAINED

31. PROPOSED CENTRAL DRAINAGE SWALE WITH AQUATIC PLANTING

32. AUTO VERTICAL SWING ENTRY & EXIT BARRIER, VARIABLE HEIGHT

33. MOUNDING/BERM OR BARRIER RAIL AS VEHICULAR DETERRENT

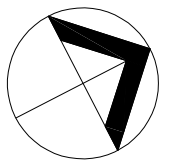
34. KNEE RAILING

35. DESIGNATED CAR SHARE BAYS

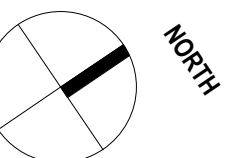
36. POSSIBLE ADDITIONAL TREE PLANTING AREA

37. PVs BATTERY STORAGE CONTAINER BY OTHERS

38. MINIMUM KERB RADIUS OF 3m (SWEEPED PATH)



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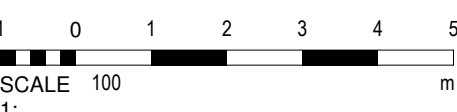
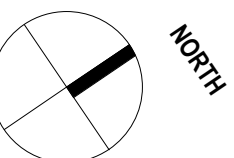
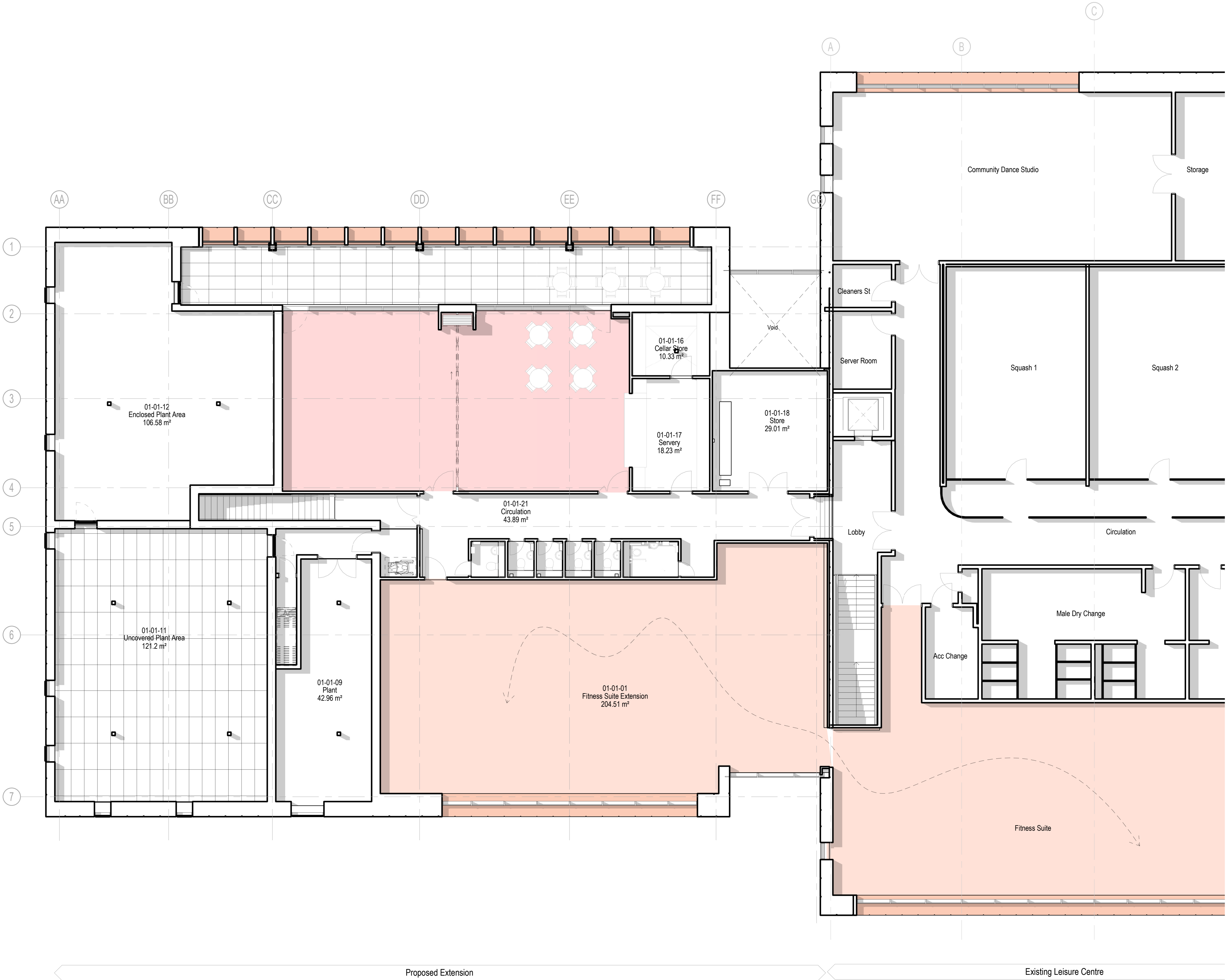
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Project Number: 2638
Project Name: Hough End Leisure Centre Extension

Drawing Status: Planning
Drawing Number: **HEV- EWA- 01- 00- DR- A- 40400**
Drawing Name: Level 00 - Ground Floor
Date: 31.03.21
Rev: P1
Drawn By: LA
Scale: 1 : 100

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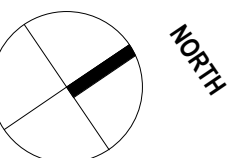
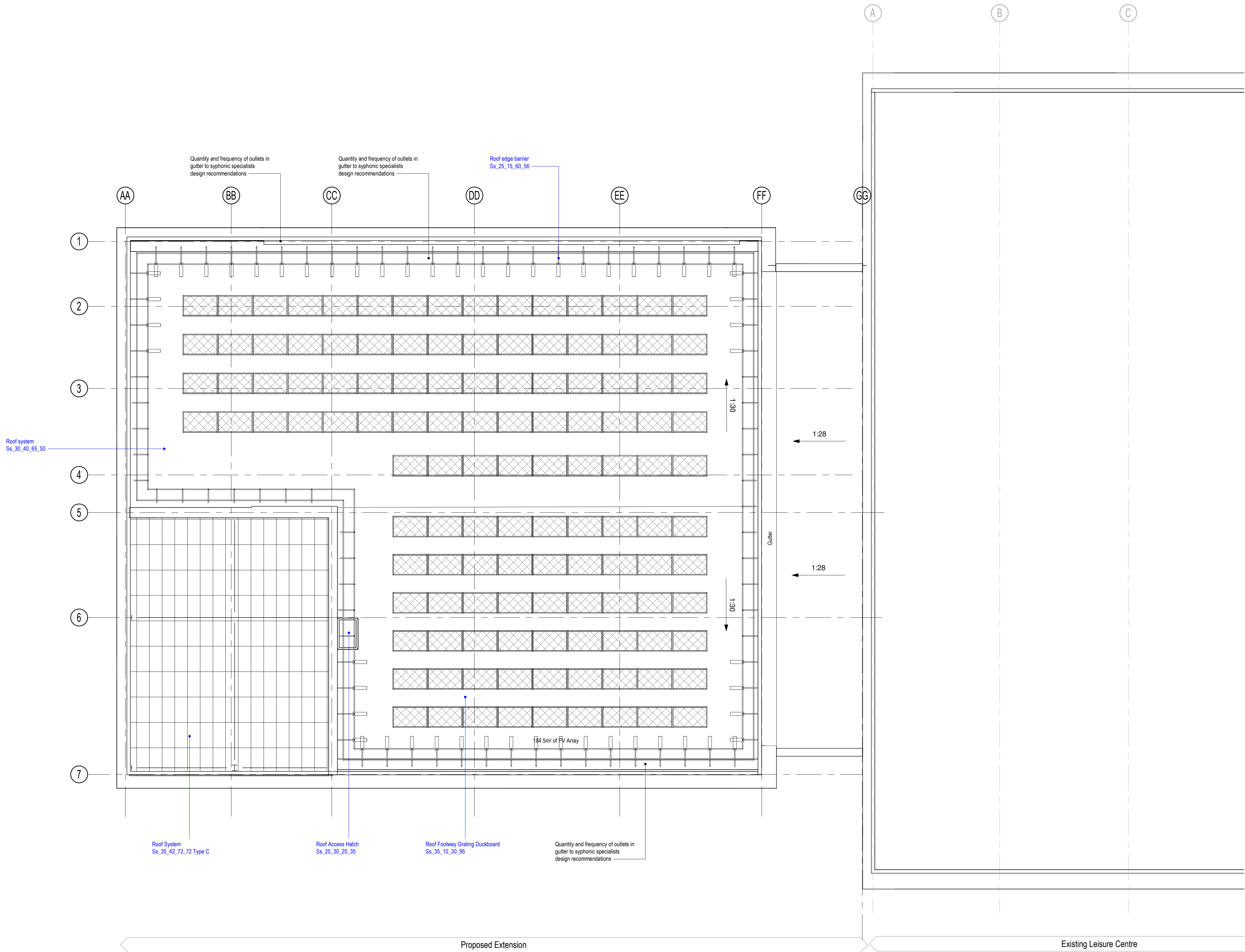


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Project Number: 2638
Project Name: Hough End Leisure Centre Extension

Drawing Status: Planning
Drawing Number: **HEV- EWA- 01- 01- DR- A- 40401**
Drawing Name: Level 01 - First Floor
Date: 31.03.21 Rev: P1
Drawn By: LA Scale: 1 : 100

Wellfield Chester Road Preston Brook WA7 3BA
T: 01928 752200 E: info@ewa.co.uk W: ewa.co.uk



1 0 1 2 3 4 5
SCALE 100
1: m

elliswilliams

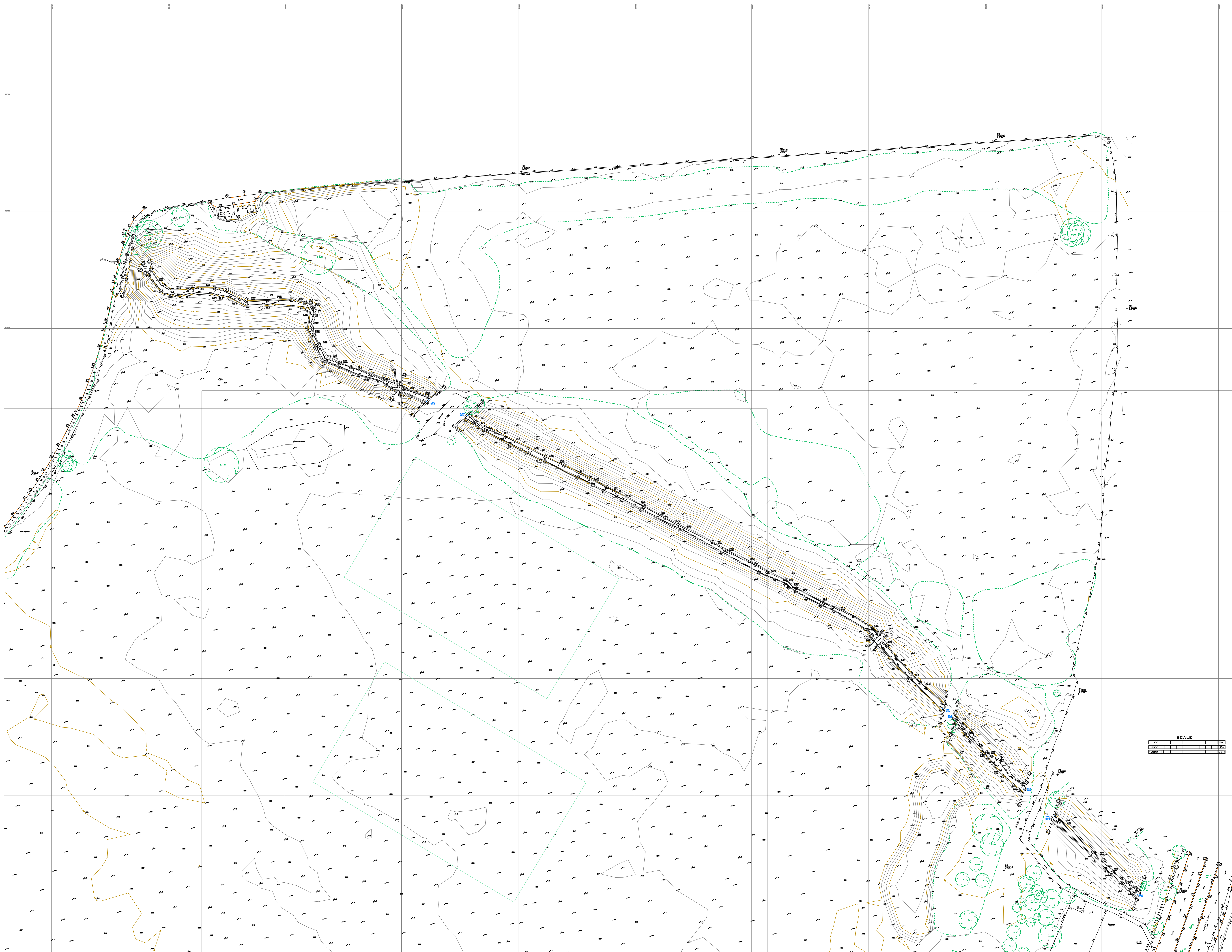
Project Number: 2638
Project Name: Hough End Leisure Centre Extension

Drawing Status: Stage 3
Drawing Number: **HEV-EWA-01-R1-DR-A-10403**
Drawing Name: Roof Plan
Date: 26.02.21
Drawn By: LA
Rev: P1
Scale: 1 : 100

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Appendix B

Topographical Survey



SYMBOL & ABBREVIATION KEY

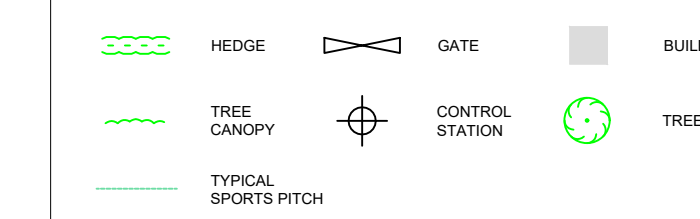
KEY

Grid & Datum - Local Plane Grid related to OS National Grid & Datum
By GNSS RTK Observations

STANDARD ABBREVIATIONS

A/C		L/C		L/C		L/C	
1	AC CONDENSING LN	1	LN	1	LN	1	LN
2	AC CONDENSING LN	2	LN	2	LN	2	LN
3	AC CONDENSING LN	3	LN	3	LN	3	LN
4	AC CONDENSING LN	4	LN	4	LN	4	LN
5	AC CONDENSING LN	5	LN	5	LN	5	LN
6	AC CONDENSING LN	6	LN	6	LN	6	LN
7	AC CONDENSING LN	7	LN	7	LN	7	LN
8	AC CONDENSING LN	8	LN	8	LN	8	LN
9	AC CONDENSING LN	9	LN	9	LN	9	LN
10	AC CONDENSING LN	10	LN	10	LN	10	LN
11	AC CONDENSING LN	11	LN	11	LN	11	LN
12	AC CONDENSING LN	12	LN	12	LN	12	LN
13	AC CONDENSING LN	13	LN	13	LN	13	LN
14	AC CONDENSING LN	14	LN	14	LN	14	LN
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16	AC CONDENSING LN	16	LN	16	LN	16	LN
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18	AC CONDENSING LN	18	LN	18	LN	18	LN
19	AC CONDENSING LN	19	LN	19	LN	19	LN
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22	AC CONDENSING LN	22	LN	22	LN	22	LN
23	AC CONDENSING LN	23	LN	23	LN	23	LN
24	AC CONDENSING LN	24	LN	24	LN	24	LN
25	AC CONDENSING LN	25	LN	25	LN	25	LN
26	AC CONDENSING LN	26	LN	26	LN	26	LN
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28	AC CONDENSING LN	28	LN	28	LN	28	LN
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79	AC CONDENSING LN	79	LN	79	LN	79	LN
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92	AC CONDENSING LN	92	LN	92	LN	92	LN
93	AC CONDENSING LN	93	LN	93	LN	93	LN
94	AC CONDENSING LN	94	LN	94	LN	94	LN
95	AC CONDENSING LN	95	LN	95	LN	95	LN
96	AC CONDENSING LN	96	LN	96	LN	96	LN
97	AC CONDENSING LN	97	LN	97	LN	97	LN
98	AC CONDENSING LN	98	LN	98	LN	98	LN
99	AC CONDENSING LN	99	LN	99	LN	99	LN
100	AC CONDENSING LN	100	LN	100	LN	100	LN

SYMBOLS



GENERAL

TOPOGRAPHICAL NOTES

Coordinates related to OS National Grid by GPS

KEY FOR UNDERGROUND SERVICES

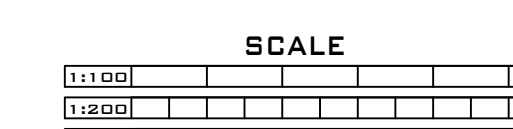
[illegible]

Where chamber extents are significantly greater than the cover size, their approximate

ABBREVIATION KEY

[illegible]

UTILITY SURVEY NOTES

[illegible]

AMBER UTILITIES LTD

CLIENT: X

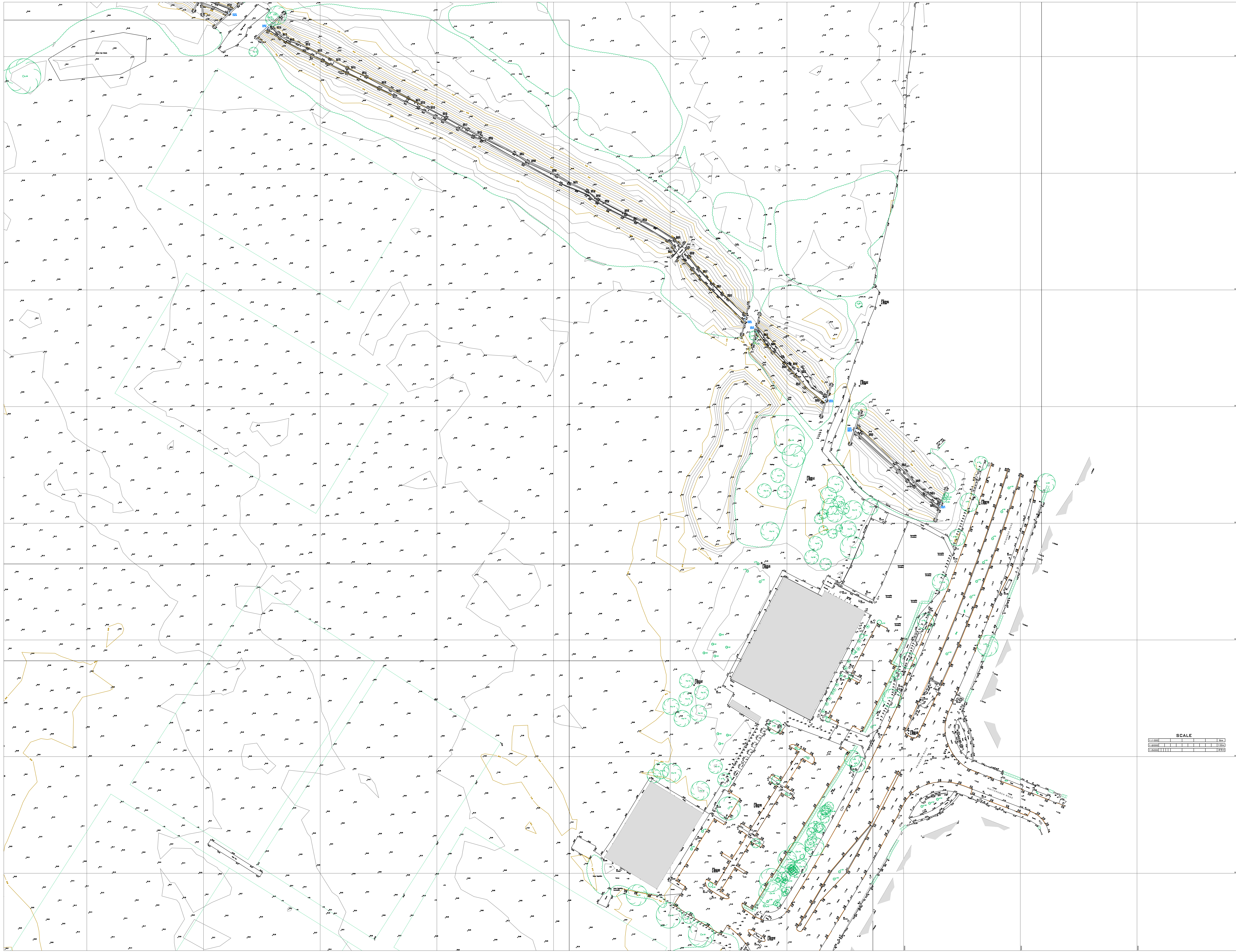
SITE LOCATION: Hough End Leisure Centre,
480 Princess Road,
Manchester, M20 1HD,

DRAWING TITLE: Topographical & Utility Survey

SURVEYED BY: _____			DRAWN BY: _____		APPROVED BY: _____	
MD/YV			YY			

DRILLING NO:	UXX-XXXX	SURVEY DATE:	February
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SCALE: 1:500 @A0	SHEET NO: 1 OF 4
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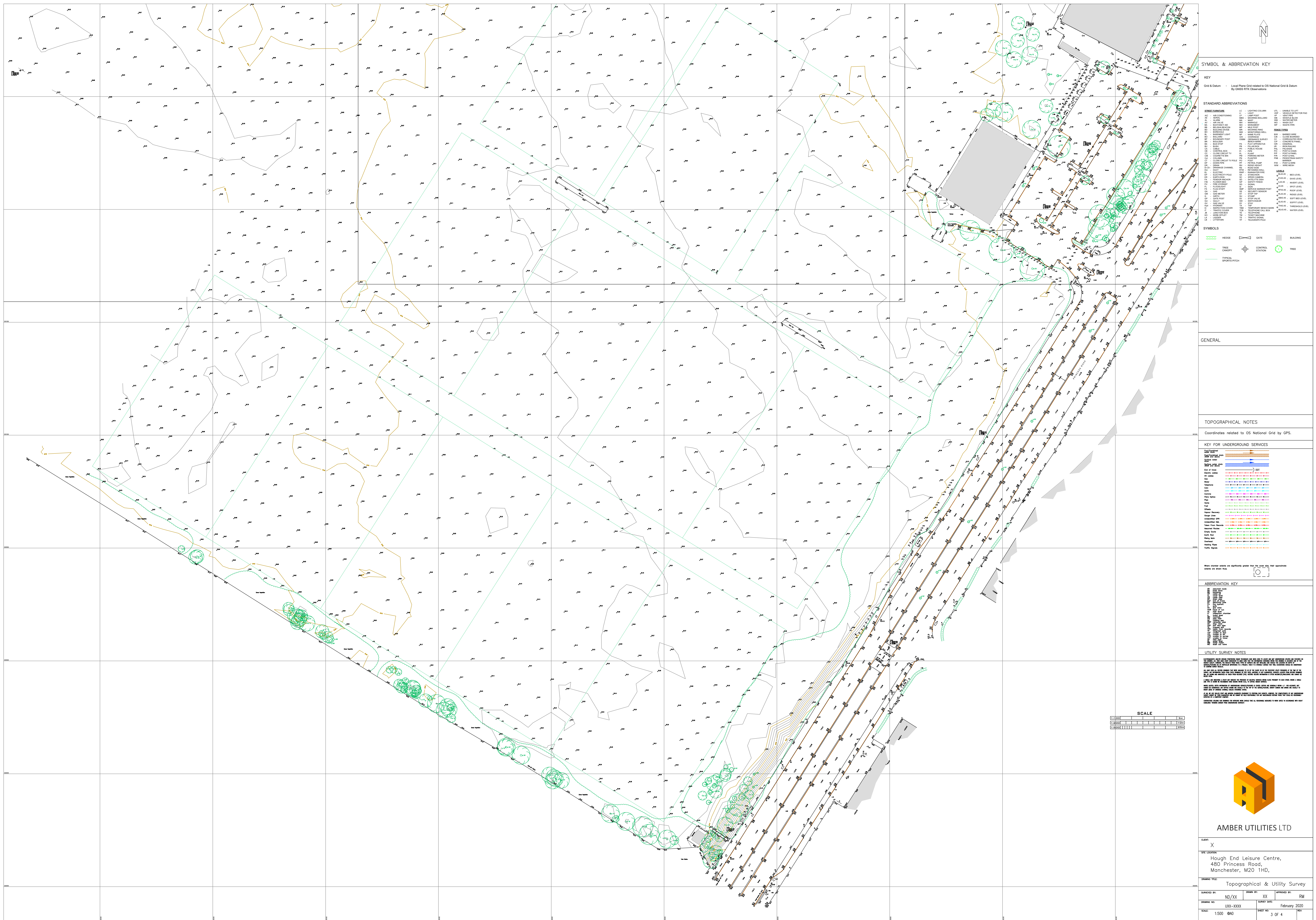
SYMBOL & ABBREVIATION KEY

KEY

Grid & Datum - Local Plane Grid related to OS National Grid & Datum
By GNSS RTK Observations

STANDARD ABBREVIATIONS

ABBREVIATIONS	SYMBOLS	LEVELS
AC - ALUMINIUM CABLE	AC - ALUMINIUM CABLE	AC - ALUMINIUM CABLE
AD - ALUMINIUM DUCT	AD - ALUMINIUM DUCT	AD - ALUMINIUM DUCT
AE - ALUMINIUM EARTH	AE - ALUMINIUM EARTH	AE - ALUMINIUM EARTH
AF - ALUMINIUM FIBRE	AF - ALUMINIUM FIBRE	AF - ALUMINIUM FIBRE
AG - ALUMINIUM GROUND	AG - ALUMINIUM GROUND	AG - ALUMINIUM GROUND
AL - ALUMINIUM LIGHT	AL - ALUMINIUM LIGHT	AL - ALUMINIUM LIGHT
AM - ALUMINIUM MANTLE	AM - ALUMINIUM MANTLE	AM - ALUMINIUM MANTLE
AN - ALUMINIUM NERVE	AN - ALUMINIUM NERVE	AN - ALUMINIUM NERVE
AO - ALUMINIUM OIL	AO - ALUMINIUM OIL	AO - ALUMINIUM OIL
AP - ALUMINIUM PAPER	AP - ALUMINIUM PAPER	AP - ALUMINIUM PAPER
AR - ALUMINIUM RAY	AR - ALUMINIUM RAY	AR - ALUMINIUM RAY
AS - ALUMINIUM SHEATH	AS - ALUMINIUM SHEATH	AS - ALUMINIUM SHEATH
AT - ALUMINIUM TAP	AT - ALUMINIUM TAP	AT - ALUMINIUM TAP
AV - ALUMINIUM VALVE	AV - ALUMINIUM VALVE	AV - ALUMINIUM VALVE
AW - ALUMINIUM WIRE	AW - ALUMINIUM WIRE	AW - ALUMINIUM WIRE
AX - ALUMINIUM X	AX - ALUMINIUM X	AX - ALUMINIUM X
AY - ALUMINIUM Y	AY - ALUMINIUM Y	AY - ALUMINIUM Y
AZ - ALUMINIUM Z	AZ - ALUMINIUM Z	AZ - ALUMINIUM Z
BA - BRICK	BA - BRICK	BA - BRICK
BB - BRICK BOND	BB - BRICK BOND	BB - BRICK BOND
BC - BRICK CHIMNEY	BC - BRICK CHIMNEY	BC - BRICK CHIMNEY
BD - BRICK DRAIN	BD - BRICK DRAIN	BD - BRICK DRAIN
BE - BRICK EARTH	BE - BRICK EARTH	BE - BRICK EARTH
BF - BRICK FLOOR	BF - BRICK FLOOR	BF - BRICK FLOOR
BG - BRICK GROUND	BG - BRICK GROUND	BG - BRICK GROUND
BH - BRICK HOLE	BH - BRICK HOLE	BH - BRICK HOLE
BI - BRICK INLET	BI - BRICK INLET	BI - BRICK INLET
BJ - BRICK JUNCTION	BJ - BRICK JUNCTION	BJ - BRICK JUNCTION
BK - BRICK KILN	BK - BRICK KILN	BK - BRICK KILN
BL - BRICK LAMP	BL - BRICK LAMP	BL - BRICK LAMP
BM - BRICK MANTLE	BM - BRICK MANTLE	BM - BRICK MANTLE
BN - BRICK NERVE	BN - BRICK NERVE	BN - BRICK NERVE
BO - BRICK OIL	BO - BRICK OIL	BO - BRICK OIL
BP - BRICK PAPER	BP - BRICK PAPER	BP - BRICK PAPER
BQ - BRICK RAY	BQ - BRICK RAY	BQ - BRICK RAY
BR - BRICK RAY	BR - BRICK RAY	BR - BRICK RAY
BS - BRICK SHEATH	BS - BRICK SHEATH	BS - BRICK SHEATH
BT - BRICK TAP	BT - BRICK TAP	BT - BRICK TAP
BU - BRICK VALVE	BU - BRICK VALVE	BU - BRICK VALVE
BV - BRICK WIRE	BV - BRICK WIRE	BV - BRICK WIRE
BW - BRICK X	BW - BRICK X	BW - BRICK X
BX - BRICK Y	BX - BRICK Y	BX - BRICK Y
BY - BRICK Z	BY - BRICK Z	BY - BRICK Z
BZ - BRICK	BZ - BRICK	BZ - BRICK
CA - CEMENT	CA - CEMENT	CA - CEMENT
CB - CEMENT BOND	CB - CEMENT BOND	CB - CEMENT BOND
CC - CEMENT CHIMNEY	CC - CEMENT CHIMNEY	CC - CEMENT CHIMNEY
CD - CEMENT DRAIN	CD - CEMENT DRAIN	CD - CEMENT DRAIN
CE - CEMENT EARTH	CE - CEMENT EARTH	CE - CEMENT EARTH
CF - CEMENT FLOOR	CF - CEMENT FLOOR	CF - CEMENT FLOOR
CG - CEMENT GROUND	CG - CEMENT GROUND	CG - CEMENT GROUND
CH - CEMENT HOLE	CH - CEMENT HOLE	CH - CEMENT HOLE
CI - CEMENT INLET	CI - CEMENT INLET	CI - CEMENT INLET
CJ - CEMENT JUNCTION	CJ - CEMENT JUNCTION	CJ - CEMENT JUNCTION
CK - CEMENT KILN	CK - CEMENT KILN	CK - CEMENT KILN
CL - CEMENT LAMP	CL - CEMENT LAMP	CL - CEMENT LAMP
CM - CEMENT MANTLE	CM - CEMENT MANTLE	CM - CEMENT MANTLE
CN - CEMENT NERVE	CN - CEMENT NERVE	CN - CEMENT NERVE
CO - CEMENT OIL	CO - CEMENT OIL	CO - CEMENT OIL
CP - CEMENT PAPER	CP - CEMENT PAPER	CP - CEMENT PAPER
CQ - CEMENT RAY	CQ - CEMENT RAY	CQ - CEMENT RAY
CR - CEMENT RAY	CR - CEMENT RAY	CR - CEMENT RAY
CS - CEMENT SHEATH	CS - CEMENT SHEATH	CS - CEMENT SHEATH
CT - CEMENT TAP	CT - CEMENT TAP	CT - CEMENT TAP
CU - CEMENT VALVE	CU - CEMENT VALVE	CU - CEMENT VALVE
CV - CEMENT WIRE	CV - CEMENT WIRE	CV - CEMENT WIRE
CW - CEMENT X	CW - CEMENT X	CW - CEMENT X
CX - CEMENT Y	CX - CEMENT Y	CX - CEMENT Y
CY - CEMENT Z	CY - CEMENT Z	CY - CEMENT Z
CZ - CEMENT	CZ - CEMENT	CZ - CEMENT
DA - DRAIN	DA - DRAIN	DA - DRAIN
DB - DRAIN BOND	DB - DRAIN BOND	DB - DRAIN BOND
DC - DRAIN CHIMNEY	DC - DRAIN CHIMNEY	DC - DRAIN CHIMNEY
DD - DRAIN DRAIN	DD - DRAIN DRAIN	DD - DRAIN DRAIN
DE - DRAIN EARTH	DE - DRAIN EARTH	DE - DRAIN EARTH
DF - DRAIN FLOOR	DF - DRAIN FLOOR	DF - DRAIN FLOOR
DG - DRAIN GROUND	DG - DRAIN GROUND	DG - DRAIN GROUND
DH - DRAIN HOLE	DH - DRAIN HOLE	DH - DRAIN HOLE
DI - DRAIN INLET	DI - DRAIN INLET	DI - DRAIN INLET
DJ - DRAIN JUNCTION	DJ - DRAIN JUNCTION	DJ - DRAIN JUNCTION
DK - DRAIN KILN	DK - DRAIN KILN	DK - DRAIN KILN
DL - DRAIN LAMP	DL - DRAIN LAMP	DL - DRAIN LAMP
DM - DRAIN MANTLE	DM - DRAIN MANTLE	DM - DRAIN MANTLE
DN - DRAIN NERVE	DN - DRAIN NERVE	DN - DRAIN NERVE
DO - DRAIN OIL	DO - DRAIN OIL	DO - DRAIN OIL
DP - DRAIN PAPER	DP - DRAIN PAPER	DP - DRAIN PAPER
DQ - DRAIN RAY	DQ - DRAIN RAY	DQ - DRAIN RAY
DR - DRAIN RAY	DR - DRAIN RAY	DR - DRAIN RAY
DS - DRAIN SHEATH	DS - DRAIN SHEATH	DS - DRAIN SHEATH
DT - DRAIN TAP	DT - DRAIN TAP	DT - DRAIN TAP
DU - DRAIN VALVE	DU - DRAIN VALVE	DU - DRAIN VALVE
DV - DRAIN WIRE	DV - DRAIN WIRE	DV - DRAIN WIRE
DW - DRAIN X	DW - DRAIN X	DW - DRAIN X
DX - DRAIN Y	DX - DRAIN Y	DX - DRAIN Y
DY - DRAIN Z	DY - DRAIN Z	DY - DRAIN Z
DZ - DRAIN	DZ - DRAIN	DZ - DRAIN
EA - EARTH	EA - EARTH	EA - EARTH
EB - EARTH BOND	EB - EARTH BOND	EB - EARTH BOND
EC - EARTH CHIMNEY	EC - EARTH CHIMNEY	EC - EARTH CHIMNEY
ED - EARTH DRAIN	ED - EARTH DRAIN	ED - EARTH DRAIN
EE - EARTH EARTH	EE - EARTH EARTH	EE - EARTH EARTH
EF - EARTH FLOOR	EF - EARTH FLOOR	EF - EARTH FLOOR
EG - EARTH GROUND	EG - EARTH GROUND	EG - EARTH GROUND
EH - EARTH HOLE	EH - EARTH HOLE	EH - EARTH HOLE
EI - EARTH INLET	EI - EARTH INLET	EI - EARTH INLET
EJ - EARTH JUNCTION	EJ - EARTH JUNCTION	EJ - EARTH JUNCTION
EK - EARTH KILN	EK - EARTH KILN	EK - EARTH KILN
EL - EARTH LAMP	EL - EARTH LAMP	EL - EARTH LAMP
EM - EARTH MANTLE	EM - EARTH MANTLE	EM - EARTH MANTLE
EN - EARTH NERVE	EN - EARTH NERVE	EN - EARTH NERVE
EO - EARTH OIL	EO - EARTH OIL	EO - EARTH OIL
EP - EARTH PAPER	EP - EARTH PAPER	EP - EARTH PAPER
EQ - EARTH RAY	EQ - EARTH RAY	EQ - EARTH RAY
ER - EARTH RAY	ER - EARTH RAY	ER - EARTH RAY
ES - EARTH SHEATH	ES - EARTH SHEATH	ES - EARTH SHEATH
ET - EARTH TAP	ET - EARTH TAP	ET - EARTH TAP
EU - EARTH VALVE	EU - EARTH VALVE	EU - EARTH VALVE
EV - EARTH WIRE	EV - EARTH WIRE	EV - EARTH WIRE
EW - EARTH X	EW - EARTH X	EW - EARTH X
EX - EARTH Y	EX - EARTH Y	EX - EARTH Y
EY - EARTH Z	EY - EARTH Z	EY - EARTH Z
EZ - EARTH	EZ - EARTH	EZ - EARTH
FA - FLOOR	FA - FLOOR	FA - FLOOR
FB - FLOOR BOND	FB - FLOOR BOND	FB - FLOOR BOND
FC - FLOOR CHIMNEY	FC - FLOOR CHIMNEY	FC - FLOOR CHIMNEY
FD - FLOOR DRAIN	FD - FLOOR DRAIN	FD - FLOOR DRAIN
FE - FLOOR EARTH	FE - FLOOR EARTH	FE - FLOOR EARTH
FF - FLOOR FLOOR	FF - FLOOR FLOOR	FF - FLOOR FLOOR
FG - FLOOR GROUND	FG - FLOOR GROUND	FG - FLOOR GROUND
FH - FLOOR HOLE	FH - FLOOR HOLE	FH - FLOOR HOLE
FI - FLOOR INLET	FI - FLOOR INLET	FI - FLOOR INLET
FJ - FLOOR JUNCTION	FJ - FLOOR JUNCTION	FJ - FLOOR JUNCTION
FK - FLOOR KILN	FK - FLOOR KILN	FK - FLOOR KILN
FL - FLOOR LAMP	FL - FLOOR LAMP	FL - FLOOR LAMP
FM - FLOOR MANTLE	FM - FLOOR MANTLE	FM - FLOOR MANTLE
FN - FLOOR NERVE	FN - FLOOR NERVE	FN - FLOOR NERVE
FO - FLOOR OIL	FO - FLOOR OIL	FO - FLOOR OIL
FP - FLOOR PAPER	FP - FLOOR PAPER	FP - FLOOR PAPER
FQ - FLOOR RAY	FQ - FLOOR RAY	FQ - FLOOR RAY
FR - FLOOR RAY	FR - FLOOR RAY	FR - FLOOR RAY
FS - FLOOR SHEATH	FS - FLOOR SHEATH	FS - FLOOR SHEATH
FT - FLOOR TAP	FT - FLOOR TAP	FT - FLOOR TAP
FU - FLOOR VALVE	FU - FLOOR VALVE	FU - FLOOR VALVE
FV - FLOOR WIRE	FV - FLOOR WIRE	FV - FLOOR WIRE
FW - FLOOR X	FW - FLOOR X	FW - FLOOR X
FX - FLOOR Y	FX - FLOOR Y	FX - FLOOR Y
FY - FLOOR Z	FY - FLOOR Z	FY - FLOOR Z
FZ - FLOOR	FZ - FLOOR	FZ - FLOOR
GA - GAS	GA - GAS	GA - GAS
GB - GAS BOND	GB - GAS BOND	GB - GAS BOND
GC - GAS CHIMNEY	GC - GAS CHIMNEY	GC - GAS CHIMNEY
GD - GAS DRAIN	GD - GAS DRAIN	GD - GAS DRAIN
GE - GAS EARTH	GE - GAS EARTH	GE - GAS EARTH
GF - GAS FLOOR	GF - GAS FLOOR	GF - GAS FLOOR
GG - GAS GROUND	GG - GAS GROUND	GG - GAS GROUND
GH - GAS HOLE	GH - GAS HOLE	GH - GAS HOLE
GI - GAS INLET	GI - GAS INLET	GI - GAS INLET
GJ - GAS JUNCTION	GJ - GAS JUNCTION	GJ - GAS JUNCTION
GK - GAS KILN	GK - GAS KILN	GK - GAS KILN
GL - GAS LAMP	GL - GAS LAMP	GL - GAS LAMP
GM - GAS MANTLE	GM - GAS MANTLE	GM - GAS MANTLE
GN - GAS NERVE	GN - GAS NERVE	GN - GAS NERVE
GO - GAS OIL	GO - GAS OIL	GO - GAS OIL
GP - GAS PAPER	GP - GAS PAPER	GP - GAS PAPER
GQ - GAS RAY	GQ - GAS RAY	GQ - GAS RAY
GR - GAS RAY	GR - GAS RAY	GR - GAS RAY
GS - GAS SHEATH	GS - GAS SHEATH	GS - GAS SHEATH
GT - GAS TAP	GT - GAS TAP	GT - GAS TAP
GU - GAS VALVE	GU - GAS VALVE	GU - GAS VALVE
GV - GAS WIRE	GV - GAS WIRE	GV - GAS WIRE
GW - GAS X	GW - GAS X	GW - GAS X
GX - GAS Y	GX - GAS Y	GX - GAS Y
GY - GAS Z	GY - GAS Z	GY - GAS Z
GZ - GAS	GZ - GAS	GZ - GAS
HA - HOLE	HA - HOLE	HA - HOLE
HB - HOLE BOND	HB - HOLE BOND	HB - HOLE BOND
HC - HOLE CHIMNEY	HC - HOLE CHIMNEY	HC - HOLE CHIMNEY
HD - HOLE DRAIN	HD - HOLE DRAIN	HD - HOLE DRAIN
HE - HOLE EARTH	HE - HOLE EARTH	HE - HOLE EARTH
HF - HOLE FLOOR	HF - HOLE FLOOR	HF - HOLE FLOOR
HG - HOLE GROUND	HG - HOLE GROUND	HG - HOLE GROUND
HH - HOLE HOLE	HH - HOLE HOLE	HH - HOLE HOLE
HI - HOLE INLET	HI - HOLE INLET	HI - HOLE INLET
HJ - HOLE JUNCTION	HJ - HOLE JUNCTION	HJ - HOLE JUNCTION
HK - HOLE KILN	HK - HOLE KILN	HK - HOLE KILN
HL - HOLE LAMP	HL - HOLE LAMP	HL - HOLE LAMP
HM - HOLE MANTLE	HM - HOLE MANTLE	HM - HOLE MANTLE
HN - HOLE NERVE	HN - HOLE NERVE	HN - HOLE NERVE
HO - HOLE OIL	HO - HOLE OIL	HO - HOLE OIL
HP - HOLE PAPER	HP - HOLE PAPER	HP - HOLE PAPER
HQ - HOLE RAY	HQ - HOLE RAY	HQ - HOLE RAY
HR - HOLE RAY	HR - HOLE RAY	HR - HOLE RAY
HS - HOLE SHEATH	HS - HOLE SHEATH	HS - HOLE SHEATH
HT - HOLE TAP	HT - HOLE TAP	HT - HOLE TAP
HU - HOLE VALVE	HU - HOLE VALVE	HU - HOLE VALVE
HV - HOLE WIRE	HV - HOLE WIRE	HV - HOLE WIRE
HW - HOLE X	HW - HOLE X	HW - HOLE X
HX - HOLE Y	HX - HOLE Y	HX - HOLE Y
HY - HOLE Z	HY - HOLE Z	HY - HOLE Z
HZ - HOLE	HZ - HOLE	HZ - HOLE
IA - INLET	IA - INLET	IA - INLET
IB - INLET BOND	IB - INLET BOND	IB - INLET BOND
IC - INLET CHIMNEY	IC - INLET CHIMNEY	IC - INLET CHIMNEY
ID - INLET DRAIN	ID - INLET DRAIN	ID - INLET DRAIN
IE - INLET EARTH	IE - INLET EARTH	IE - INLET EARTH
IF - INLET FLOOR	IF - INLET FLOOR	IF - INLET FLOOR
IG - INLET GROUND	IG - INLET GROUND	IG - INLET GROUND
IH - INLET HOLE	IH - INLET HOLE	IH - INLET HOLE
II - INLET INLET	II - INLET INLET	II - INLET INLET
IJ - INLET JUNCTION	IJ - INLET JUNCTION	IJ - INLET JUNCTION
IK - INLET KILN	IK - INLET KILN	IK - INLET KILN
IL - INLET LAMP	IL - INLET LAMP	IL - INLET LAMP
IM - INLET MANTLE	IM - INLET MANTLE	IM - INLET MANTLE
IN - INLET NERVE	IN - INLET NERVE	IN - INLET NERVE
IO - INLET OIL	IO - INLET OIL	IO - INLET OIL
IP - INLET PAPER	IP - INLET PAPER	IP - INLET PAPER
IQ - INLET RAY	IQ - INLET RAY	IQ - INLET RAY
IR - INLET RAY	IR - INLET RAY	IR - INLET RAY
IS - INLET SHEATH	IS - INLET SHEATH	IS - INLET SHEATH
IT - INLET TAP	IT - INLET TAP	IT - INLET TAP
IU - INLET VALVE	IU - INLET VALVE	IU - INLET VALVE
IV - INLET WIRE	IV - INLET WIRE	IV - INLET WIRE
IW - INLET X	IW - INLET X	IW - INLET X
IX - INLET Y	IX - INLET Y	IX - INLET Y
IY - INLET Z	IY - INLET Z	IY - INLET Z
IZ - INLET	IZ - INLET	IZ - INLET
JA - JUNCTION	JA - JUNCTION	JA - JUNCTION
JB - JUNCTION BOND	JB - JUNCTION BOND	JB - JUNCTION BOND
JC - JUNCTION CHIMNEY	JC - JUNCTION CHIMNEY	JC - JUNCTION CHIMNEY
JD - JUNCTION DRAIN	JD - JUNCTION DRAIN	JD - JUNCTION DRAIN
JE - JUNCTION EARTH	JE - JUNCTION EARTH	JE - JUNCTION EARTH
JF - JUNCTION FLOOR	JF - JUNCTION FLOOR	JF - JUNCTION FLOOR
JG - JUNCTION GROUND	JG - JUNCTION GROUND	JG - JUNCTION GROUND
JH - JUNCTION HOLE	JH - JUNCTION HOLE	JH - JUNCTION HOLE
JI - JUNCTION INLET	JI - JUNCTION INLET	JI - JUNCTION INLET
JJ - JUNCTION JUNCTION	JJ - JUNCTION JUNCTION	JJ - JUNCTION JUNCTION
JK - JUNCTION KILN	JK - JUNCTION KILN	JK - JUNCTION KILN
JL - JUNCTION LAMP	JL - JUNCTION LAMP	JL - JUNCTION LAMP
JM - JUNCTION MANTLE	JM - JUNCTION MANTLE	JM - JUNCTION MANTLE
JN - JUNCTION NERVE	JN - JUNCTION NERVE	JN - JUNCTION NERVE
JO - JUNCTION OIL	JO - JUNCTION OIL	JO - JUNCTION OIL
JP - JUNCTION PAPER	JP - JUNCTION PAPER	JP - JUNCTION PAPER
JQ - JUNCTION RAY	JQ - JUNCTION RAY	JQ - JUNCTION RAY
JR - JUNCTION RAY	JR - JUNCTION RAY	JR - JUNCTION RAY
JS - JUNCTION SHEATH	JS - JUNCTION SHEATH	JS - JUNCTION SHEATH
JT - JUNCTION TAP	JT - JUNCTION TAP	JT - JUNCTION TAP
JU - JUNCTION VALVE	JU - JUNCTION VALVE	JU - JUNCTION VALVE
JV - JUNCTION WIRE	JV - JUNCTION WIRE	JV - JUNCTION WIRE
JW - JUNCTION X	JW - JUNCTION X	JW - JUNCTION X
JX - JUNCTION Y	JX - JUNCTION Y	JX - JUNCTION Y
JY - JUNCTION Z	JY - JUNCTION Z	JY - JUNCTION Z
JZ - JUNCTION	JZ - JUNCTION	JZ - JUNCTION
KA - KILN	KA - KILN	KA - KILN
KB - KILN BOND	KB - KILN BOND	KB - KILN BOND
KC - KILN CHIMNEY	KC - KILN CHIMNEY	KC - KILN CHIMNEY
KD - KILN DRAIN	KD - KILN DRAIN	KD - KILN DRAIN
KE - KILN EARTH	KE - KILN EARTH	KE - KILN EARTH
KF - KILN FLOOR	KF - KILN FLOOR	KF - KILN FLOOR
KG - KILN GROUND	KG - KILN GROUND	KG - KILN GROUND
KH - KILN HOLE	KH - KILN HOLE	KH - KILN HOLE
KI - KILN INLET	KI - KILN INLET	KI - KILN INLET
KJ - KILN JUNCTION	KJ - KILN JUNCTION	KJ - KILN JUNCTION
KK - KILN KILN	KK - KILN KILN	KK - KILN KILN
KL - KILN LAMP	KL - KILN LAMP	KL - KILN LAMP
KM - KILN MANTLE	KM - KILN MANTLE	KM - KILN MANTLE
KN - KILN NERVE	KN - KILN NERVE	KN - KILN NERVE
KO - KILN OIL	KO - KILN OIL	KO - KILN OIL
KP - KILN PAPER	KP - KILN PAPER	KP - KILN PAPER
KQ - KILN RAY	KQ - KILN RAY	KQ - KILN RAY
KR - KILN RAY	KR - KILN RAY	KR - KILN RAY
KS - KILN SHEATH	KS - KILN SHEATH	KS - KILN SHEATH
KT - KILN TAP	KT - KILN TAP	KT - KILN TAP
KU - KILN VALVE	KU - KILN VALVE	KU - KILN VALVE
KV - KILN WIRE	KV - KILN WIRE	KV - KILN WIRE
KW - KILN X	KW - KILN X	KW - KILN X
KX - KILN Y	KX - KILN Y	KX - KILN Y
KY - KILN Z	KY - KILN Z	KY - KILN Z
KZ - KILN	KZ - KILN	KZ - KILN
LA - LAMP	LA - LAMP	LA - LAMP
LB - LAMP BOND	LB - LAMP BOND	LB - LAMP BOND
LC - LAMP CHIMNEY	LC - LAMP CHIMNEY	LC - LAMP CHIMNEY
LD - LAMP DRAIN	LD - LAMP DRAIN	LD - LAMP DRAIN
LE - LAMP EARTH	LE - LAMP EARTH	LE - LAMP EARTH
LF - LAMP FLOOR	LF - LAMP FLOOR	LF - LAMP FLOOR
LG - LAMP GROUND	LG - LAMP GROUND	LG - LAMP GROUND
LH - LAMP HOLE	LH - LAMP HOLE	LH - LAMP HOLE
LI - LAMP INLET	LI - LAMP INLET	LI - LAMP INLET
LJ - LAMP JUNCTION	LJ - LAMP JUNCTION	LJ - LAMP JUNCTION
LK - LAMP KILN	LK - LAMP KILN	LK - LAMP KILN
LL - LAMP LAMP	LL - LAMP LAMP	LL - LAMP LAMP
LM - LAMP MANTLE	LM - LAMP MANTLE	LM - LAMP MANTLE
LN - LAMP NERVE	LN - LAMP NERVE	LN - LAMP NERVE
LO - LAMP OIL	LO - LAMP OIL	LO - LAMP OIL
LP - LAMP PAPER	LP - LAMP PAPER	LP - LAMP PAPER
LQ - LAMP RAY	LQ - LAMP RAY	LQ - LAMP RAY
LR - LAMP RAY	LR - LAMP RAY	LR - LAMP RAY
LS - LAMP SHEATH	LS - LAMP SHEATH	LS - LAMP SHEATH
LT - LAMP TAP	LT - LAMP TAP	LT - LAMP TAP
LU - LAMP VALVE	LU - LAMP VALVE	LU - LAMP VALVE
LV - LAMP WIRE	LV - LAMP WIRE	LV - LAMP WIRE
LW - LAMP X	LW - LAMP X	LW - LAMP X
LX - LAMP Y	LX - LAMP Y	LX - LAMP Y
LY - LAMP Z	LY - LAMP Z	LY - LAMP Z
LZ - LAMP	LZ - LAMP	LZ - LAMP
MA - MANTLE	MA - MANTLE	MA - MANTLE
MB - MANTLE BOND	MB - MANTLE BOND	MB - MANTLE BOND
MC - MANTLE CHIMNEY	MC - MANTLE CHIMNEY	MC - MANTLE CHIMNEY
MD - MANTLE DRAIN	MD - MANTLE DRAIN	MD - MANTLE DRAIN
ME - MANTLE EARTH	ME - MANTLE EARTH	ME - MANTLE EARTH
MF - MANTLE FLOOR	MF - MANTLE FLOOR	MF - MANTLE FLOOR
MG - MANTLE GROUND	MG - MANTLE GROUND	MG - MANTLE GROUND
MH - MANTLE HOLE	MH - MANTLE HOLE	MH - MANTLE HOLE
MI - MANTLE INLET	MI - MANTLE INLET	MI - MANTLE INLET
MJ - MANTLE JUNCTION	MJ - MANTLE JUNCTION	MJ - MANTLE JUNCTION
MK - MANTLE KILN	MK - MANTLE KILN	MK - MANTLE KILN
ML - MANTLE LAMP	ML - MANTLE LAMP	ML - MANTLE LAMP
MM - MANTLE MANTLE	MM - MANTLE MANTLE	MM - MANTLE MANTLE
MN - MANTLE NERVE	MN - MANTLE NERVE	MN - MANTLE NERVE
MO - MANTLE OIL	MO - MANTLE OIL	MO - MANTLE OIL
MP - MANTLE PAPER	MP - MANTLE PAPER	MP - MANTLE PAPER
MQ - MANTLE RAY	MQ - MANTLE RAY	MQ - MANTLE RAY
MR - MANTLE RAY	MR - MANTLE RAY	MR - MANTLE RAY
MS - MANTLE SHEATH	MS - MANTLE SHEATH	MS - MANTLE SHEATH
MT - MANTLE TAP	MT - MANTLE TAP	MT -



Appendix C

CCTV Drainage Survey Drawing



General Note:
Private Utility Supplies
Have Not Been Surveyed

KEY FOR UNDERGROUND SERVICES

Time
 566 min *100%*
 567 min *100%*
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ABBREVIATION KEY

UTILITY SURVEY NOTES

SYMBOL & ABBREVIATION KEY

KEY

Grid & Datum - Local Plane Grid related to OS National Grid & Datum
By GNSS RTK Observations

STANDARD ABBREVIATIONS

ACG / ABBREVIATIONS		LIFE / LUMINOUS		VOLUME / VOLUME	
ACG	AC AC CONDITIONING	LT	LAMP POWER	VP	VOLUME DETECTION
AD	ADDITIONAL	LV	LOW VOLTAGE	VR	VOLUME REDUCTION
AL	ALARM	MA	MAIN	VS	VOLUME SENSITIVE
ALC	ALCOHOL	MB	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	MC	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	MD	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	ME	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	MF	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	MG	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	MH	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	MI	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	ML	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	MM	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	MN	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	MO	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	MP	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	MQ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	MR	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	MS	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	MT	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	MU	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	MV	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	MW	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	MX	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	MY	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	MZ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NA	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NB	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NC	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	ND	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NE	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NF	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NG	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NH	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NI	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NJ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NK	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NL	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NM	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NO	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NP	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NQ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NR	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NS	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NT	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NU	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NV	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NW	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NX	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NY	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	NZ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OA	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OB	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OC	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OD	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OE	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OF	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OG	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OH	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OI	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OJ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OK	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OL	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OM	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	ON	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OO	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OP	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OQ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OR	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OS	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OT	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OU	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OV	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OW	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OX	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OY	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	OZ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PA	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PB	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PC	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PD	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PE	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PF	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PG	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PH	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PI	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PJ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PK	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PL	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PM	MAIN BOARD	VT	VOLUME TEST
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ALC	ALCOHOL	PO	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PP	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PQ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PR	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PS	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PT	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PV	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PW	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PX	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PY	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	PZ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QA	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QB	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QC	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QD	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QE	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QF	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QG	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QH	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QI	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QJ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QK	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QL	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QM	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QN	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QO	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QP	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QQ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QR	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QS	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QT	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QU	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QV	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QW	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QX	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QY	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	QZ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RA	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RB	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RC	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RD	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RE	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RF	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RG	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RH	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RI	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RJ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RK	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RL	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RM	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RN	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RO	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RP	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RQ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RR	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RS	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RT	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RU	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RV	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RW	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RX	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RY	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	RZ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SA	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SB	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SC	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SD	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SE	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SF	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SG	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SH	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SI	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SJ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SK	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SL	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SM	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SN	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SO	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SP	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SQ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SR	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SS	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	ST	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SU	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SV	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SW	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SX	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SY	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	SZ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TA	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TB	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TC	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TD	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TE	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TF	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TG	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TH	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TI	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TJ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TK	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TL	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TM	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TN	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TO	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TP	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TQ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TR	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TS	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TT	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TU	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TV	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TW	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TX	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TY	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	TZ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UA	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UB	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UC	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UD	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UE	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UF	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UG	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UH	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UI	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UJ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UK	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UL	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UM	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UN	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UO	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UP	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UQ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UR	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	US	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UT	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UU	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UV	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UW	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UX	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UY	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	UZ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VA	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VB	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VC	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VD	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VE	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VF	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VG	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VH	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VI	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VJ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VK	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VL	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VM	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VN	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VO	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VP	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VQ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VR	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VS	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VT	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VU	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VV	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VW	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VX	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VY	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	VZ	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	WA	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	WB	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	WC	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	WD	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	WE	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	WF	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	WG	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	WH	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	WI	MAIN BOARD	VT	VOLUME TEST
ALC	ALCOHOL	WJ	MAIN BOARD	VT</	

SYMBOLS

	HEDGE		GATE		BUILDING
	TREE CANOPY		CONTROL STATION		TREE

GENERAL

TOPOGRAPHICAL NOTES

Coordinates related to OS National Grid by GPS.

KEY FOR UNDERGROUND SERVICES

Where chamber extents are significantly greater than the cover size, their approximate extents are shown (thus)

ABBREVIATION KEY

[illegible]

UTILITY SURVEY NOTES

[illegible]

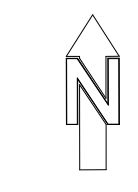
AMBER UTILITIES LTD

CUSTOMER: ISG PLC

SITE LOCATION:
Hough End Leisure Centre,
480 Princess Road,
Manchester, M20 1HD,

(Drawing) Title: Topographical, Utility & CCTV Survey Drawing No.:
--

SUBMITTED BY: ND/WC/RM/UK	DRAWN BY: ND/WC/UK	APPROVED BY: RM
DRAWING NO: U20-4667	SURVEY DATE: February 2020	
SCALE: 1:500 QAD	SHEET NO: 2 OF 4	REV:



SYMBOL & ABBREVIATION KEY

KEY

Grid & Datum - Local Plane Grid related to OS National Grid & Datum
By GNSS RTK Observations

STANDARD ABBREVIATIONS

ACM / EFTS		LC	LEAF	UP	UPM	UPM	UPM
AC	AC - AC COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
AD	AD - AD COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
AL	AL - AL COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
AM	AM - AM COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
AN	AN - AN COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
AO	AO - AO COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
AP	AP - AP COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
AR	AR - AR COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
AS	AS - AS COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
AT	AT - AT COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
AV	AV - AV COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
AW	AW - AW COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
AX	AX - AX COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
AY	AY - AY COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
AZ	AZ - AZ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BA	BA - BA COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BB	BB - BB COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BC	BC - BC COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BD	BD - BD COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BE	BE - BE COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BF	BF - BF COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BG	BG - BG COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BH	BH - BH COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BI	BI - BI COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BJ	BJ - BJ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BK	BK - BK COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BL	BL - BL COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BM	BM - BM COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BN	BN - BN COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BO	BO - BO COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BP	BP - BP COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BQ	BQ - BQ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BR	BR - BR COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BS	BS - BS COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BT	BT - BT COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BU	BU - BU COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BV	BV - BV COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BW	BW - BW COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BX	BX - BX COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BY	BY - BY COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
BZ	BZ - BZ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CA	CA - CA COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CB	CB - CB COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CC	CC - CC COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CD	CD - CD COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CE	CE - CE COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CF	CF - CF COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CG	CG - CG COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CH	CH - CH COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CI	CI - CI COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CJ	CJ - CJ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CK	CK - CK COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CL	CL - CL COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CM	CM - CM COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CN	CN - CN COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CO	CO - CO COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CP	CP - CP COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CQ	CQ - CQ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CR	CR - CR COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CS	CS - CS COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CT	CT - CT COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CU	CU - CU COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CV	CV - CV COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CW	CW - CW COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CX	CX - CX COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CY	CY - CY COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
CZ	CZ - CZ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DA	DA - DA COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DB	DB - DB COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DC	DC - DC COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DD	DD - DD COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DE	DE - DE COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DF	DF - DF COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DG	DG - DG COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DH	DH - DH COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DI	DI - DI COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DJ	DJ - DJ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DK	DK - DK COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DL	DL - DL COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DM	DM - DM COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DN	DN - DN COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DO	DO - DO COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DP	DP - DP COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DQ	DQ - DQ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DR	DR - DR COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DS	DS - DS COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DT	DT - DT COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DU	DU - DU COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DV	DV - DV COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DW	DW - DW COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DX	DX - DX COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DY	DY - DY COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
DZ	DZ - DZ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EA	EA - EA COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EB	EB - EB COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EC	EC - EC COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
ED	ED - ED COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EE	EE - EE COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EF	EF - EF COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EG	EG - EG COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EH	EH - EH COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EI	EI - EI COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EJ	EJ - EJ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EK	EK - EK COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EL	EL - EL COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EM	EM - EM COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EN	EN - EN COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EO	EO - EO COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EP	EP - EP COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EQ	EQ - EQ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
ER	ER - ER COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
ES	ES - ES COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
ET	ET - ET COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EU	EU - EU COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EV	EV - EV COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EW	EW - EW COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EX	EX - EX COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EY	EY - EY COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
EZ	EZ - EZ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FA	FA - FA COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FB	FB - FB COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FC	FC - FC COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FD	FD - FD COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FE	FE - FE COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FF	FF - FF COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FG	FG - FG COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FH	FH - FH COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FI	FI - FI COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FJ	FJ - FJ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FK	FK - FK COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FL	FL - FL COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FM	FM - FM COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FN	FN - FN COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FO	FO - FO COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FP	FP - FP COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FQ	FQ - FQ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FR	FR - FR COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FS	FS - FS COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FT	FT - FT COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FU	FU - FU COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FV	FV - FV COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FW	FW - FW COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FX	FX - FX COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FY	FY - FY COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
FZ	FZ - FZ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GA	GA - GA COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GB	GB - GB COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GC	GC - GC COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GD	GD - GD COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GE	GE - GE COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GF	GF - GF COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GG	GG - GG COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GH	GH - GH COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GI	GI - GI COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GJ	GJ - GJ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GK	GK - GK COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GL	GL - GL COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GM	GM - GM COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GN	GN - GN COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GO	GO - GO COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GP	GP - GP COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GQ	GQ - GQ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GR	GR - GR COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GS	GS - GS COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GT	GT - GT COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GU	GU - GU COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GV	GV - GV COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GW	GW - GW COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GX	GX - GX COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GY	GY - GY COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
GZ	GZ - GZ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HA	HA - HA COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HB	HB - HB COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HC	HC - HC COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HD	HD - HD COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HE	HE - HE COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HF	HF - HF COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HG	HG - HG COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HH	HH - HH COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HI	HI - HI COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HJ	HJ - HJ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HK	HK - HK COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HL	HL - HL COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HM	HM - HM COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HN	HN - HN COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HO	HO - HO COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HP	HP - HP COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HQ	HQ - HQ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HR	HR - HR COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HS	HS - HS COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HT	HT - HT COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HU	HU - HU COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HV	HV - HV COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HW	HW - HW COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HX	HX - HX COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HY	HY - HY COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
HZ	HZ - HZ COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
IA	IA - IA COORDINATOR	LC	LEAF	UP	UPM	UPM	UPM
IB	IB - IB COORDINATOR	LC	LEAF</				

SYMBOLS

 HEDGE
  GATE
  BUILD

 TREE CANOPY
  CONTROL STATION
  TREE

 TYPICAL SPORTS PITCH

GENERAL

TOPOGRAPHICAL NOTES

Coordinates related to OS National Grid by GPS.

KEY FOR UNDERGROUND SERVICES

100 kb
 5' end
 3' end
 CpG islands
 Repeats
 SNPs
 Other features
 SLC11A1 gene
 Exons
 Introns
 Transcription direction
 5' end
 3' end

Where chamber extents are significantly greater than the cover slot, their approximate

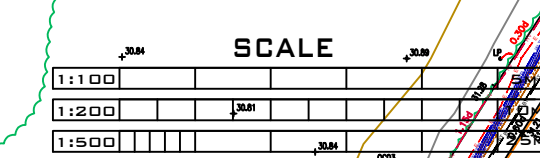
ABBREVIATION KEY

```

40 assumed rule
41 bow bend
42 C
43 C
44 C
45 cover level
46 C
47 C
48 end of line
49 C
50 C
51 C
52 C
53 C
54 C
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96 C
97 C
98 C
99 C

```

UTILITY SURVEY NOTES

[illegible]

AMBER UTILITIES LTD

CLIENT:	ISG PLC
SITE LOCATION:	Hough End Leisure Centre, 480 Princess Road, Manchester, M20 1HD,

Examined Title: Topographical, Utility & CCTV Sur

SUBMITTED BY: ND/WC/RM/UK	DRAWN BY: ND/WC/UK	APPROVED BY:
DRAWING NO: U20-4667	SURVEY DATE: February 2	
SCALE: 1:500 QAD	SHEET NO: 4 OF 4	

Appendix D

Environment Agency Flood Map for Planning

Flood map for planning

Your reference
Hough End

Location (easting/northing)
383657/393481

Created
1 Mar 2021 11:28

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

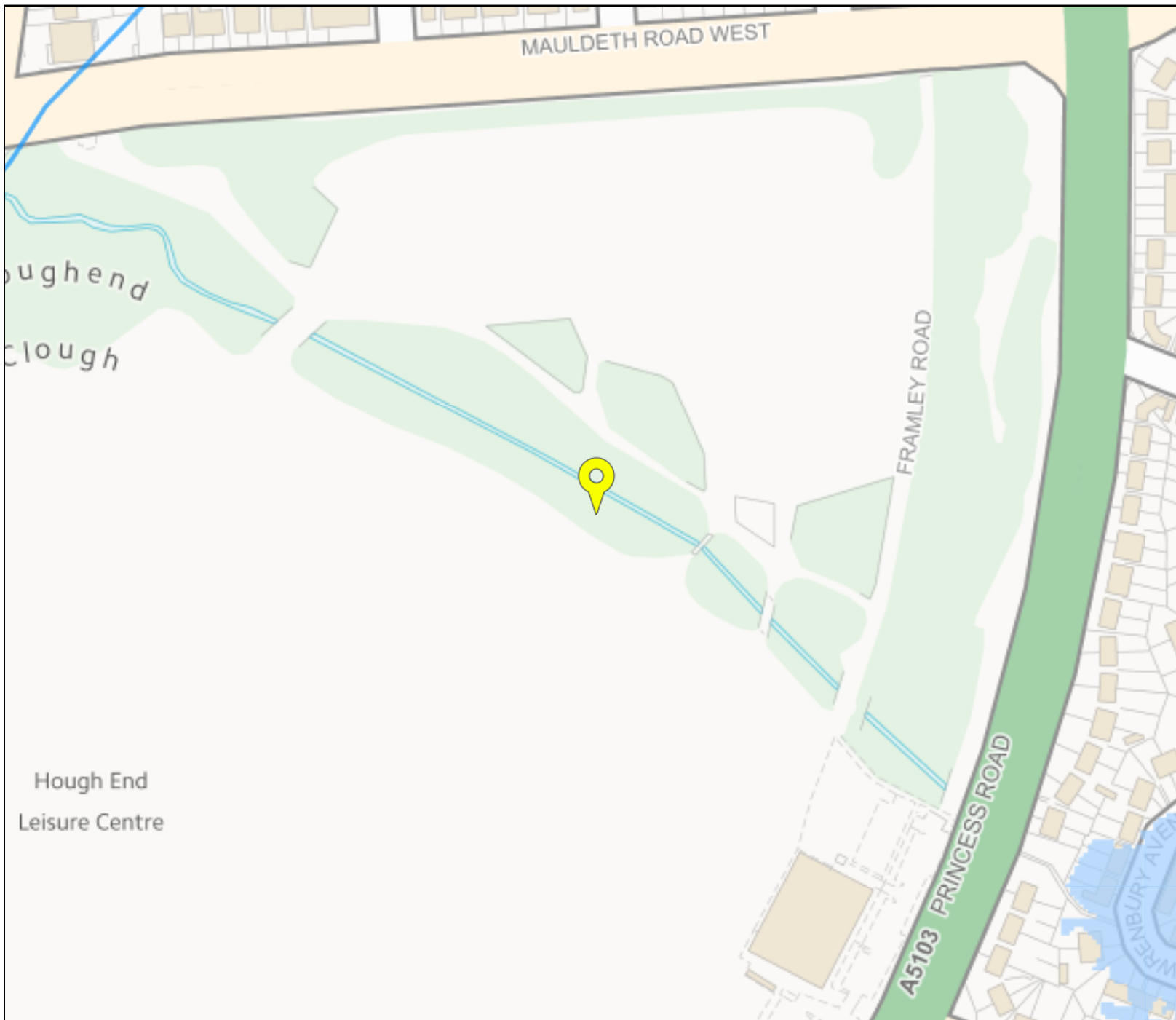
- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

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/>



Flood map for planning

Your reference

Hough End

Location (easting/northing)

383657/393481

Scale

1:2500

Created

1 Mar 2021 11:28

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

0 20 40 60m

Appendix E

Lead Local Flood Authority Correspondence

United Utilities Correspondence

Chloé Grimsley

From: Flood Risk Management <floodriskmanagement@manchester.gov.uk>
Sent: 07 January 2021 15:58
To: Chloé Grimsley
Subject: RE: Hough End Leisure Centre, Manchester
Attachments: Manchester City Council - SuDS Requirement for Developers 2019.pdf; Screenshot.pdf

Hi Chloe,

Hope you had a good Christmas and New Year.

Yes, we would require both an FRA and Drainage Strategy as the site is located within a Critical Drainage Area and is at least 0.5ha.

Please see in [blue](#) my response to the below:

- Are we still working to the SuDS guidance document – i.e greenfield rates for greenfield sites and 50% reduction for brownfield sites? [Yes that is correct, find attached a copy of the MCC SuDS Requirement for Developers 2019 Document. I should note, that MCC are now only accepting the 1 in 1 year event for Greenfield rates, this is to aid in the increased pressure on the UU network and ordinary watercourses.](#)
- Any historic flood data for the site – if any? [Our records show no historic records of flooding on site.](#)
- Any watercourse, unmapped drains you may be aware of. [See attached a screenshot of our asset register highlighting the Red Lion Brook to be present North of the site.](#)
- Pollution measures. [For sites where proposed development would cause unusual pollution risk to surface water \(large car park areas \(>50 parking spaces\) or industrial estates\), evidence of pollution control measures \(preferably through SuDS\) is required.](#)

Thanks,

Oliver

Oliver Timmins
Engineer (Flood Risk Management)
Mobile: 07814082200
Email: oliver.timmins@manchester.gov.uk

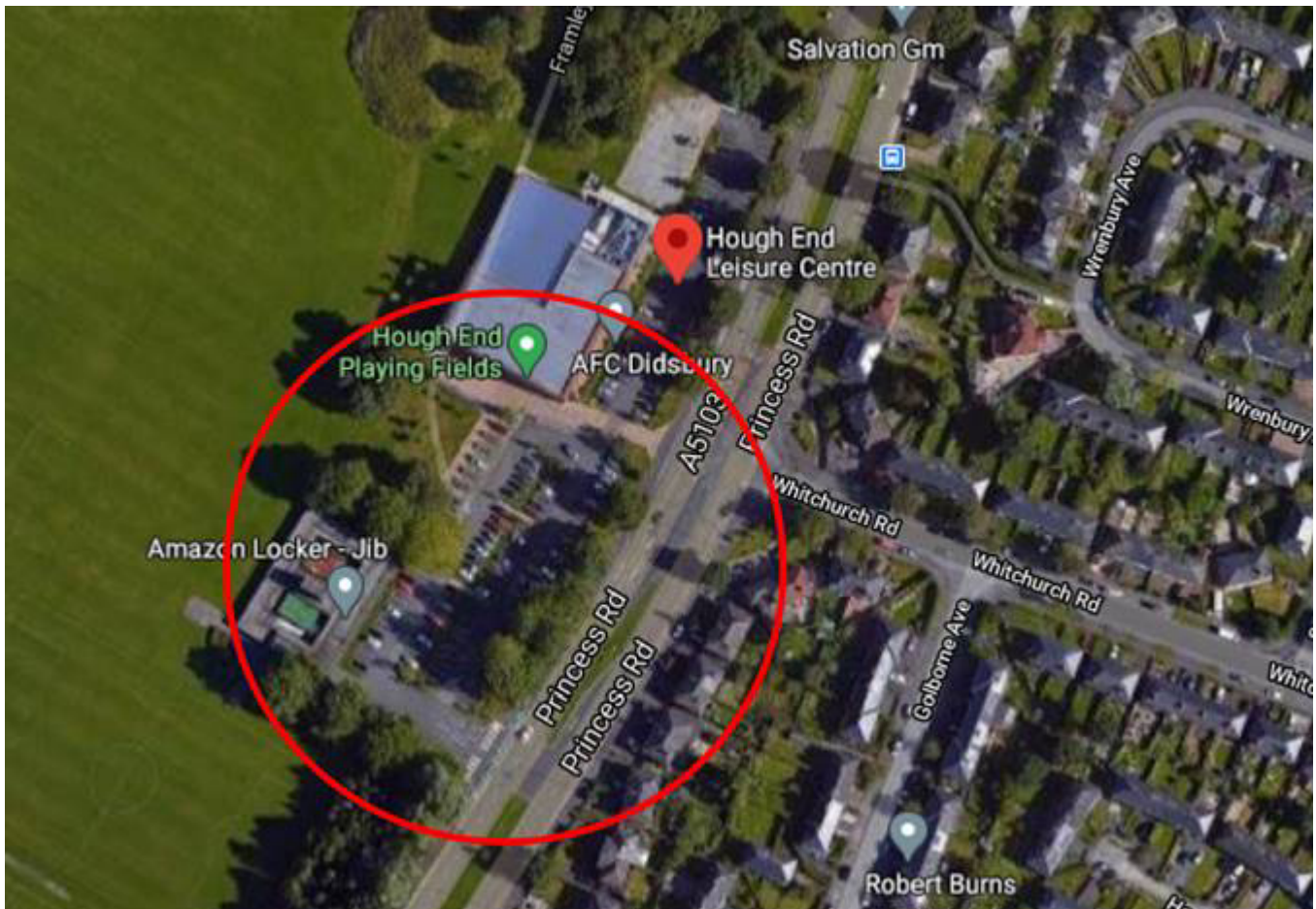
Lead Local Flood Authority
Highways
Growth & Development and Neighbourhoods Directorate
Manchester City Council
PO Box 532 Town Hall
Manchester
M60 2LA

Web: <http://www.manchester.gov.uk>

From: Chloé Grimsley <Chloe.Grimmsley@curtins.com>
Sent: 22 December 2020 22:29
To: Flood Risk Management <floodriskmanagement@manchester.gov.uk>
Subject: Hough End Leisure Centre, Manchester

Dear Sir/Madam,

We are currently looking at the proposed development of the Hough End Leisure Centre, located on Princess Road, Manchester M20 1HD. The site location is illustrated below:



The site proposals are to extend the existing building and to increase the parking capacity by reconfiguration of the existing car park and increase the extent of hardstanding. I have attached the proposals for your information. There are proposals to upgrade the existing sports pitches on the site, however we have been advised that the existing pitch drainage is being retained and no new drainage is proposed.

As part of the planning application, we assume a FRA and Drainage Strategy would be required? The area excluding the pitches appears to be approximately 0.5ha.

In terms of proposed drainage for the building/car parking, we would assume that the existing drainage on site will be utilised – which is to be confirmed.

Please could you confirm the following:

- Are we still working to the SuDS guidance document – i.e greenfield rates for greenfield sites and 50% reduction for brownfield sites?
- Any historic flood data for the site – if any?
- Any watercourse, unmapped drains you may be aware of.
- Pollution measures.

If you require any further information, please let me know.

Kind Regards,
Chloé

Chloé Grimsley
Principal Engineer
T. 0161 236 2394
chloe.grimsley@curtins.com



Merchant Exchange
17-19 Whitworth Street West
Manchester M1 5WG



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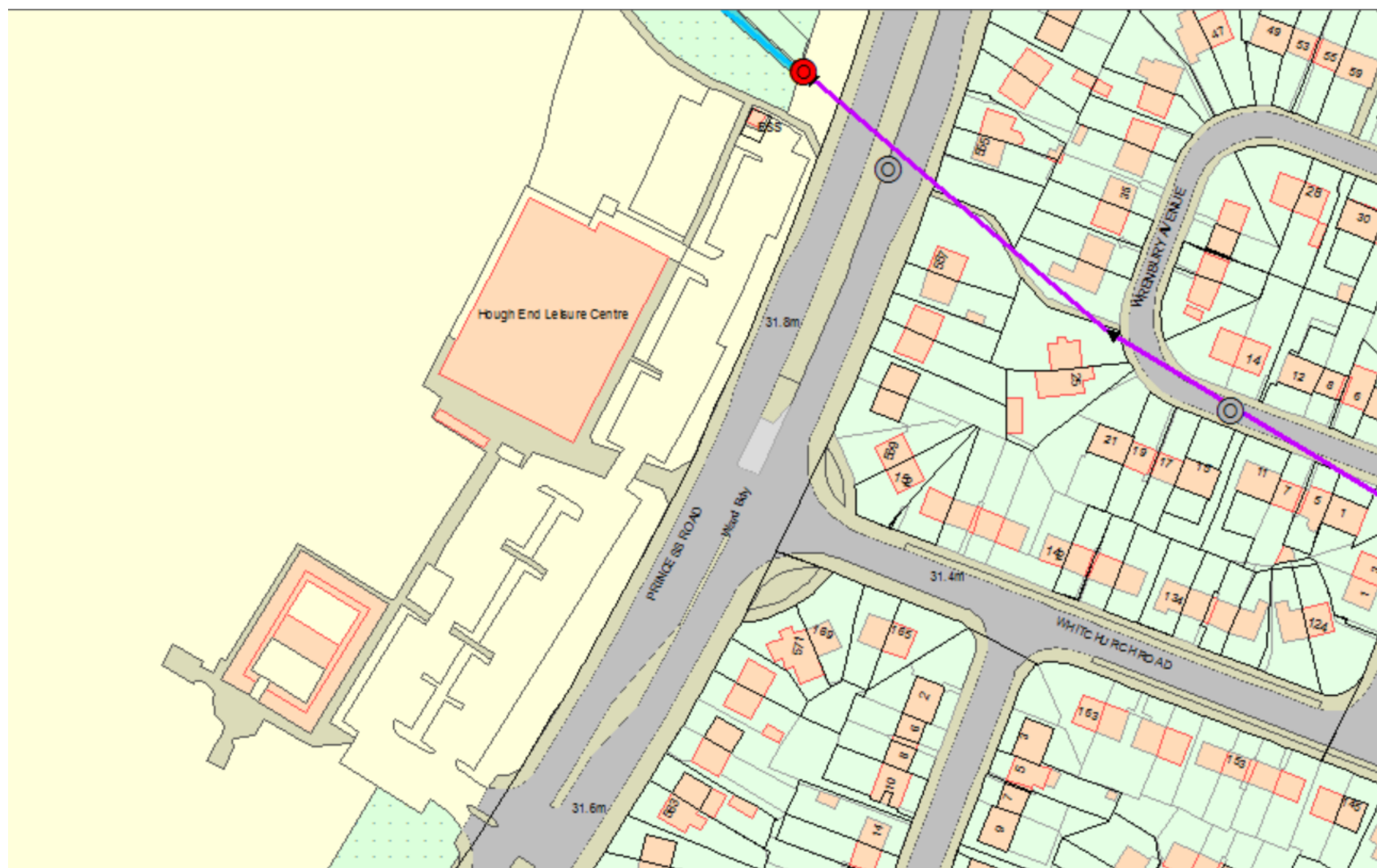
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Chloé Grimsley

From: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Sent: 26 April 2021 16:17
To: Chloé Grimsley
Cc: Wastewater Developer Services
Subject: Pre Development Enquiry - Hough End Sports Village 480 Princess Road,M20 1HD - UU ref 4200039159
Attachments: Hough End Sports Village, Manchester M20 1HD

Good Afternoon Chloé,

Pre Development Enquiry - Hough End Sports Village 480 Princess Road,M20 1HD - UU ref 4200039159

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

If your investigations require access to our public sewer network, we ask that you contact our network engineers with a request for an access certificate via our main contact telephone number 0345 3723223 or refer to the link below:

<https://www.unitedutilities.com/builders-developers/working-near-our-assets/>

Foul Water

United Utilities have no objection to the proposal to drain foul via the existing private drainage which connects to UUMH 8301, at an unrestricted rate (it is noted the predicted peak flow will be 14 l/s).

Surface Water

United Utilities have no objection to the proposal to drain surface water to the Red Lion brook – please note discharge rates and consents must be discussed with all interested parties (for example the Lead Local Flood Authority).

Levels

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

Land drainage / Overland flows / track drainage

United Utilities have no obligation, and furthermore we do not accept land drainage, overland flows or track drainage into the public sewerage network under any circumstances

Existing Water Assets Crossing the Site

It is the developer responsibility to identify utilities on-site. Where clean water assets are shown on our records, we recommend that you contact our Water Pre-Development Team, via the following email address:

DeveloperServicesWater@uuplc.co.uk. Further information for this service can be found on our website via the link below:

<https://www.unitedutilities.com/builders-developers/larger-developments/pre-development/water-pre-dev/>

Connection Application

Although we may discuss and agree discharge points and rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below:

<https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-connections/>

We recommend that the detailed design should confirm the locations of all utilities in the area and ensure that any proposed drainage solution considers routing and clash checks where required.

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

Many thanks and kind regards,

Tom



Thomas Bethell
Assistant Engineer
Developer Services & Metering
Customer Services
M: 07880 339 195
unitedutilities.com

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EMGateway3.uuplc.co.uk made the following annotations

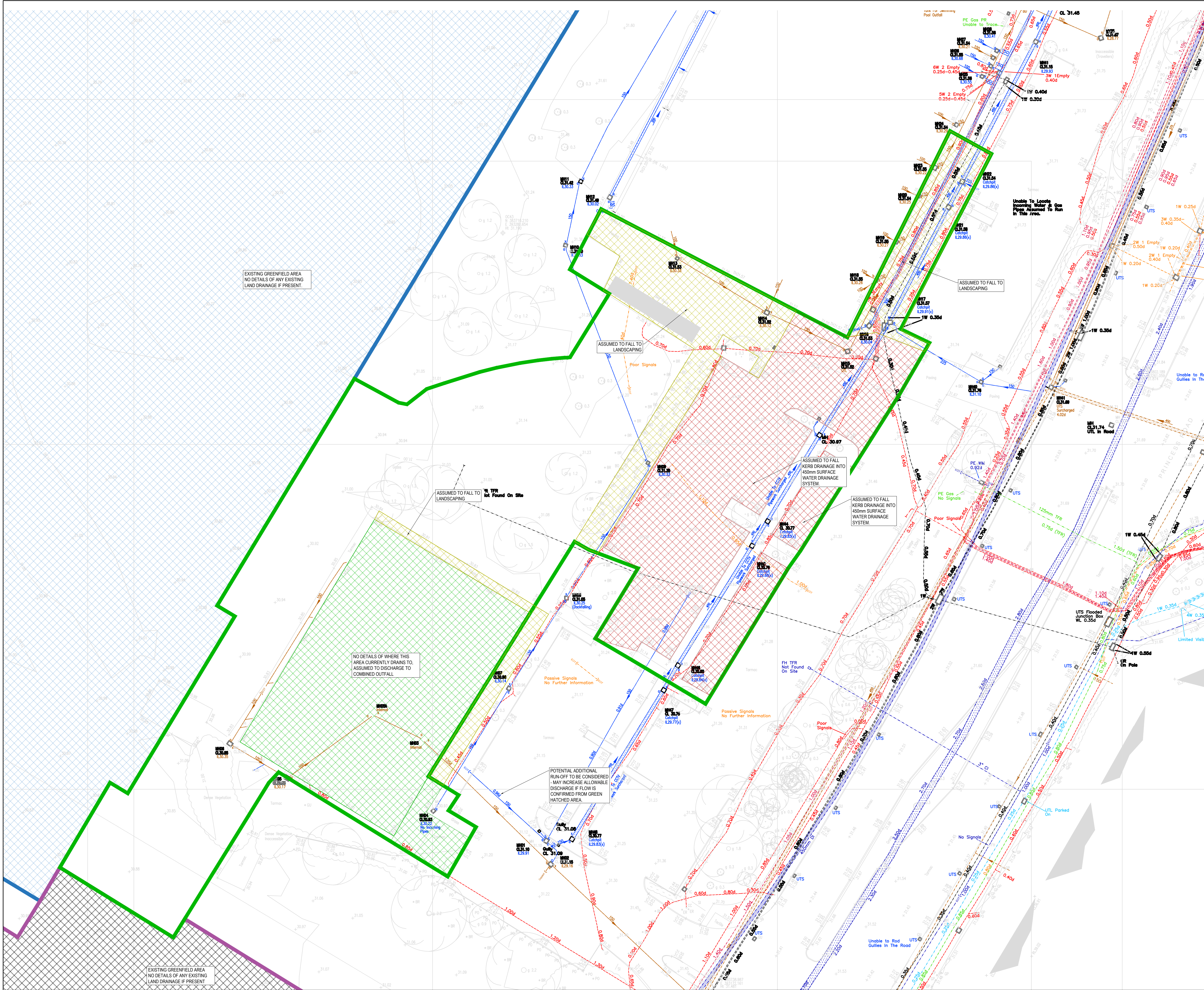
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Appendix F

Existing Drainage Catchments



GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. IMPERMEABLE AREAS AND FLOWS BASED ON TOPOGRAPHICAL SURVEY AND CCTV SURVEY INFORMATION AVAILABLE AT THE TIME OF DESIGN.
3. ALL EXISTING SEWERS, CONNECTIONS, PIPE SIZES AND INVERT LEVELS TO BE CONFIRMED BY CONTRACTOR PRIOR TO COMMENCEMENT OF WORKS TO ENSURE CONNECTIVITY. ANY VARIANCE FROM THE INFORMATION SHOWN SHOULD BE REPORTED TO THE ENGINEER FOR REVIEW.

KEY:

- EXISTING IMPERMEABLE AREA - DRAINS TO EXISTING 450mm SURFACE WATER SYSTEM - 0.106 Ha.
- EXISTING IMPERMEABLE AREA: ASSUMED TO DRAIN TO LANDSCAPING - 0.051 Ha.
- EXISTING IMPERMEABLE AREA: ASSUMED TO DRAIN TO COMBINED SYSTEM - 0.105 Ha.
- EXISTING GREENFIELD AREA - ARTIFICIAL 3G FTP PITCH 2.03 Ha.
- EXISTING GREENFIELD AREA - OVERSPILL CAR PARK 0.32 Ha.
- EXTENTS OF WORKS (TBC)
- EXTENTS OF ARTIFICIAL 3G FTP PITCH
- EXTENTS OF OVERSPILL CAR PARK

DRAWING IS BASED ON:

- PROPOSED SITE PLAN REF: 21-03-30 2638-X(90)-Site (For Extent of Works)
- TOPOGRAPHICAL SURVEY REF: U20-4667 February 2021.
- DRAINAGE CCTV SURVEY REF: U21-4667 March 2021.

P02	STAGE 3 ISSUE	08/04/21	CG	CG
P01	STAGE 3 ISSUE	08/04/21	CG	CG
Rev:	Description:	Date:	By:	Chkd:



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Status: **STAGE 3**

Project: **HOUGH END SPORTS VILLAGE**

Orig Title: **EXISTING DRAINAGE CATCHMENTS**

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	07/04/21	CG	CG	CG
Scale: 1:250				
Project No:	Originator:	Volume:	Level:	Type:
HEV - CUR - XX - XX - DR - C -	92010	-	P02	

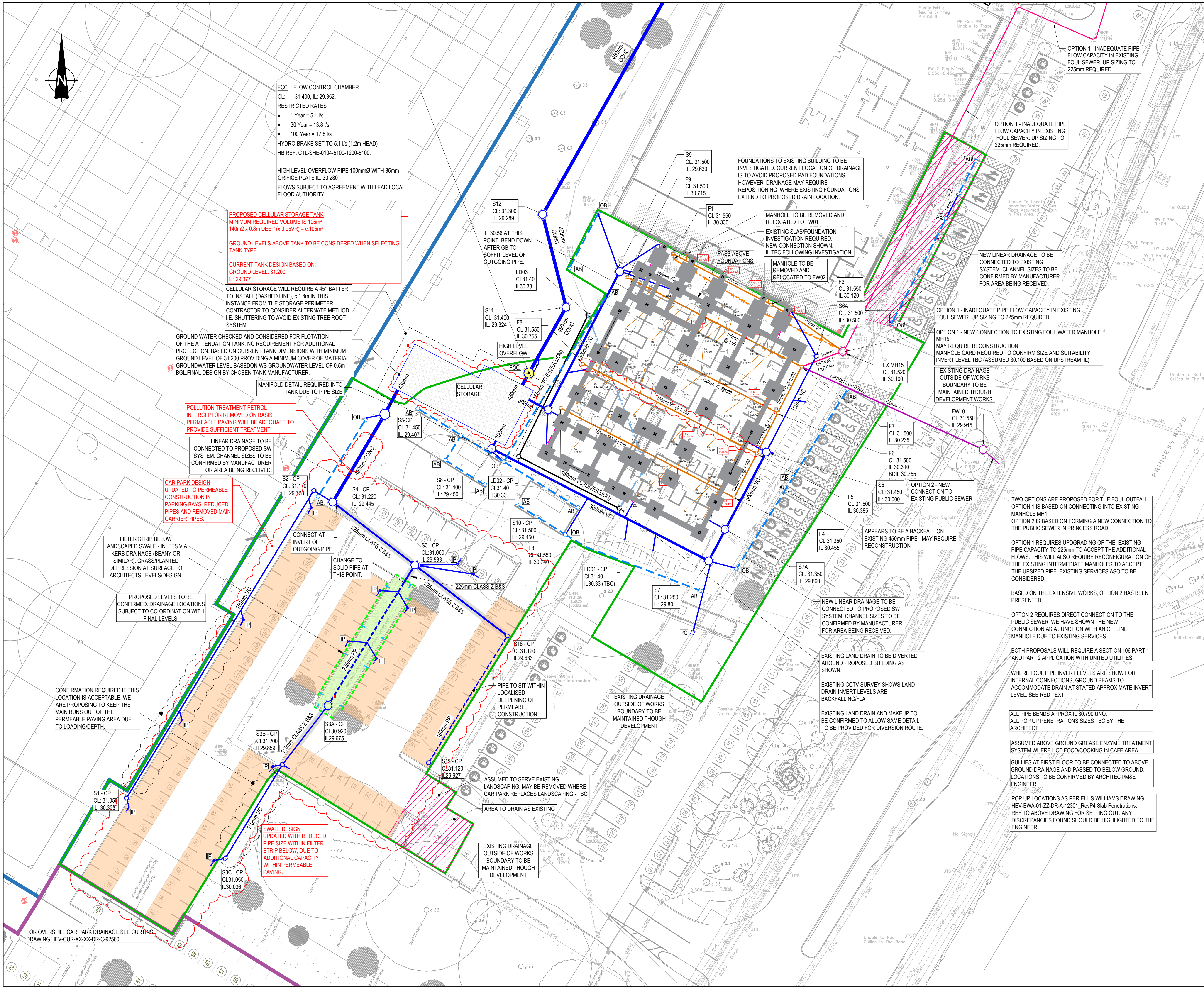
Appendix G

Proposed Drainage Layout Sheet 1

Proposed Drainage Layout Sheet 2

Car Park Drainage Layout

Overspill Car Park Drainage Layout



GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. STRATEGY BASED ON NO AVAILABLE TOPOGRAPHICAL SURVEY AND CCTV FLOW SURVEY INFORMATION AVAILABLE AT THE TIME OF DESIGN AND SHOULD BE REASSESSED UPON RECEIPT.
3. REFER TO THE CURTINS CCTV DRAINAGE SURVEY REVIEW DRAWINGS 92011 & 92012 FOR INFORMATION ON FURTHER WORK REQUIRED AN ALLOWANCES TO BE MADE FOR EXISTING DRAINAGE
4. REFER TO CURTINS NOTES DRAWING 92502 FOR DRAINAGE. NOTES.

DRAWING IS BASED ON:

- ARCHITECT LAYOUT - HEV-EWA-02-XX-DR-L-79001_RevP8
- POP UPS - HEV-EWA-01-ZZ-DR-A-12301_RevP4
- TOPOGRAPHICAL SURVEY REF: U20-4667 February 2021.
- DRAINAGE CCTV SURVEY REF: U21-4667 March 2021.
- FOUNDATION LAYOUT - 076170-CUR-01-ZZ-M3-S-00001 - Structural Plan - 12.11.21

KEY

- APPROXIMATE EXTENT OF WORKS FOR BUILDING EXTENSION AND CAR PARK EXTENSION. TO BE CONFIRMED.
- PROPOSED FOUL DRAINAGE
- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED FLOW CONTROL CHAMBER
- PROPOSED GATIC CAST SLOT DRAIN. ACCESS BOX TO HIGH END. OUTLET BOX TO LOW END. OUTLET PIPE TO MATCH GATIC SIZE. TBC BY MANUFACTURER.
- PROPOSED THRESHOLD DRAINAGE. GATIC FACADE SLOT. ACCESS BOX TO HIGH END. OUTLET BOX TO LOW END. OUTLET PIPE TO MATCH GATIC SIZE. TBC BY MANUFACTURER.
- PROPOSED KERB DRAIN (BEANY OR SIMILAR). OUTLET PIPE TO FILTER DRAIN.
- SURFACE WATER FULLY PERFORATED PIPE.
- PROPOSED SURFACE WATER GULLY
- PROPOSED FOUL WATER GULLY
- PROPOSED SHOWER GULLY
- BACK DROP
- PROPOSED UNDERGROUND ATTENUATION STORAGE
- EXISTING LAND DRAIN TO BE REMOVED
- DIVERTED LAND DRAIN.
- EXISTING FOUL DRAIN TO BE REMOVED
- IMPERMEABLE AREA TO DRAIN AS EXISTING
- FOUNDATIONS
- 150mm VERTICAL INSPECTION POINT WITH 150mm VC OUTLET PIPE AND 150mm WRAPPED PERFORATED INLET PIPE. REFER TO DETAILS.
- PERMEABLE TARMAC AREA. BAYS ONLY. SUBBASE LAID TO FALL TOWARDS THE PERFORATED PIPE / INSPECTION POINT POSITIONS. REFER TO DETAILS.
- STONE TRENCH WITH GRASSED DEPRESSION / SWALE AT SURFACE. REFER TO DETAILS.

P07	STAGE 4 UPDATE	19/11/21	CD	CG
P06	DRAFT STAGE 4 UPDATE - TO INCLUDE SUDS	05/11/21	CD	CG
P05	UPDATED TO INCORPORATE TEAMS COMMENTS	30/06/21	CS	CD
P04	STAGE 4	14.06.21	CD	CG
P03	STAGE 3 ISSUE	16/04/21	CG	CG
P02	STAGE 3/PLANNING	07/04/21	CG	CG
P01	STAGE 2 ISSUE	14/01/21	CG	CG
Rev:	Description:	Date:	By:	Chkd:



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Status:

STAGE 4 UPDATE

Project:

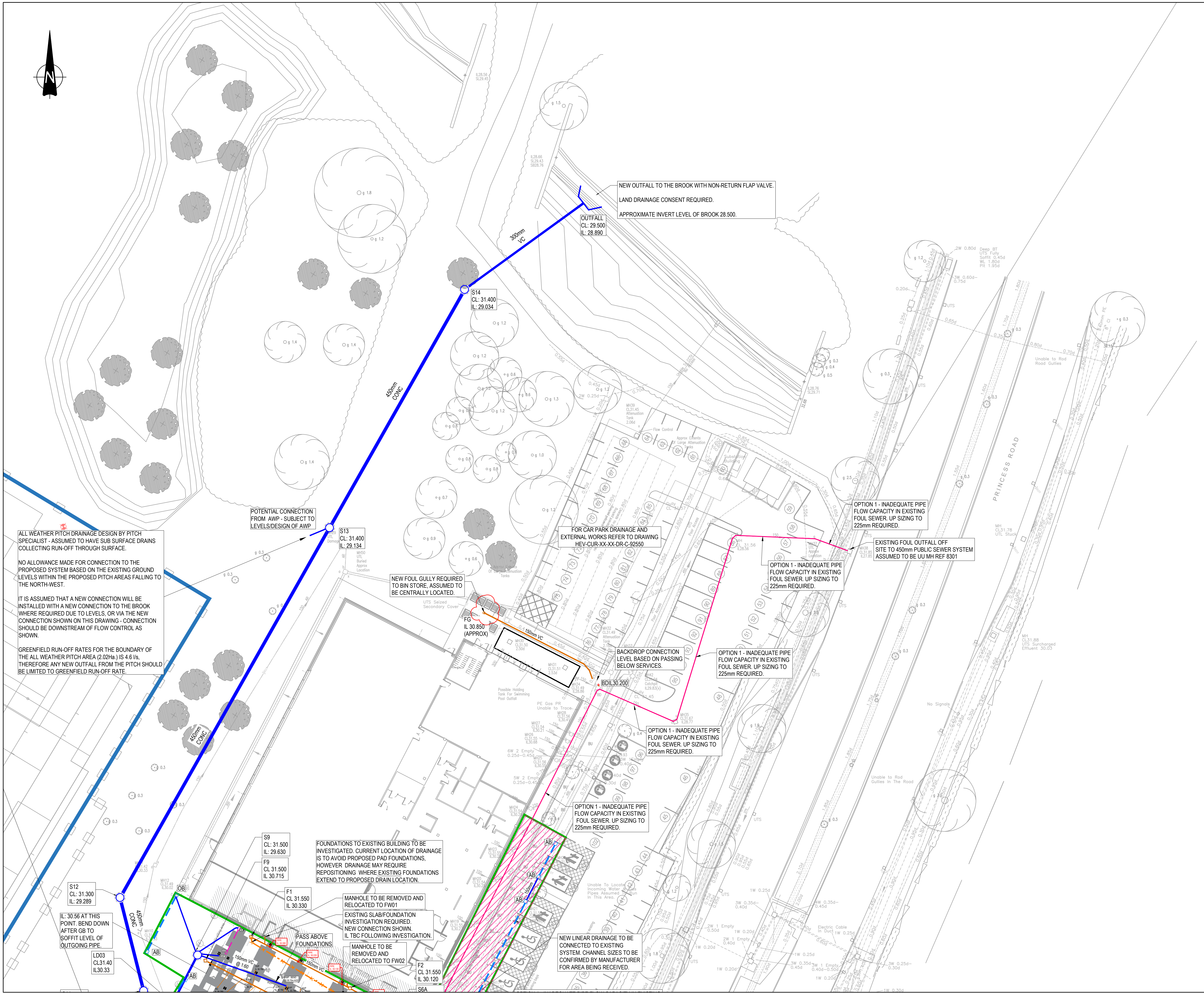
HOUGH END SPORTS VILLAGE

Orig Title:

PROPOSED DRAINAGE LAYOUT
SHEET 1 OF 2

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	12/01/21	CG	CG	CG
Scale: 1:250				
Project No:	Originator:	Volume:	Level:	Type:
				Role:
				Category / Number:
				Rev:

HEV - CUR - XX - XX - DR - C - 92500 - P07



GENERAL NOTES:

- DRAWING IS BASED ON:**
- ARCHITECT LAYOUT - HEV-EWA-02-XX-DR-L-79001_RevP8
 - POP UPS - HEV-EWA-01-ZZ-DR-A-12301_RevP4
 - TOPOGRAPHICAL SURVEY REF: U20-4667 February 2021.
 - DRAINAGE CCTV SURVEY REF: U21-4667 March 2021.
 - FOUNDATION LAYOUT - 076170-CUR-01-ZZ-M3-S-00001 - Structural Plan - 12.11.21

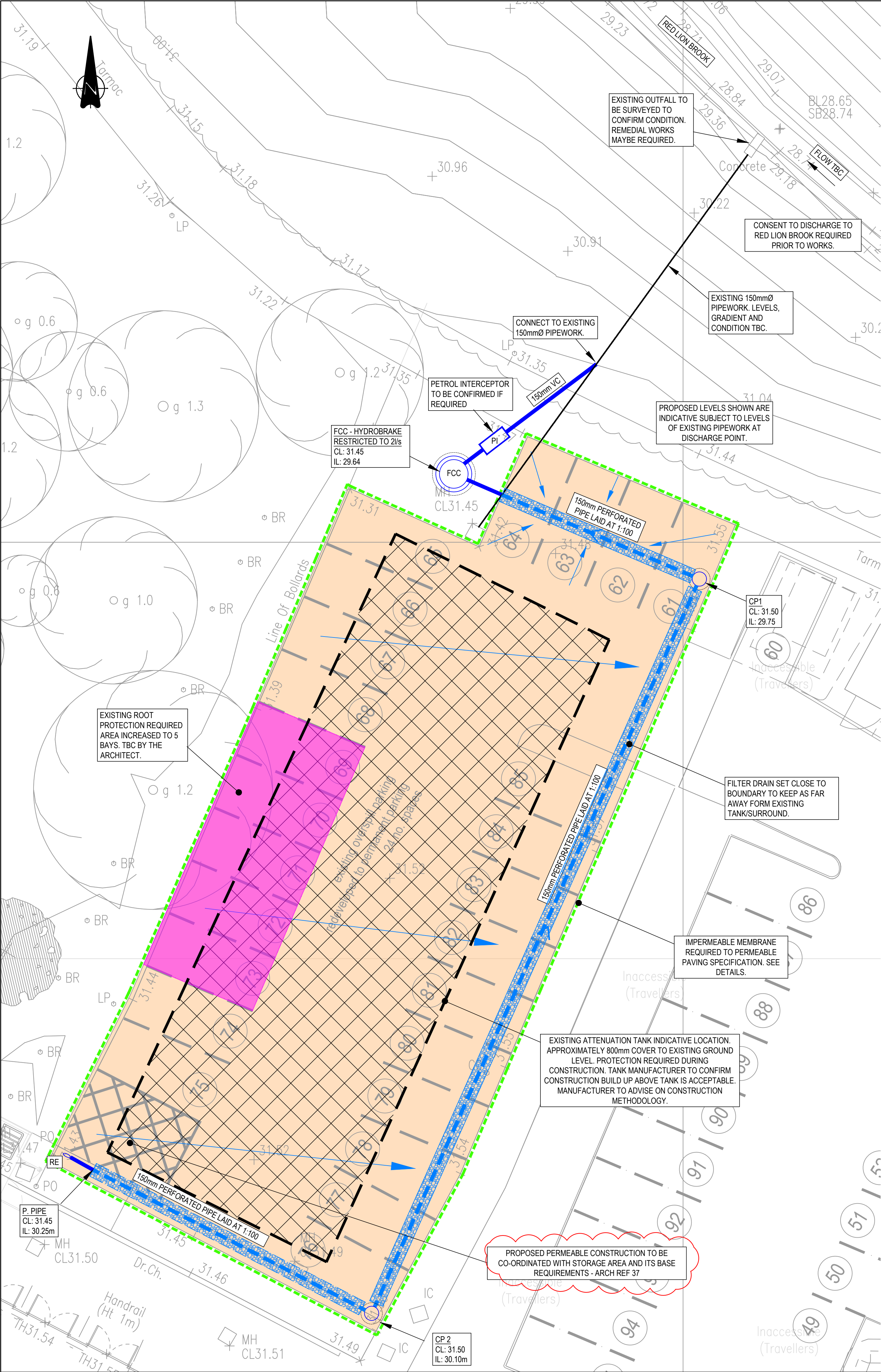
KEY

- | | | | | |
|------|--|----------|-----|-------|
| P06 | STAGE 4 UPDATE | 19/11/21 | CD | CG |
| P05 | DRAFT STAGE 4 UPDATE - TO INCLUDE SUDS | 05/11/21 | CD | CG |
| P04 | UPDATED TO INCORPORATE TEAMS COMMENTS | 30/06/21 | CS | CD |
| P03 | STAGE 4 | 14.06.21 | CD | CG |
| P02 | STAGE 3 ISSUE | 16/04/21 | CG | CG |
| P01 | STAGE 3/PLANNING | 08/04/21 | CG | CG |
| Rev: | Description: | Date: | By: | Chkd: |

Status: **STAGE 4 UPDATE**

Project: HOUGH END
SPORTS VILLAGE

HEV - CUR - XX - XX - DR - C - 92501 - P06



Quick Storage Estimate

Variables

FSR Rainfall

Return Period (years) 100

Region England and Wales

Map M5-60 (mm) 18.000

Ratio R 0.370

Cv (Summer) 0.750

Cv (Winter) 0.840

Impermeable Area (ha) 0.054

Maximum Allowable Discharge (l/s) 2.0

Infiltration Coefficient (m/hr) 0.00000

Safety Factor 2.0

Climate Change (%) 40

Analyse OK Cancel Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0

Quick Storage Estimate

Results

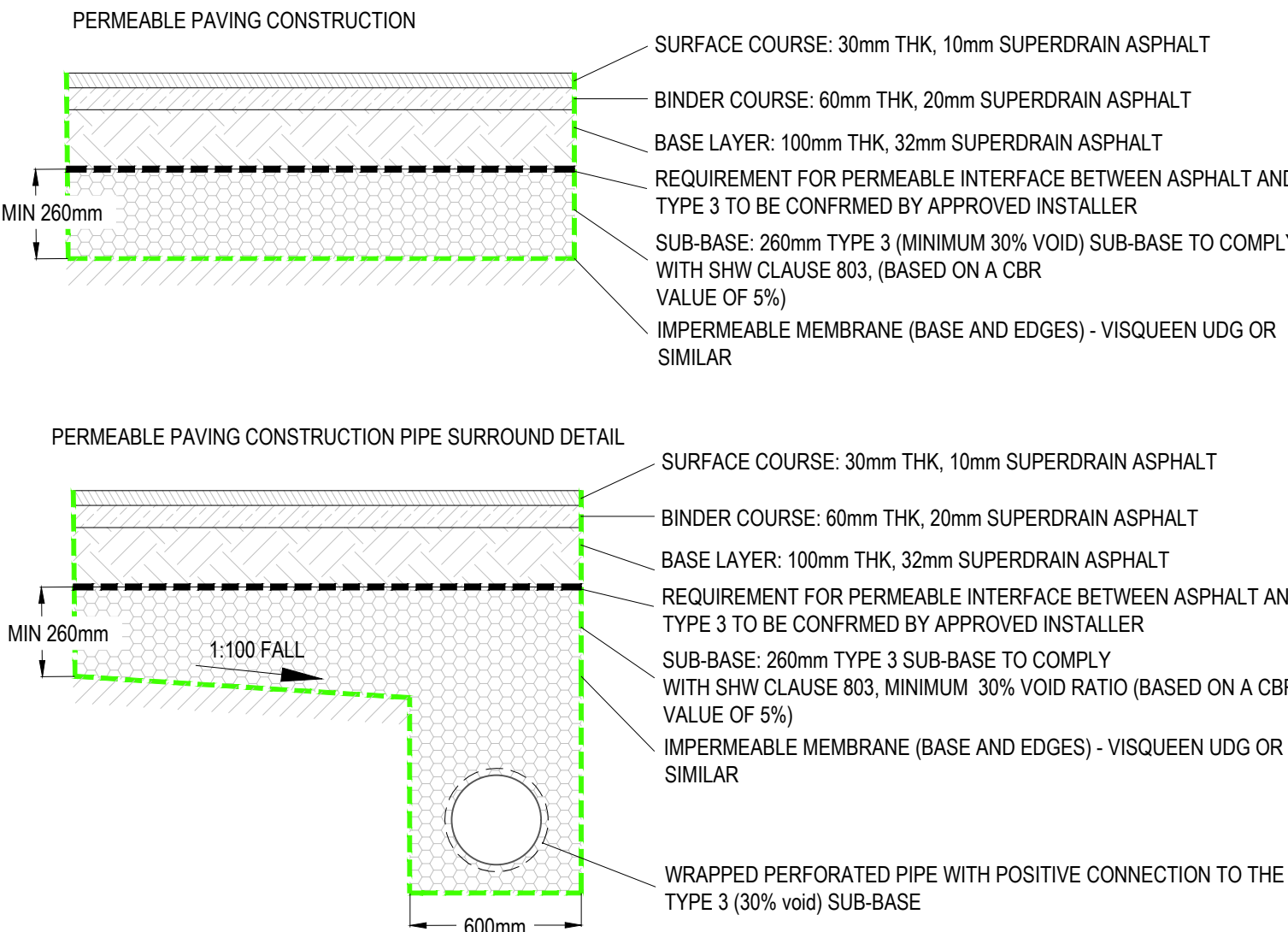
Global Variables require approximate storage of between 16 m³ and 26 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0

CONSTRUCTION SPECIFICATION



SITE ASSESSMENT

EXISTING AREA IS ROUGH GROUND, NO POSITIVE DRAINAGE IDENTIFIED ON TOPOGRAPHICAL SURVEY.

ASSUME RAIN WATER CURRENTLY SOAKS AWAY INTO THE GROUND WATER AND INTO THE BROOK.

SITE TOPOGRAPHY SHOWS SLIGHT FALL c.100mm ACROSS THE SITE HOWEVER GENERALLY FLAT.

CLOSEST WATER BODY IS RED LION BROOK, c.15m TO THE NORTH OF THE SITE.

PROPOSED STRATEGY

INFILTRATION TESTING TO BE CARRIED OUT TO CONFIRM IF A SOAKAWAY SYSTEM CAN BE USED.

SHOULD A SOAKAWAY SYSTEM NOT BE FEASIBLE GREENFIELD RATES SHOULD APPLY.

DUE TO NO POSITIVE DRAINAGE PRESENT ON SITE GREENFIELD RATES SHOULD APPLY.

CLOSEST WATER BODY IS RED LION BROOK, c.15m TO THE NORTH OF THE SITE.

CAR PARK TO BE PERMEABLE TARMAC THEREFORE ATTENUATION CAN BE PROVIDED WITH THE BASE LAYERS.

PAVEMENT SYSTEM TO BE WRAPPED IN IMPERMEABLE MEMBRANE WITH WRAPPED PERMEABLE PIPEWORK.

FLOW CONTROL CHAMBER PROVIDED PRIOR TO DISCHARGING TO THE WATERCOURSE.

PETROL INTERCEPTOR MAY BE REQUIRED AS SECOND STAGE TREATMENT, INFILTRATION THROUGH STONE TO BE FIRST STAGE OF TREATMENT. TO BE AGREED WITH LLFA.

HYDRO-BRAKE OR SIMILAR TO BE PROVIDED TO RESTRICT FLOWS.

CATCHMENTS AND DISCHARGE RATE

EXISTING CATCHMENT AREA = 535m² (0.054ha)

QBAR = 0.1l/s (GREENFIELD)

DUE TO THE SMALL ORIFICE REQUIRED FOR 0.1l/s AND THE HIGH RISK OF BLOCKAGE, WE PROPOSE A MAX 2 l/s DISCHARGE RATE.

DRAINAGE DESIGN

REQUIRED STORAGE VOLUME TO BE ATTENUATED WITHIN STONE SUB-BASE LAYER = MAX 26m³ BASED ON 1:100 YR PLUS 40% CLIMATE CHANGE.

CAR PARK AREA = 535m² x 0.260m (SUB-BASE LAYER DEPTH) = 139.1m³.

139.1m³ x 0.3 (30%VR) = 41.73m³ (ACTUAL STORAGE PROVIDED).

PAVEMENT DESIGN

BASED ON SUPERDRAIN ASPHALT, MAX LOADING 3.5t TBC BY OTHERS.

30mm SURFACE COURSE
60mm BINDER COURSE
100mm BASE LAYER
260mm SUB-BASE
INCREASE SUB-BASE TO 260mm FROM 185mm TO PROVIDE MINIMUM 450mm FROST SUSCEPTIBLE MATERIAL.

BASED ON 5% CBR.

SEE CONSTRUCTION SPECIFICATION.

DRAINAGE KEY

- PROPOSED SW PERFORATED PIPE
- PROPOSED SW PIPE
- FCC PROPOSED FLOW CONTROL CHAMBER
- CP PROPOSED CATCHPIT
- RE PROPOSED RODDING EYE
- PROPOSED PERMEABLE PAVEMENT
- PROPOSED SUB-BASE FALL ARROWS
- PI PROPOSED PETROL INTERCEPTOR (TBC IF REQUIRED)
- TREE ROOT PROTECTION REQUIRED. CELLWEB SYSTEM TO BE USED REFER TO MANUFACTURERS DESIGN.



THE PERMEABLE PAVING IS AN INTEGRAL PART OF THE SURFACE WATER SYSTEM. A MINIMUM 185mm SUB-BASE (TYPE 3 AT 30% VOID RATIO) IS REQUIRED TO ATTENUATE WATER IS STORM EVENTS - INCREASE DEPTH (260mm) PROPOSED BASED ON LOADING REQUIREMENTS. A POSITIVE CONNECTION TO THE PIPE NETWORK VIA THE PERFORATED PIPES IS ESSENTIAL OF THE SYSTEM TO WORK.

GENERAL NOTES:

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- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
 - ALL PRIVATE DRAINAGE WORKS TO BE IN ACCORDANCE WITH CURTINS DRAINAGE SPECIFICATION, "CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY 7th EDITION", BS EN 52 2017 'DRAIN AND SEWER SYSTEMS OUTSIDE BUILDINGS' AND THE BUILDING REGULATIONS APPROVED 'DOCUMENT H'.
 - DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
 - DESIGN BASED ON TOPOGRAPHICAL SURVEY INFORMATION AVAILABLE AT THE TIME OF THE DESIGN.
 - OUTFALL CONNECTION(S) SUBJECT TO AGREEMENT WITH THE APPROVING AUTHORITY.
 - ALL DIMENSIONS ARE IN METRES AND LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS OTHERWISE NOTED.
 - COVER LEVELS ARE APPROXIMATE AND SHALL BE CONFIRMED BY ARCHITECT/ LANDSCAPE ARCHITECT. CONTRACTOR TO ALLOW FOR ADJUSTMENT TO SUIT AGREED POSITIONS AND FINISHED LEVELS, AND CONFIRM ALL COVER LEVELS ON SITE.
 - INVERT LEVELS AT MANHOLES/ INSPECTION CHAMBERS TO BE USED TO SET OUT PIPEWORK. PIPE GRADIENTS ARE SHOWN INDICATIVELY ONLY.
 - ALL PIPE DIAMETERS GIVEN ARE NOMINAL INTERNAL PIPE DIAMETERS.
 - ALL PIPEWORK, UNLESS AGREED OTHERWISE STATED, SHALL BE:
 - 100mm to 300mm DIA TO BE VITRIFIED CLAY.
 - 375mm DIA AND GREATER TO BE CLASS 120 CONCRETE PIPES.
 - AS AN ALTERNATIVE THE CONTRACTOR MAY USE AN APPROVED UNPLASTICISED POLYVINYL CHLORIDE (PVCU) WITH APPROVAL FROM THE ENGINEER.
 - SEWER PIPES TO BE LAID IN MAXIMUM 3 METRE LENGTHS UNLESS THERE IS A SPECIFIC OPERATIONAL NEED TO LAY LONGER LENGTHS.
 - THE FIRST PIPE OUT OF MANHOLES TO BE AS SHORT AS PRACTICABLE SO AS TO PROVIDE A FLEXIBLE JOINT AS CLOSE AS POSSIBLE TO THE OUTSIDE FACE OF THE CONCRETE SURROUND AND CONNECTED TO A LENGTH OF ROCKER PIPE.
 - ALL NEW CONNECTIONS INTO EXISTING MANHOLES (OR INTO EXISTING SEWERS) TO BE 'SOFFITS LEVEL' UNLESS OTHERWISE NOTED.
 - WHERE PEAT IS ENCOUNTERED DURING THE SITE INVESTIGATION, ADDITIONAL NOTES WILL BE REQUIRED AND DESIGN ADJUSTED TO SUIT.
 - ALL MANHOLE COVERS IN BLOCK/SLAB AND EXTERNAL PAVING AREAS TO HAVE RECESSED COVERS OF THE APPROPRIATE GRADE TO ACCEPT ARCHITECT'S PAVING PROPOSAL.
 - UNLESS NOTED OTHERWISE IN THE MANHOLE SCHEDULE, ALL MANHOLE, GULLY AND CHANNEL COVERS (IRONWORK) SHOULD BE THE FOLLOWING SPECIFICATION:
 - B125 LOAD CLASS IN PEDESTRIAN AREAS
 - D400 LOAD CLASS IN VEHICULAR AREAS.
 - ALL PROPRIETARY PRODUCTS TO BE INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURERS REQUIREMENTS, INSTRUCTIONS AND RECOMMENDATIONS.
 - THE DESIGN IS BASED ON A GRAVITY RAINWATER SYSTEM.
 - CONSENT REQUIRED TO CONNECT TO RED LION BROOK BY RELEVANT AUTHORITY.
 - CATCHPIT CHAMBERS PROVIDED PRIOR TO FLOW CONTROL TO CATCH SILTS AND PREVENT BLOCKAGE RISK.
 - SURFACE WATER ATTENUATION TO BE PROVIDED WITHIN THE CONSTRUCTION BUILD UP.
 - REFER TO DRAWING 92561 FROM DRAINAGE DETAILS.

P04	STAGE 4 UPDATE	19.11.21	CD	CG
P03	DRAFT STAGE 4 UPDATE - LATEST SITE PLAN	05.11.21	CD	CG
P02	UPDATED TO INCORPORATE TEAMS COMMENTS	30.06.21	CS	CD
P01	STAGE 4 ISSUE	04.06.21	CD	CG
Rev:	Description:	Date:	By:	Chkd:

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Status:

Project:

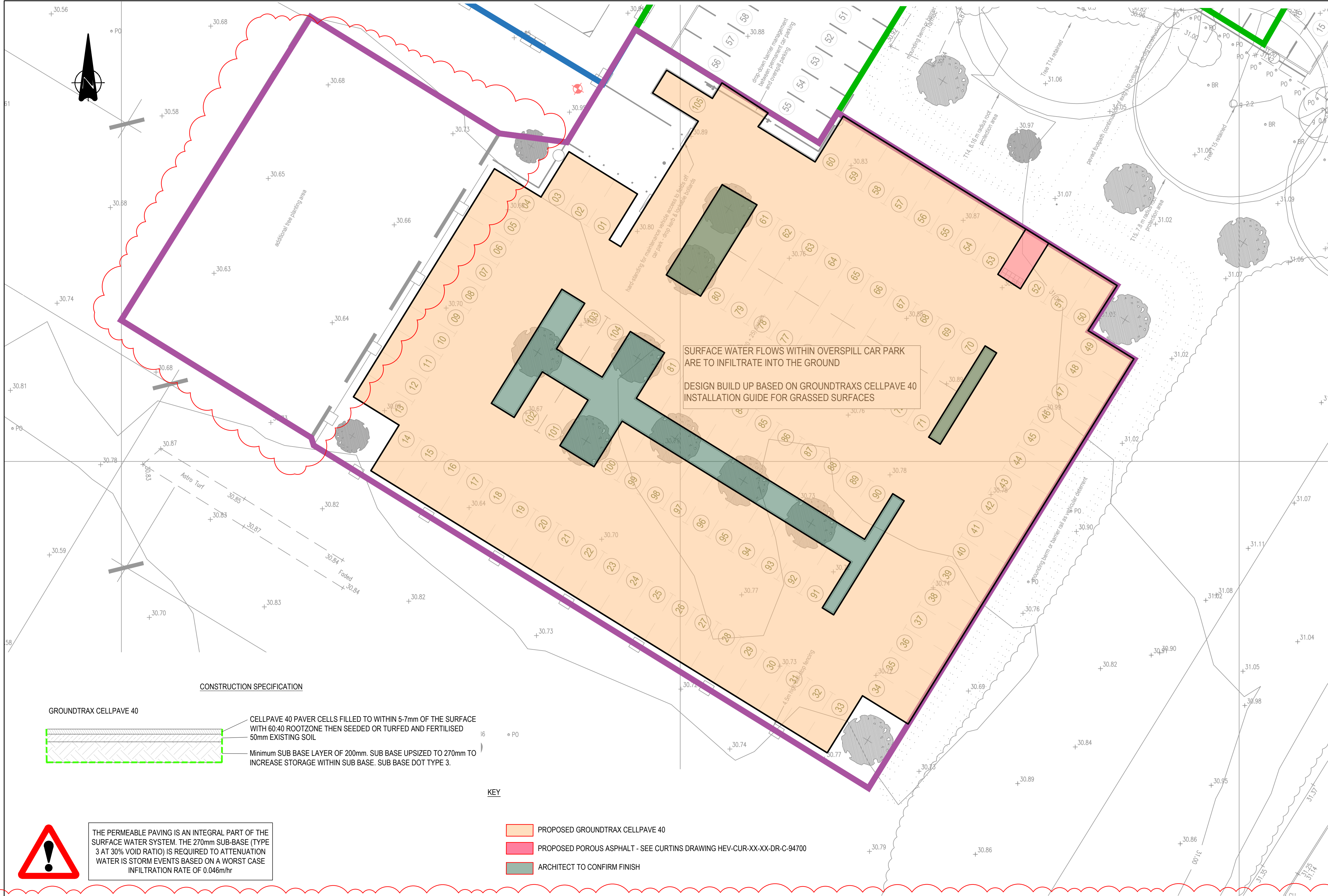
HOUGH END SPORTS VILLAGE

Orig Title:

CAR PARK DRAINAGE

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	14/05/21	CD	CG	CG
Scale: 1:100				
Project No:	Originator:	Volume:	Level:	Type:
				Role:
				Category / Number:
				Rev:

HEV - CUR - XX - XX - DR - C - 92550 - P04



CONSTRUCTION SPECIFICATION

GROUNDTRAX CELLPAVE 40

CELLPAVE 40 PAVER CELLS FILLED TO WITHIN 5-7mm OF THE SURFACE WITH 60:40 ROOTZONE THEN SEEDED OR TURFED AND FERTILISED 50mm EXISTING SOIL

Minimum SUB BASE LAYER OF 200mm. SUB BASE UPSIZED TO 270mm TO INCREASE STORAGE WITHIN SUB BASE. SUB BASE DOT TYPE 3.

KEY

- PROPOSED GROUNDTRAX CELLPAVE 40
- PROPOSED POROUS ASPHALT - SEE CURTINS DRAWING HEV-CUR-XX-XX-DR-C-94700
- ARCHITECT TO CONFIRM FINISH



THE PERMEABLE PAVING IS AN INTEGRAL PART OF THE SURFACE WATER SYSTEM. THE 270mm SUB-BASE (TYPE 3 AT 30% VOID RATIO) IS REQUIRED TO ATTENUATION WATER IS STORM EVENTS BASED ON A WORST CASE INFILTRATION RATE OF 0.046m/hr

SITE ASSESSMENT

EXISTING AREA IS GRASSED AREA, NO POSITIVE DRAINAGE IDENTIFIED ON TOPOGRAPHICAL SURVEY.

ASSUME RAIN WATER CURRENTLY SOAKS AWAY INTO THE GROUND WATER.

SITE TOPOGRAPHY SHOWS SLIGHT FALL c.400mm ACROSS THE SITE HOWEVER GENERALLY FLAT.

PROPOSED STRATEGY

DUE TO THE GROUND BEING SUITABLE FOR INFILTRATION, PERMEABLE PAVING USING INFILTRATION CAN BE USED.

WORST CASE SCENARIO INFILTRATION RATE OF 1.28X10⁻³X3600 TO BE USED.

CAR PARK TO BE GROUNDTRAX CELLPAVE 40 AS PER THE ARCHITECTS SPECIFICATION.

CATCHMENTS AND DISCHARGE RATE

PROPOSED CATCHMENT AREA = 3200m² (0.032ha)

INFILTRATION RATE = 0.046m/hr

DRAINAGE DESIGN

REQUIRED STORAGE VOLUME TO BE ATTENUATED WITHIN STONE SUB-BASE LAYER = MAX 236m³ BASED ON 1:100 YR PLUS 40% CLIMATE CHANGE. FOR INFILTRATION RATES PLEASE SEE LKC GROUP PHASE 2 GEO-ENVIRONMENTAL INVESTIGATION, RISK ASSESSMENT AND REMEDIATION STRATEGY.

CAR PARK AREA = 3000m² x 0.270m (SUB-BASE LAYER DEPTH) = 810m³.

810m³ x 0.3 (30%VR) = 243m³ (ACTUAL STORAGE PROVIDED).

PAVEMENT DESIGN

BASED ON GROUNDTRAX CELLPAVE 40.

40mm CELLPAVE 40 PAVERS
50mm EXISTING SOIL
200mm SUB-BASE LAYER
INCREASE SUB-BASE TO 270mm FROM 200mm TO PROVIDE MINIMUM 240m³ SURFACE WATER ATTENUATION.
BASED ON 5% CBR.

SEE CONSTRUCTION SPECIFICATION.

GENERAL NOTES:

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- SURFACE WATER ATTENUATION TO BE PROVIDED WITHIN THE CONSTRUCTION BUILD UP.

P02	STAGE 4 UPDATE	19/11/21	CD	CG
P01	STAGE 4 ISSUE	30.06.21	CS	CD
Rev:	Description:	Date:	By:	Chkd:

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Status: STAGE 4 UPDATE

Project: HOUGH END SPORTS VILLAGE

Orig Title: CAR PARK DRAINAGE

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	14/05/21	CD	CG	CG
Scale: 1:200				
Project No:	Originator:	Volume:	Level:	Type:
				Role:
				Category / Number:
				Rev:

HEV - CUR - XX - XX - DR - C - 92560 - P02

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