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Our Ref: 18022/PG

8th May 2018

Welwyn Hatfield Borough Council Offices
The Campus
Welwyn Garden City
Hertfordshire
AL8 6AE

Dear Sir/Madam,

PREMIER INN, STANBOROUGH ROAD, WELWYN GARDEN CITY, AL8 6DQ
FLOOD RISK STATEMENT AND SUSTAINABLE DRAINAGE STRATEGY

This Flood Risk Statement (FRS) assesses the risk of flooding from all sources relating to the proposed development located at the Premier Inn, Stanborough Road, in Welwyn Garden City. The project proposal involves extension to the front of the existing Premier Inn hotel building, which will lead to 24 additional hotel rooms on site.

According to the latest Environment Agency Flood Zone Maps for Planning, the Premier Inn in Welwyn lies entirely within 'Flood Zone 1', which means that it has been assessed as having less than 1 in 1,000 annual probability of fluvial or tidal flooding. Therefore, it is at very low risk of flooding from rivers and the sea. To support a planning application for this development, the risk of flooding to the site from all sources has been considered, with particular attention to surface water management, access, evacuation and floor levels to enable safe future operation of the site.

This FRS has been prepared with due consideration of the National Planning Policy Framework¹ (NPPF), the latest Planning Practice Guidance (PPG) for Flood Risk and Coastal Change², and the local planning policy in effect within Welwyn Hatfield Borough Council.

ASSESSMENT OF EXISTING SITE

The site considered in this assessment is located along Stanborough Road, in Welwyn Garden City, AL8 6DQ, as shown in Figure 1.

The site is bounded to the west by Stanborough Road and by residential dwellings to the north. The railway borders the site to the east and Gosling Sports Park is located to the south of the Premier Inn.

The existing site covers an area of approximately 0.95 hectares. It includes one restaurant building and three hotel buildings with associated car parking and soft-landscaping features.

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¹ Communities and Local Government, National Planning Policy Framework, 2012

² Communities and Local Government, Planning Practice Guidance, 2014, Available at: <https://www.gov.uk/guidance/flood-risk-and-coastal-change>, Accessed 05/03/2018



Figure 1 - Existing site location³

A topographic survey was undertaken for the site by 40Seven in April 2008 and it covered ground levels across the whole site. Levels to the north of the site range from 88.07m AOD to 88.80m AOD. Ground levels are falling in a southerly direction, with levels between 86.38m AOD and 87.93m AOD to the south of the existing buildings.

The site houses one restaurant building (The Stanborough Beefeater) and three hotel buildings (Premier Inn). According to Table 2 of the PPG² for Flood Risk and Coastal Change, “Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels” are classed as ‘More vulnerable’ in terms of flood risk.

The role of the Lead Local Flood Authority (LLFA) is fulfilled by Hertfordshire County Council and the role of the Local Planning Authority (LPA) is fulfilled by Welwyn Hatfield Borough Council.

ASSESSMENT OF THE PROPOSED DEVELOPMENT

The planning application is for the extension of the existing Premier Inn hotel. This extension will be built to the front of the existing buildings, on the current car parking area. This extension will result in 24 additional bedrooms for the Premier Inn and the scheme will also include the addition of 11 new car parking spaces.

According to Table 2 of the PPG for Flood Risk and Coastal Change, there will be no change of use following the extension of the Premier Inn, and therefore, the site will remain ‘More vulnerable’ in terms of flood risk.

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PLANNING POLICY AND GUIDANCE

National Planning Policy Framework

The NPPF was released in March 2012 and sets out the Governments' planning policies for England and how these are expected to be applied. The NPPF states that:

“Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere.”

In addition to the NPPF, online Planning Practice Guidance was released in March 2014 to clarify planning aspects of flood risk management. The PPG supersedes the Technical Guidance to the NPPF and defines which development types are considered appropriate within each flood zone.

Local Planning Policy

Hertfordshire County Council Preliminary Flood Risk Assessment⁴ (PFRA) was completed in 2011 and confirms that there are no indicative flood risk areas of national significance above the flood risk thresholds within Hertfordshire. This report considers flooding from surface water, groundwater and urban drainage to be of relevance in Hertfordshire. Nevertheless, no historical events from surface water, groundwater or urban drainage were considered to be of sufficient severity to support further investigation. Only Stage 1 of the Flood Risk Regulations 2009 process has been completed.

Hertfordshire County Council Local Flood Risk Management Strategy⁵ (LFRMS) guides the planning process in relation to flood risk across all categories and outlines key policies in relation to development within the county. The LFRMS aims to make sure that all those involved in flood risk management are aware of their responsibilities and sets the direction for what work is carried out and how this can be coordinated across Hertfordshire. Specific objectives of relevance to the proposals are to reduce the potential impact and costs of flooding in the county, secure improvements to the water environment of Hertfordshire through the undertaking of actions associated with flood risk management.

In this context, Hertfordshire County Council produced a SuDS policy statement⁶ in March 2015 which outlines the anticipated requirements of Hertfordshire County Council for developers needing to gain approval for drainage schemes. SuDS Policy 3 of this statement indicates that *“Previously developed sites should aim to discharge at the original pre-development greenfield for the whole site area where possible. If not, a significant reduction in the current rate of discharge should be achieved and evidence provided as to why greenfield rates are not viable. The volume of attenuation storage that would be required for the site should be based on the 100 year critical storm duration with an allowance for climate change and the allowable discharge rate.”*

Welwyn Hatfield Council Strategic Flood Risk Assessment⁷ (SFRA) includes a screening of the sources of flooding and a Level 2 SFRA of Specified Sites. This report also promotes the addition of SuDS into new developments.

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⁴ Hertfordshire County Council, Preliminary Flood Risk Assessment, August 2011

⁵ Hertfordshire County Council, Local Flood Risk Management Strategy for Hertfordshire 2013-2016, June 2012

⁶ Hertfordshire County Council, Lead Local Flood Authority SuDS Policy Statement, Meeting Sustainable Drainage Systems Standards in Hertfordshire, March 2017

⁷ JBA Consulting, Welwyn Hatfield Council Level 1 and 2 Strategic Flood Risk Assessment Final Report, May 2016

Stanborough Road, Welwyn

Furthermore, Welwyn Hatfield District Plan⁸, adopted in 2005, contains the local planning framework, policies and proposals which guide the development and use of land in the district. This adopted Plan includes several policies related to flood prevention and water conservation.

Policy R7 'Protection of Ground and Surface Water' states that *"Planning permission will not be granted for development which poses a threat to the quality of both surface and/or groundwater. Where proposals are acceptable the use of sustainable drainage systems will be encouraged, dependent on local site and underlying groundwater considerations."* Policy R8 'Floodplains and Flood Prevention' indicates that *"[...] Planning permission for new development outside floodplains will not be granted where the proposals would result in an increase in flooding downstream because of increased run-off. The use of sustainable drainage systems will be encouraged, dependent on local site and underlying groundwater considerations. Proposals for development necessary to prevent an increase in flooding will be considered in terms of their impact on biodiversity, the landscape and recreation."* Moreover, Policy R9 'Water Supply and Disposal' states that *"Permission will not be granted for proposals that: (i) Would be detrimental to existing water abstractions, fisheries, amenity and nature conservation; (ii) Would cause adverse change in flows or levels in the groundwater, or any rivers, streams, ditches, springs, lakes or ponds in the vicinity. Proposals should be consistent with the long term management of, and co-ordinated with, the provision of new water supply and disposal infrastructure"*. Finally, Policy R10 'Water Conservation Measures' highlights that *"New development will be expected to incorporate water conservation measures wherever applicable, including sustainable drainage systems, water storage systems, soft landscaping and permeable surfaces to help reduce surface water run-off."*

The aforementioned 2005 adopted Plan covered the period up to 2011. In this context, a new plan has been produced: Welwyn Hatfield's emerging Local Plan⁹ which covers the period 2013-2032 and sets out the Council's new planning framework for the borough. This emerging Plan includes a specific policy related to 'Flood Risk and Surface Water Management'. This Policy SADM 14 states that *"All major development proposals, and all proposals in areas identified as being at risk of surface water flooding, will be required to manage surface water runoff and surface water flood risk via the use of Sustainable Drainage Systems."* These drainage systems once implemented should help to reduce overall flood risk in the wider area.

As presented in the following paragraphs, the proposed development at the Premier Inn in Welwyn Garden City follows the relevant local policy requirements by ensuring that there will be no deterioration of ground or surface water quality and by ensuring that there will be no increase in flood risk elsewhere after development. The extension will particularly include sustainable development and drainage systems to help reduce surface water runoff.

ASSESSMENT OF FLOOD RISK

In assessing the risks of flooding to the site, data were collected from:

- The Environment Agency;
- Hertfordshire PFRA⁴;
- Hertfordshire LFRMS⁵;
- Welwyn Hatfield's Local Plan⁹;
- Welwyn Hatfield Council SFRA⁷.

All sources of flooding to the site have been assessed and are presented in the following paragraphs.

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⁸ Welwyn Hatfield Borough Council, Welwyn Hatfield District Plan 2005,

⁹ Welwyn Hatfield Borough Council, Local Plan Proposed Submission August 2016, available at:

http://consult.welhat.gov.uk/portal/planning_policy/local_plan_proposed_submission_august_2016/lpps_document?pointId=1455192034080#section-1455192034080, accessed on 06/04/2018

Historic Flood Records

A number of sources of flood risk were investigated to determine if the site and its surrounding area have been affected by flooding in the past.

Welwyn Hatfield SFRA⁷ includes records of historical flooding events across the Borough. Several flooding events from the River Lea were recorded in March 1947, May 1978, December 2000 and March 2007. However, no indication were given on the extent of these flood incidents.

In terms of historic surface water flood events, significant surface water flooding occurred in Hertfordshire during June 2007 as a result of a series of intense, short duration rainfall events. The SFRA indicates that surface water flooding affected Hatfield and Welwyn Garden City. Although these data provide an indication of possible areas prone to surface water flooding, they do not include the exact location of these flooding incidents nor details on the exact cause.

Therefore, according to the available data, we are not currently aware of any other history of flooding at the site, or of any records of flooding from any source.

Risk of Flooding from Rivers and the Sea

The River Lea is located approximately 1km south of the site and the River Mimram flows approximately 3km north of the site. There are no other designated Main Rivers in the vicinity of the Premier Inn. As presented in Figure 2, the latest online Environment Agency Flood Zone maps for Planning show that the site lies wholly within 'Flood Zone 1'. It means that it has been assessed as having less than 1 in 1,000 annual probability of fluvial flooding. The risk of flooding from rivers is therefore low.

Welwyn Garden City does not border any stretches of coastline, and hence, the site is not at risk from tidal flooding.

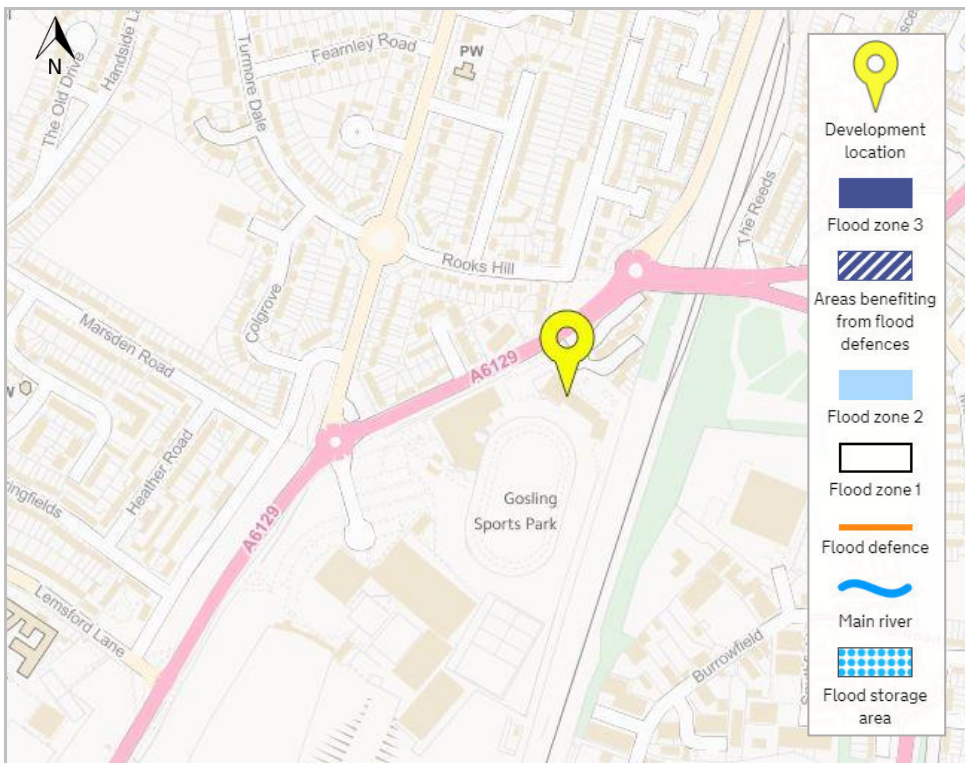


Figure 2 - Environment Agency Flood Map for Planning (Rivers and Sea)¹⁰

¹⁰ © Environment Agency copyright and database rights 2018. © Ordnance Survey Crown copyright. All rights reserved. Environment Agency, 100024198. Contains Royal Mail data © Royal Mail copyright and database right 2018.

Risk of Flooding from Surface Water

Flooding from surface water arises during intense rainfall events when floodwater is unable to infiltrate into the ground or discharge into local ditches or artificial drainage infrastructures. In an urban environment, the risk of flooding from surface water and from overloaded sewer is closely related, and both are included in the relevant surface water flooding datasets. Flooding events are typically of short duration (unless there is a drainage system blockage), but can be severe.

The Environment Agency online maps for surface water flooding are the most up-to-date data available for assessing the risks of surface water flooding. The map relevant to the site is presented in Figure 3.

On the map, the dark blue areas represent areas of 'High' surface water flood risk that have a 3.3% AEP (1 in 30 year event) chance of flooding. The lighter blue areas are of 'Medium' risk of surface water flooding which have a 1% AEP (1 in 100 year event) chance of flooding and the pale blue areas are of 'Low' risk of surface water flooding with a 0.1% to 1% AEP (between a 1 in 1000 year and 1 in 100 year event) chance of occurring. Areas that are not highlighted are classified as 'Very Low' risk of surface water flooding with a less than 0.1% AEP (1 in 1000 year event) chance of occurring.

Figure 3 shows that the Premier Inn along Stanborough Road is almost entirely at 'Very Low' risk of surface water flooding. Only a small extent of the car park to the north of the existing buildings is identified as being at 'Low' risk, with localised areas classed as 'Medium' risk of surface water flooding along the edges of the hotel.

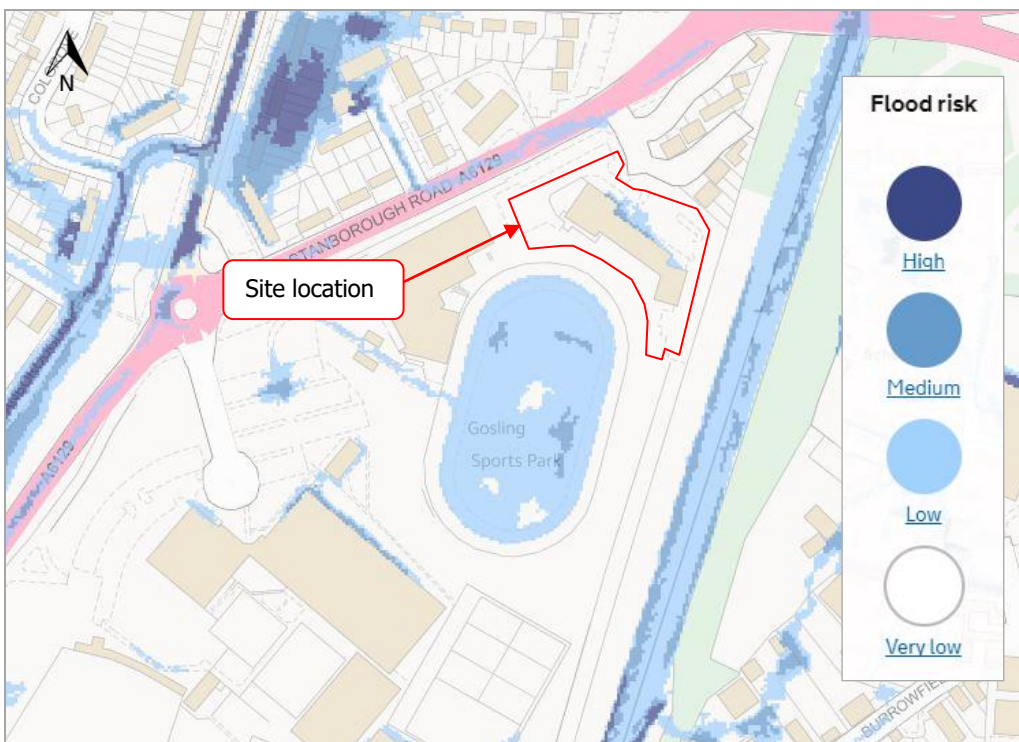


Figure 3 - Environment Agency Surface Water Map¹⁰

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Figure 4 below shows the ‘Medium’ risk event in the area of the site. This map shows that the current buildings are not at risk from surface water flooding during this scenario (the design event). Only a very small extent along the northern side of the buildings is expected to experience surface water flooding shallower than 300mm. In this scenario, the depth of flooding is very shallow and the drainage system on site is expected to cope with such a flooding event. The risk to people is therefore low.

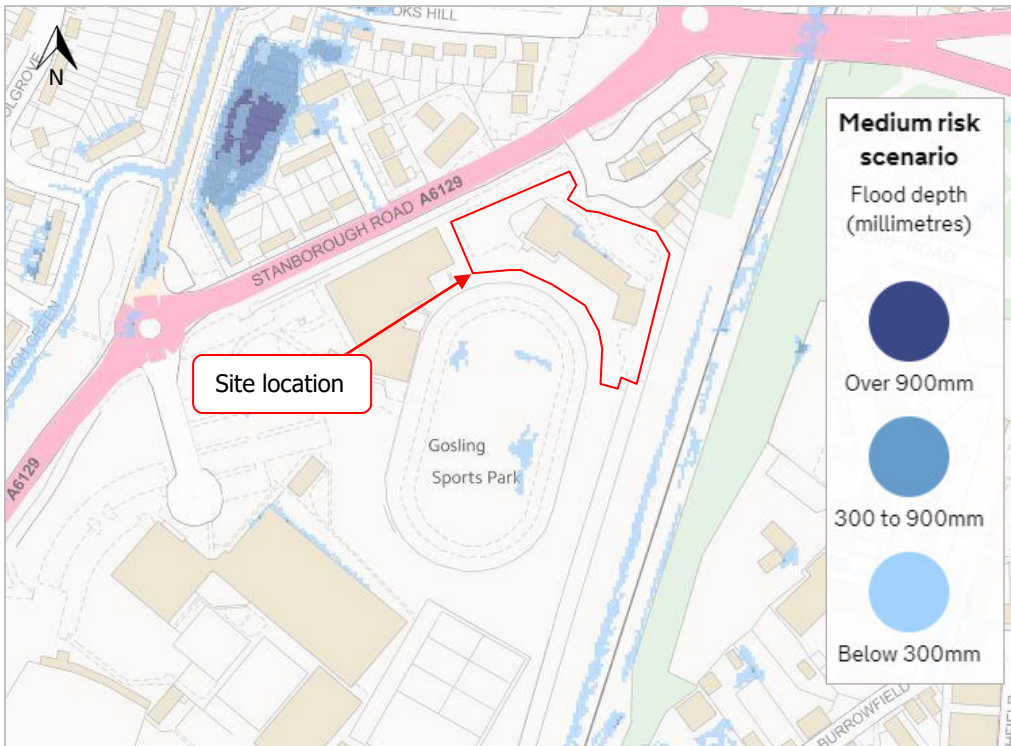


Figure 4 - Updated Flood Map for Surface Water (uFMfSW) Medium Risk Scenario Depth¹⁰

Figure 5 shown below presents the ‘Low’ risk scenario event (0.1% AEP event) in the vicinity of the site. In this scenario, only the edges along the northern side of the buildings are at risk of flooding and could experience surface water flooding shallower than 300mm, with localised areas of flooding up to 900mm. However, the depth of flooding in such scenario remains shallow and it is assumed that the drainage system on site has been designed to manage this.

According to the available data, the site lies mainly in an area defined as ‘Very low’ risk of surface water flooding. The site is not expected to flood internally during the 0.1% AEP event, which represents the most severe scenario considered for planning purposes. During this scenario, only the car park area to the north of the buildings could experience surface water flooding shallower than 300mm and up to 900mm at the edges of the buildings. These areas of higher risk are not shown as a flow path for surface water, and therefore are isolated low spots. In this context, the surface water drainage system on site is expected to be designed to mitigate such depth of flooding. The risk of surface water flooding is hence deemed to be low for the site.

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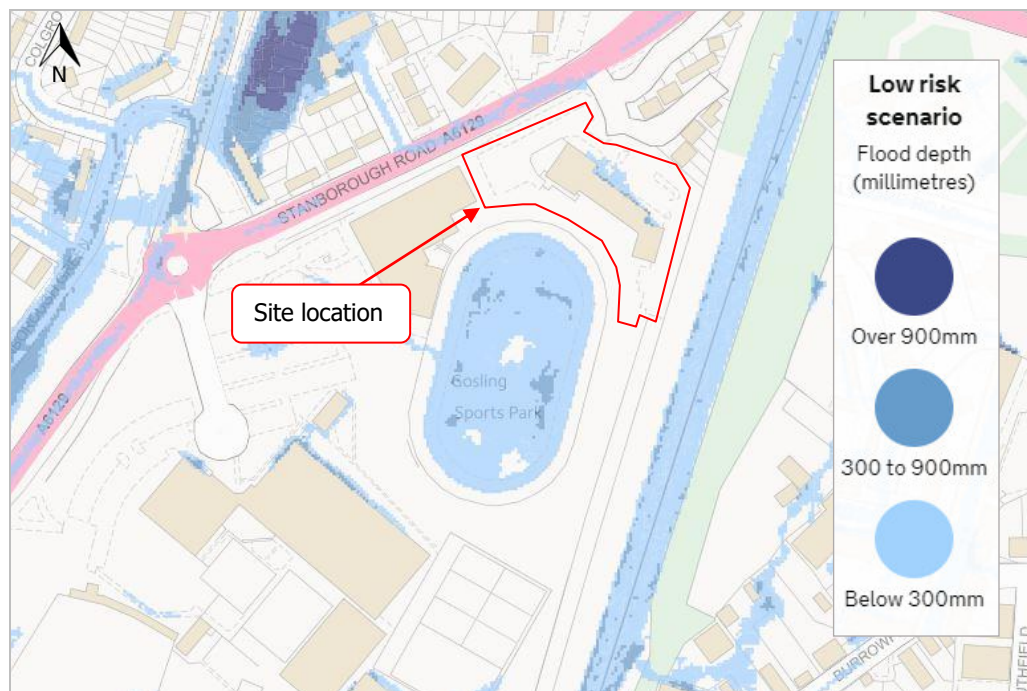


Figure 5 - Updated Flood Map for Surface Water (uFmSW) Low Risk Scenario Depth¹⁰

The proposals involve the extension of the existing Premier Inn building. In order to mitigate the impact of this redevelopment and to ensure that there will be no increase in surface water runoff after construction, a SuDS strategy has been undertaken. A summary is presented in the 'Sustainable Drainage Strategy' section of this statement.

Risk of Flooding from Sewers

Sewer flooding generally results in localised short-term flooding caused by intense rainfall events overloading the capacity of public sewers.

Thames Water, who are the sewerage undertaker in Welwyn Garden City, provided an asset location plan showing the sewerage infrastructure in the vicinity of the site. This plan shows that a 150mm section of surface water sewer flows in a south-westerly direction along Stanborough Road and connects to a manhole to the west of the site. The outgoing pipe (225mm) then flows in a northerly direction. Furthermore, the site is connected to a 225mm foul sewer which flows in a south-westerly direction along Stanborough Road.

Welwyn Hatfield Strategic Flood Risk Assessment⁷ includes an assessment of sewer flooding and historic incidents of flooding were detailed by Thames Water through their DG5 register. This database records incidents of flooding related to public foul, combined or surface water sewers and displays which properties suffered flooding. These data have been supplied on a postcode basis for incidents that occurred between 10 and 20 years ago. It is shown that three instances of internal flooding of property and five instances of external flooding of property or area were recorded in the same postcode area as the site (AL8 6). However, no indication is given on the exact location of these sewer flooding incidents or their severity.

Based on the available information, the Premier Inn located along Stanborough Road is not known to have experienced any flooding incidents as a result of surcharging public sewers. Therefore, it is considered that the risk of sewer flooding to the site is low.

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Flooding from Groundwater

Groundwater flooding is caused by the emergence of water originating from sub-surface permeable strata, and is often localised in low lying areas which are underlain by permeable aquifers. Following a prolonged period of rainfall, a rise in the water table may be observed and this can result in groundwater flooding at the surface. Groundwater responds slowly to variations in rainfall and therefore flooding may be seen for extended periods of time.

The Environment Agency online groundwater map shows that the site is located within a Groundwater Source Protection Zone (SPZ) defined as Total Catchment (Zone 3). This zone is defined as the total area needed to support the abstraction or discharge from the protected groundwater source.

The online maps also show that the bedrock geology below the site is classed as a 'Principal aquifer' and that the superficial deposits are identified as 'Secondary A' type aquifer (Figure 6).

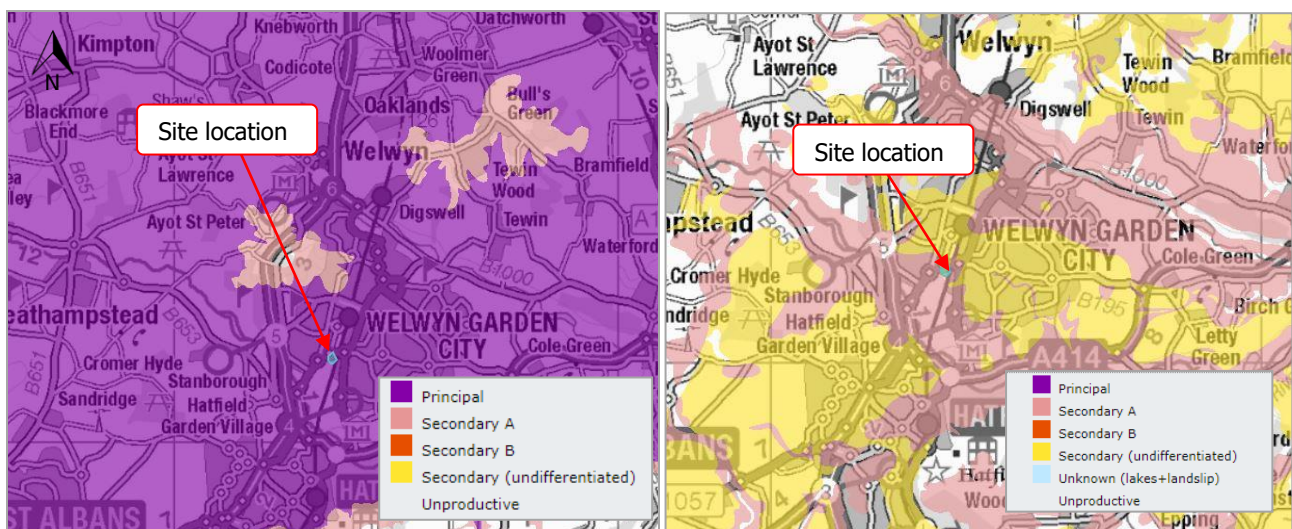


Figure 6 - Environment Agency aquifer designation map (Left: Bedrock geology; Right: Superficial deposits)

By definition, 'Principal' aquifers are layers of rocks or drift deposits that have high intergranular and/or fracture permeability and they usually provide a high level of water storage. Furthermore, 'Secondary A' aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of baseflow to rivers.

The British Geological Survey (BGS) 1:50,000 online surface geology map gives additional details related to the geology at the site.

It shows that the geology beneath the site is made of Lewes Nodular Chalk Formation and Seaford Chalk Formation (undifferentiated). On most of the site, the superficial deposits recorded are classed as Lowestoft Formation (Diamicton), which forms an extensive sheet of chalky till, together with outwash sands and gravels, silts and clays. Kesgrave Catchment Subgroup (sand and gravel) deposits are encountered along the eastern boundary of the site. These layers are considered as permeable, which reflects the EA information presented above, and confirms that the ground below the site can support groundwater.

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The BGS also holds records of boreholes logs which can give additional information about the geological formations and the presence of groundwater in the area of the site. A borehole referenced as TL21SW25 is located approximately 260m south from the site and was drilled in 1930. The record shows that rest-water level was measured 13.6m below ground level and the geological strata were identified as chalk and flints overlain by hard chalk and gravel. One other borehole, referenced as TL21SW89 and drilled in December 1963, is located approximately 185m north from the site. At this location, groundwater was not encountered during drilling and the geology encountered was made of the following succession: hard chalk and flints overlain by large gravel and flints, sandy gravel, brown clay with stones and some chalk, sand with some gravel, brown clay with some chalk and made ground.

In April 2018, a site investigation was undertaken by Risk Management Limited at the existing Stanborough Beefeater and Premier Inn site, in Welwyn Garden City. Five drive-in-sampler boreholes were drilled across the site beneath the footprint of the proposed new extension. During the current fieldwork, made ground only was encountered to a depth in excess of 5.00m below existing ground level. Details on the deeper ground conditions were given on previous borehole records and show that made ground was found below the site to a depth of 7.5m and overlain possible reworked material (depth from 7.50m to 10.80m), silty sandy clay (depth from 10.80m to 13.10m) and sand and gravel (depth from 13.10m to more than 15.00m). Soakaway tests were carried out and show relatively 'good' soakage characteristics. However, these tests were undertaken in made ground and the possibility exists that the fines will be washed away if conventional soakaways are set within this material. Therefore, due to these characteristics, the use of conventional soakaways may be precluded on site. Groundwater was not encountered during these ground investigations in 2018. Nevertheless, in 2008 groundwater was noted to be at a depth of 4.64m below ground level at one borehole.

Furthermore, Welwyn Hatfield SFRA⁷ includes a map of the whole Borough showing the 'Areas Susceptible to Groundwater Flooding'. This map shows the proportion of each 1km grid square where geological and hydrological conditions indicate that groundwater might emerge. It is shown that there is less than 25% of the 1km grid square in which the site lies in which is susceptible to groundwater flooding.

The available data do not show the occurrence of any recent groundwater flooding events in the vicinity of the site. Moreover, due its location in an urbanised area and the fact that no historical records of groundwater flooding have been registered for the site, it is considered that emergent groundwater flooding does not represent a significant risk to the proposed extension. No basement is proposed as part of the extension and therefore there is no risk of any groundwater ingress to the building.

Flooding from Artificial Sources

The Environment Agency online maps show that the site is not at risk of flooding in the event of a reservoir failure. Furthermore, no other artificial waterbodies nearby have been identified as a risk of flooding to the site.

Summary of Sources of Flood Risk

The site lies within in 'Flood Zone 1' and it is therefore at very low risk of flooding from rivers and the sea. Considering surface water flooding, for the 0.1% AEP event, the site is not expected to flood internally and the existing surface drainage system present on site is expected to cope with such flooding incident. All other sources of flooding assessed do not represent a risk of flooding to the site.

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Safe Access and Egress

During the 0.1% AEP event, no surface water flooding is expected within the building. Surface water flooding shallower than 300mm could be experienced, with isolated low spots up to 900mm deep. It is suggested that the drainage system on site is designed to cope with such depth of flooding. The risk to people is therefore limited. In such an event, people present at ground floor level would be able to seek safe refuge on the upper floors via safe internal access.

Effect on the risk of flooding elsewhere

The proposals include the construction of a new extension to the north of the existing buildings on the emplacement of the car park. The development is not expected to change radically surface water rates and volumes, since there will be no increase in impermeable areas. However, when considering climate change allowance for peak rainfall intensity, surface water runoff is expected to increase slightly. In this context, a Sustainable Drainage Strategy has been prepared and is addressed in the following paragraphs.

SUSTAINABLE DRAINAGE STRATEGY

The new extension will be built on the existing car parking. In order to take into account the impact of climate change throughout the expected lifetime of the development, a Sustainable Drainage Strategy has been prepared to reduce the risk of surface water flooding to the site and elsewhere.

The aim of the Sustainable Drainage Strategy is to ensure that the proposed development does not increase surface water runoff rates post-development and also does not increase the risk of flooding elsewhere.

Climate Change

The current best practice for climate change allowance is the National Planning Policy Framework¹ (NPPF), which defers to the Environment Agency website to specify climate change allowances. The latest climate change allowances were defined in February 2016 by the Environment Agency.

It recommends an increase in river flows and an increase in rainfall intensity depending on which river basin district the site lies in and the type of development. The range of allowances is based on percentiles, which describe the proportion of possible scenarios that fall below an allowance level. The central allowance is based on the 50th percentile, the higher central is based on the 70th percentile and the upper end is based on the 90th percentile.

The Environment Agency anticipated changes in extreme rainfall intensity in small and urban catchments as presented in Table 1:

Table 1 - 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%

According to the PPG² for Flood Risk and Coastal Change, the lifetime of the proposed development is assumed to be 100 years due to its use.

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Furthermore, according to Table 2 'Flood risk vulnerability classification' of the PPG for Flood Risk and Coastal Change², the site falls under the category of "*Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels*". Therefore, it is classed as being 'More vulnerable' to flood risk. Due to its 'More vulnerable' classification, it is recommended that the 'Upper End' allowance (40%) should be used for the site to assess the future impacts of climate change.

Therefore, for the extension of the Premier Inn in Welwyn Garden City, it has been chosen to attenuate up to Greenfield runoff rates for the 1 in 100 year storm event including 40% allowance for climate change.

Existing Site Runoff

The site at Stanborough Road encloses an area of approximately 0.95ha. It includes one building housing the Stanborough Beefeater restaurant and three buildings housing the Premier Inn hotel. The site also includes car parking areas with associated soft-landscaping features.

It is assumed that the soft-landscaping features are not formally drained. The site can therefore be divided into 0.81ha of impermeable areas and 0.14ha of permeable surfaces.

Existing peak runoff rates for the site were calculated using the Wallingford Procedure, in combination with the Modified Rational Method. The 1-year, 30-year and 100-year return period events result in peak runoff rates of 77.3 l/s, 188.9 l/s and 242.1 l/s respectively.

Existing Site Drainage

A topographic survey was undertaken by 40Seven in April 2008 and it shows the drainage system present on site.

The site is drained by surface water sewers which border the buildings on site and convey surface water runoff into a storm tank to the west of the Stanborough Beefeater building. Water stored in the tank is then pumped and discharged from the site at a rate currently unknown.

In 2009, an extension was added to the south of the site and as part of this redevelopment, new drainage connections for foul and surface water have been implemented. Existing connections for foul and surface water are in place on the site, which will provide possible connections for the new extension.

Greenfield Runoff Rates

Greenfield runoff rates from the site were calculated using the UK SuDS online tool¹¹ and the Institute of Hydrology (IoH) 124 methodology.

Assuming an entirely undeveloped ('Greenfield') site, the 1-year, 30-year and 100-year return period events would result in a discharge rate of 1.4 l/s, 3.7 l/s and 5.1 l/s respectively.

Sustainable Drainage Systems (SuDS)

As required by the local policy, Sustainable Drainage Systems should be considered for new development.

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¹¹ <http://www.uksuds.com/drainage-tools-members/greenfield-runoff-rate-tool.html>. Accessed on 05/03/2018

The aim of SuDS is to emulate natural processes with the result that watercourses and storage areas receive hydrological profiles under which they evolved, and that water quality in local ecosystems is protected or improved. The best practice guide states that a sustainable drainage system¹² will:

- Reduce the impact of additional urbanisation on the frequency and size of floods;
- Protect or enhance river and groundwater quality;
- Be sympathetic to the needs of the local environment and community;
- Encourage natural groundwater recharge.

The SuDS hierarchy (Figure 7) sets out a hierarchy of SuDS solutions from the most sustainable drainage methods to the least sustainable methods.

Most Sustainable	SuDS technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
	Living roofs	✓	✓	✓
	Basins and ponds - Constructed wetlands - Balancing ponds - Detention basins - Retention ponds	✓	✓	✓
	Filter strips and swales	✓	✓	✓
	Infiltration devices - soakaways - infiltration trenches and basins	✓	✓	✓
	Permeable surfaces and filter drains - gravelled areas - solid paving blocks - porous paviers	✓	✓	
	Tanked systems - over-sized pipes/tanks - storms cells	✓		
Least Sustainable				

Figure 7 - SuDS Hierarchy¹³

This SuDS hierarchy has been applied specifically to the site to determine the most suitable method for the addition of SuDS after development. The application of the SuDS hierarchy is summarised in Table 2 below:

Table 2 - Application of the SuDS Hierarchy to the proposed development

	SuDS Technique	Suitability	Justification
Most Sustainable	Green Roofs	✗	The roof designed for the new extension matches the design of the existing buildings. The roof will be pitched which is not suitable for the addition of a living green roof.

¹² CIRIA C523 - Sustainable Urban Drainage Systems - Best Practice Manual

¹³ Environment Agency Development Control Technical Specialists (October 2006) SuDS A Practical Guide. Development Control Thames Region

Stanborough Road, Welwyn

Least Sustainable	Basins and ponds		
	1. Constructed wetlands	✘	There is insufficient space for the addition of such features on site.
	2. Balancing ponds	✘	
	3. Detention basins	✘	
	4. Retention ponds	✘	
Filter strips and swales	✘	There is insufficient space for the addition of such features on site.	
Infiltration devices			Ground investigations were undertaken on site and showed that made ground was encountered on site to a depth of 7.5m below ground level. Due to the characteristics of made ground and the possibility that the fines will be washed away if conventional soakaways are set within this material, the use of conventional soakaways do not appear suitable for managing surface water on site. Therefore, these characteristics preclude the use of infiltration features on the site.
5. Soakaways	✘		
6. Infiltration trenches & basins	✘		
Permeable surfaces and filter drains			Due to the existing design and surfaces on site, the implementation of permeable surfaces does not appear suitable.
7. Gravelled areas	✘		
8. Solid block paving	✘		
9. Porous paving	✘		
Tanked Systems			There is space on site for tanked systems, which could provide sufficient attenuation storage to mitigate the addition of the extension.
10. Over-sized pipes/tanks	✓		
11. Box storage systems	✓		

Proposed Surface Water Drainage Strategy

The proposed development is for the extension of approximately 0.033 hectares to the front of the existing Premier Inn hotel. There will be no increase in impermeable areas since the extension will be located on the existing car park (paved area). Therefore, runoff rates and volumes are not expected to increase significantly post-development.

Cont.../

Nevertheless, in order to comply with the national and local policies, a Sustainable Drainage Strategy has been undertaken for the site. The key aim of any sustainable drainage strategy is to ensure that there is no increase in flood risk elsewhere as a direct result of surface water runoff generated from the proposed extension.

To be consistent with local policies, reduction to Greenfield rates should be achieved for the site post-development for the 1 in 100 year event including 40% for climate change. In this context, it is proposed to attenuate additional surface water runoff generated by the new extension to 1.4 l/s, which corresponds to the 1 in 1 year Greenfield peak runoff rate for the site.

First, Source Control (Microdrainage 2017) was used to estimate the volume of storage needed to attenuate surface water runoff generated by the new building. The Quick Storage Estimate tool estimated a volume of storage between 11 m³ and 19 m³, as shown in Figure 8 and Figure 9 below.

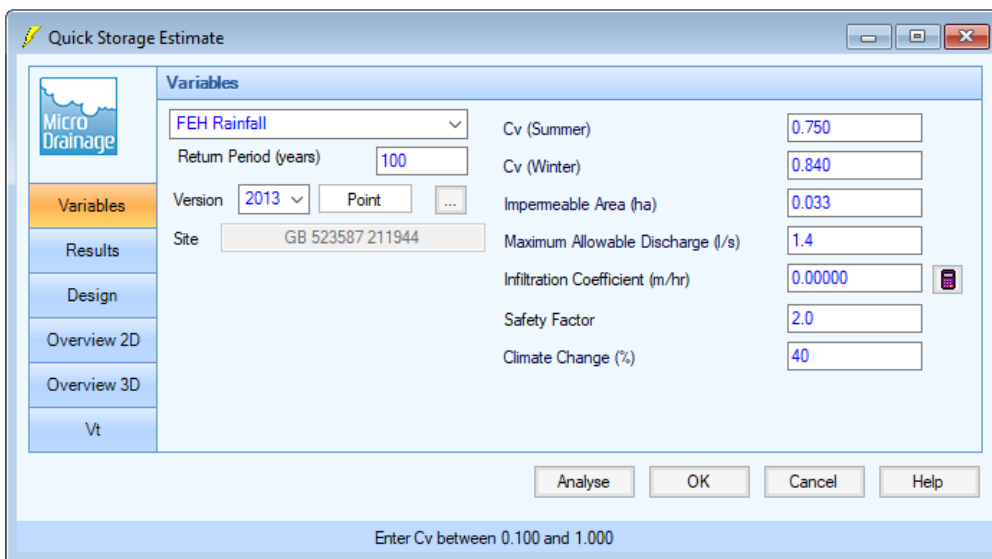


Figure 8 - Variables used for the Quick Storage Estimate (Source Control, Microdrainage 2017)

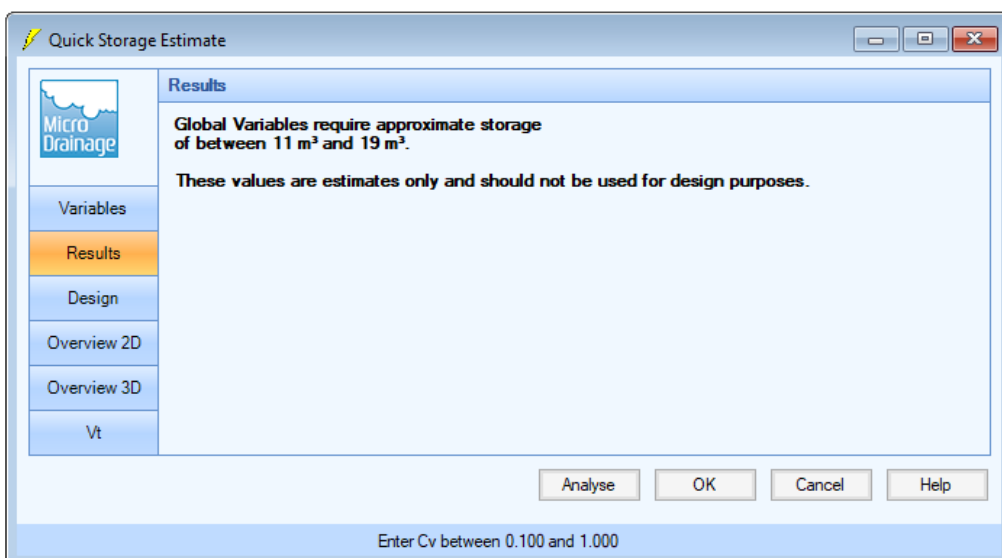


Figure 9 - Results of the Quick Storage Estimate (Source Control, Microdrainage 2017)

Cont.../

Then, the proposed drainage strategy for the extension was modelled in Microdrainage 2017 to determine precisely the volume of storage needed and its location. The following design principles have been assumed:

- Extension layout obtained from CHQ Architects, Drawing No. CHQ.15.11456-PL05, January 2018;
- External site levels assumed to be similar to the ones presented in the topographic survey undertaken by 40Seven in 2008 (Drawing No. 52001_101 A) and the ones presented in the survey undertaken by Berry Geomatics in February 2018 (Drawing No. 18/18);
- Attenuation of surface water runoff rates generated by the new extension to the 1-year Greenfield runoff peak rate which equals to 1.4 l/s;
- Connection of the proposed drainage system to the existing surface water manhole located to the north-east corner of the existing southern Premier Inn building (cover level: 88.40m AOD and invert level: 87.15m AOD).

Please find attached the drawing of the surface water drainage strategy for the proposed extension. Also enclosed is a detailed Microdrainage hydraulic analysis of the proposed surface water sewer system, which demonstrates how flows can be attenuated to 1.4 l/s.

For the 1 in 100 year event including 40% allowance for climate change, a volume of storage of 10.7m³ will be required on site to reach a discharge rate of 1.4 l/s. Attenuation storage will be provided in the form of a cellular storage of 400mm deep and covering an area of 28m² (7m length and 4m width). This volume of storage will be located beneath the car park to the east of the site. The cellular storage will then drain via an HydroBrake to the existing surface water manhole present on site.

This system will improve surface water drainage on site by reducing peak runoff rates generated by the extension. It will ensure that there will be no increase in surface water runoff due to the construction of the new extension and therefore no increase in flood risk elsewhere. This drainage strategy will be subject to detailed design at post-planning stage.

SuDS Management and Maintenance

Management and maintenance of the drainage network will be the responsibility of the owner of the site. Management and maintenance agreements and plans will be arranged prior to completion of development. Sustainable Drainage Systems should be inspected regularly and correctly maintained to ensure optimum performance.

Foul Water Management

The topographic survey undertaken by 40Seven shows the sewerage infrastructure on site. It shows that existing foul sewers flow across the site and then connect to the existing Thames Water 225mm foul sewer which flows along Stanborough Road in a southerly direction.

The new extension will be built over the existing on site 150mm foul water sewer. At this stage, it seems likely that this existing sewer will remain in place, and the extension will be connected to it. If a diversion is required, it will be confirmed at detailed design. Moreover, the invert levels of the on site existing foul sewer manholes will need to be confirmed as part of the detailed design to determine the potential connections.

Foul water infrastructure will be dealt as part of the detailed drainage design, and the Water Industry Act 1991 (as amended) applies. In principle, it is likely that a system similar to the existing one will be required to serve the proposed development.

Cont.../

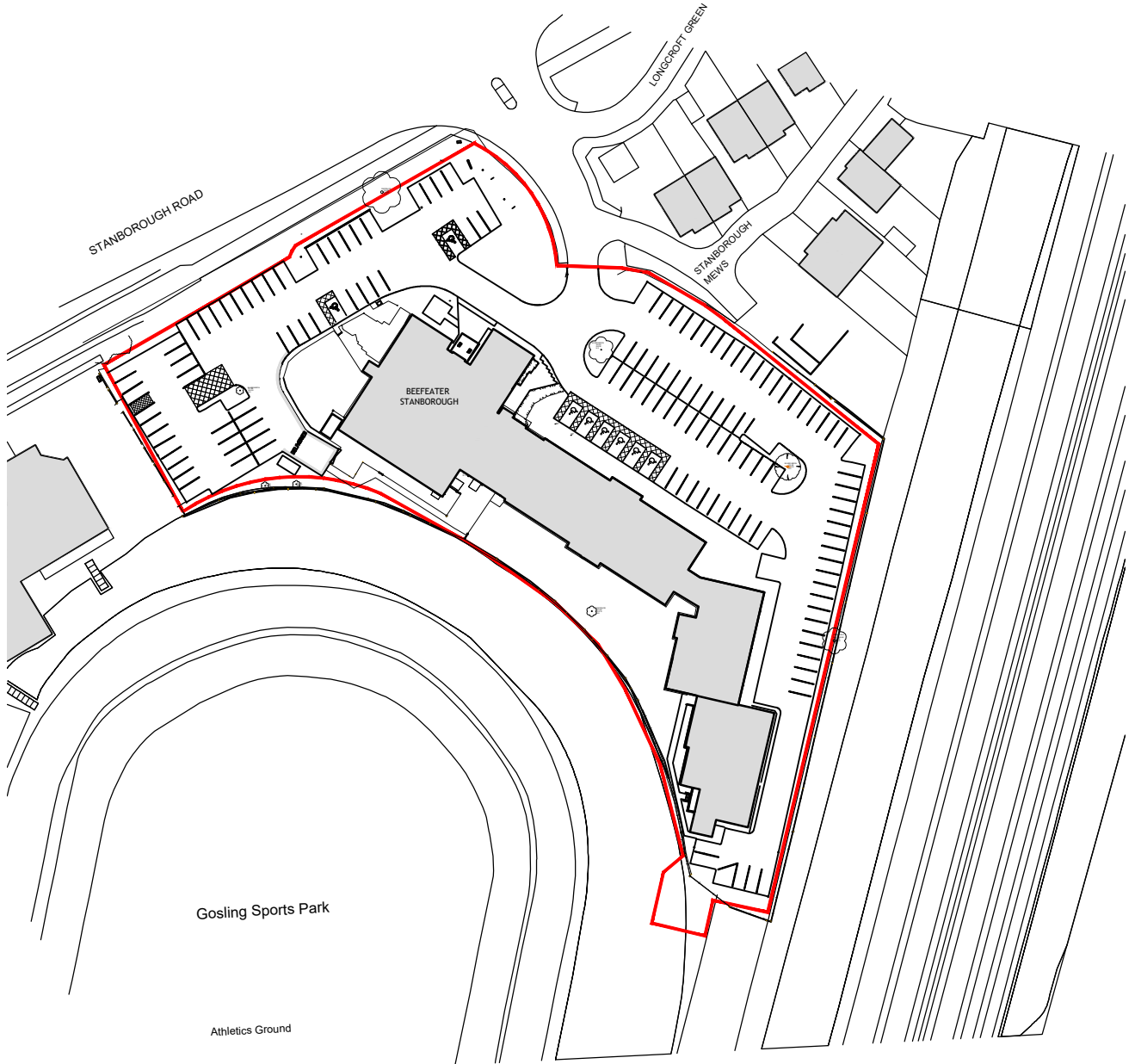
Please feel free to contact me if you have any queries related to this letter.

Yours faithfully,

Environmental Engineer

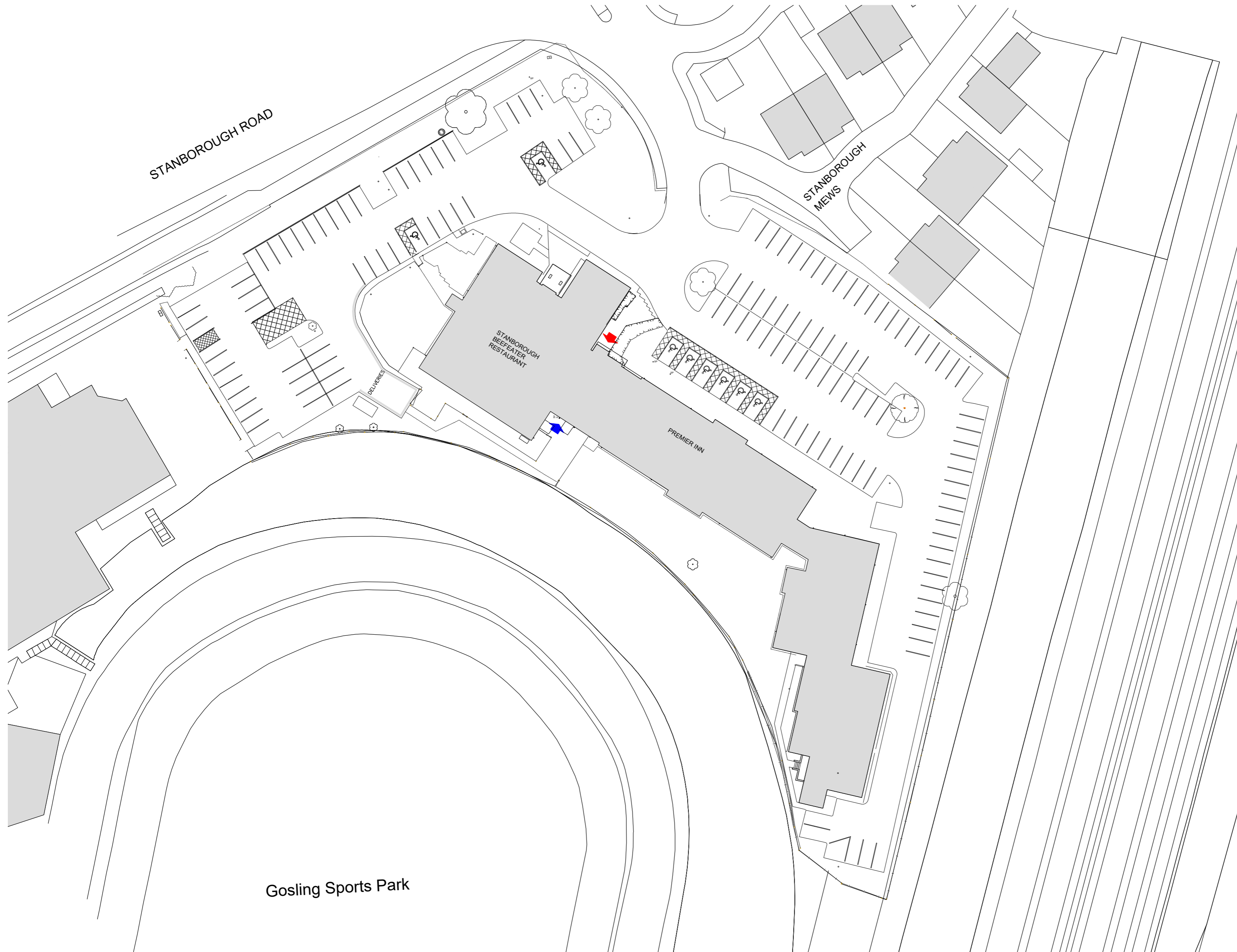
Enclosures:

- Existing site;
- Topographic survey (existing site);
- Updated topographic survey;
- Thames Water sewer asset location plan;
- Proposed site;
- Existing and Greenfield runoff rates;
- Surface Water Drainage Strategy drawing;
- Microdrainage calculations.



<p>NORTH</p> 	REV.	DESCRIPTION	DATE	INITIALS	 <p>CHQ Architects Ltd. The Mallings, 44 Whitehorse Street, Baldock, Hertfordshire SG7 6DQ</p> 	<p>PROJECT</p> <p>Premier Inn</p> <p>Stanborough Road Welwyn Garden City Hertfordshire AL8 6DQ</p>	DRAWING		
	<p>SCALE</p> 						<p>Site Location Plan</p>		
							<p>ISSUE</p> <p>PLANNING</p>	<p>DATE</p> <p>Jan 2018</p>	<p>DRAWN</p> <p>FA</p>
					<p>SCALE</p> <p>1:1250@A4</p>	<p>CHECKED</p>	<p>CHQ.15.11456-PL01</p>		

Welwyn Garden City



SITE AREA	0.95 Ha
HOTEL	
No. of Storeys	3
Bedrooms	120
CAR PARKING	
Regular	143
Disabled	8
TOTAL	151
Cycle Parking	8

CLIENT

GENERAL NOTES
 All drawings are subject to full site survey. All dimensions are to be checked on site.

SCALE

NORTH

REV.	DESCRIPTION	DATE	INITIALS

ISSUE
PLANNING

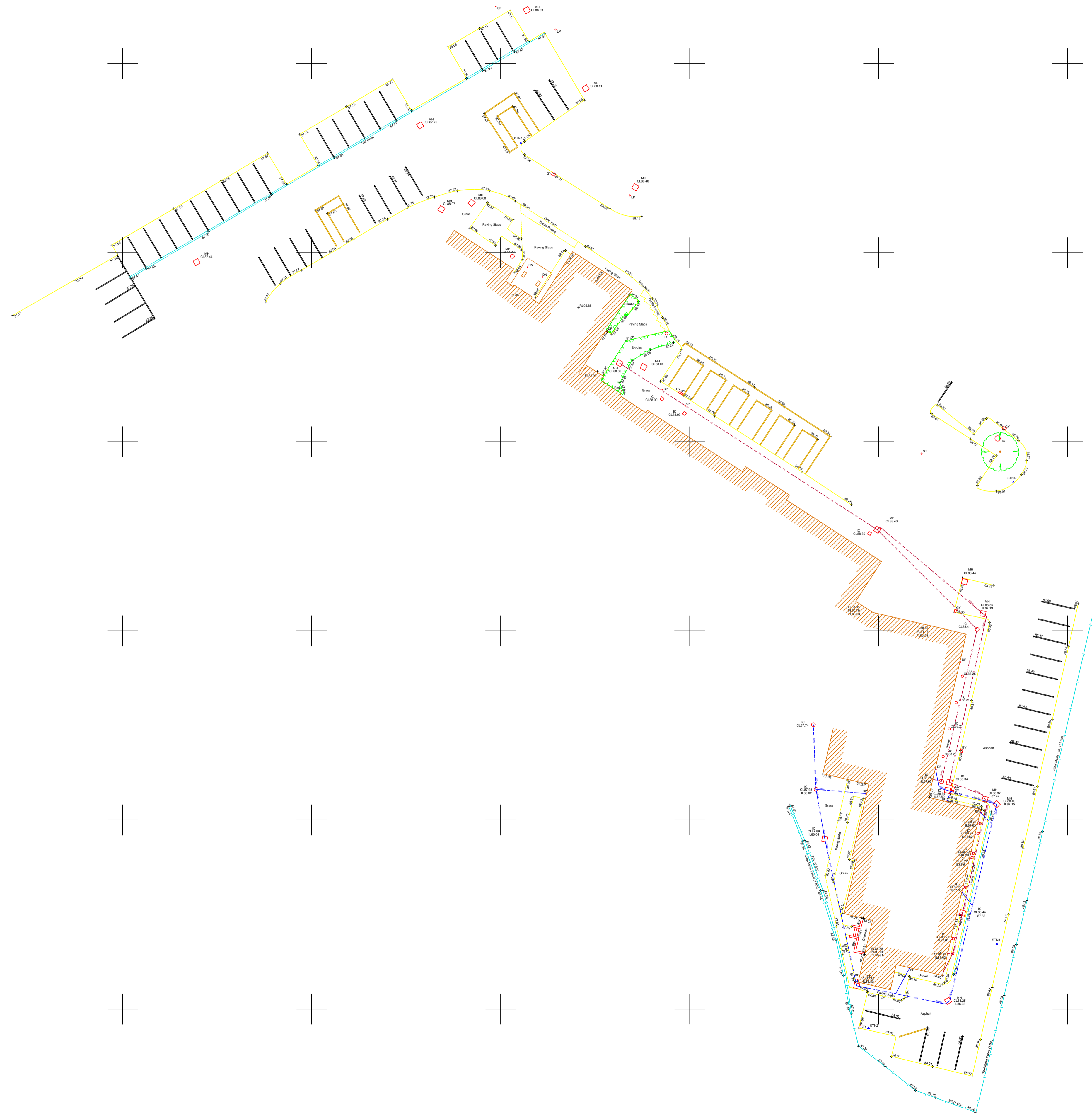
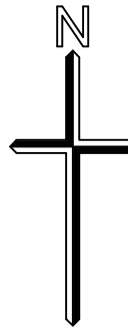
CHQ Architects Ltd
 The Millings, 44 Whitehorse Street,
 Baldock, Hertfordshire SG7 6GQ
 Telephone: (01462) 895110
 Email: design@chq-architects.co.uk
 www.chq-architects.co.uk

PROJECT
Premier Inn
 Stanborough Road
 Welwyn Garden City
 Hertfordshire
 AL8 6DQ

DRAWING
Existing Site Plan

DATE	Jan 2018	DRAWN	FA
SCALE	1:500@A2	CHECKED	MRA

CHQ.15.11456-PL02



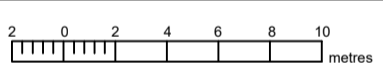
ABBREVIATIONS

Ave	Average	LB	Letter Box
AV	Air Valve	LT	Letter Bin
BB	Belted Balcon	LP	Lamp Post
Bo	Bollard	MH	Manhole
BL	Bollard Light	MK	Marker
Box	BTE/Elc	NP	Name Plate
BS	Bus Stop	OH	Overhead (Exc/Tele)
BT	Telemat IC	OSM	Ordnance Survey BM
CATV	Cable Television IC	PARA	Parapet
CCTV	Closed Circuit Camera	Pav	Paved
CL	Cover Level	PM	Parking Meter
Conc	Concrete	RE	Rodding Eye
DC	Drainage Channel	RL	Ridge Level
DH	Dish	RS	Road Sign
DI	Disipolator	RSJ	Rolled Steel Joint
DN	Drain	SD	Slot Drain
EL	Elves Level	SA	Spokeny
EP	Electricity Pole	SP	Sign Post
ER	Earthing Rod	ST	Water Stop Tap
FB	Footbridge	SV	Water Stop Valve
FESC	Fire Escape	SY	Stay
FL	Floor Level	Tic	Table Paring
Fi	Floodlight	TCB	Telephone Call Box
FS	Flagstaff	TS	Traffic Signal
FH	Fire Hydrant	TP	Telephone Pole
Gab	Gabions	Veg	Vegetation
GM	Gas Meter	WP	Wood Peg
GV	Gas Valve	WL	Water Level
GY	Gully	WM	Water Meter
HR	Hand Rail	WO	Wash Out
IC	Inspection Cover	WP	Wooden Peg
IL	Invert Level		
KO	Kerb Outlet		

FW	Foul Water	SW	Surface Water
Com	Combined Storm/Foul	BD	Back Drop
225mm	Pipe Diameter	UTL	Unable To List

Fences / Walls

CB	Crash Barrier	HR	Hand Rail
BWF	Barbed Wire	PRF	Post And Rail
CBF	Close Boarded	PRF	Post & Rail
CLF	Chain Link	PLF	Panel Fence
IR	Iron Railings	SR	Steel Railings
TS	Traffic	SPF	Sheet Pile
BW	Brick Wall	BLK	Block Wall
RW	Retaining Wall	Ren	Rendered Wall
SW	Stone Wall	(1.8m)	Height of Wall/Fence



Notes

Heights in metres
Survey related to existing site drawing by others

Do not scale this drawing. All critical dimensions and services should be field verified prior to building operations or construction.

Rev.	Date	Amendments

Client Ward Williams Associates
Mills Bakery
Royal William Yard
Plymouth
Devon
PL1 3GE

Title Premier Inn, Welwyn Garden City

Drawing Number 18/18

Drawn DMB **Checked** SB

Date 16/02/18 **Scale** 1:200(A0)

SURVEY STATISTICS

Date	Station	Working	Height
07/02	173.041	100.001	87.413
07/02	188.001	100.000	88.452
07/02	197.000	200.000	87.881



Asset location search



Property Searches

GD Partnership Ltd
The Cart Lodge
Lullingstone Lane
EYNSFORD
DA4 0HZ

Search address supplied Premier Inn
Stanborough Road
Welwyn Garden City
Hertfordshire
AL8 6DQ

Your reference Welwyn Garden City

Our reference ALS/ALS Standard/2018_3756878

Search date 14 March 2018

Keeping you up-to-date

Knowledge of features below the surface is essential in every development. The benefits of this not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility for any commercial or residential project.

An asset location search provides information on the location of known Thames Water clean and/or wastewater assets, including details of pipe sizes, direction of flow and depth. Please note that information on cover and invert levels will only be provided where the data is available.



Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13



searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk



0845 070 9148



Search address supplied: Premier Inn, Stanborough Road, Welwyn Garden City, Hertfordshire, AL8 6DQ

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This search provides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0845 070 9148, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk

Web: www.thameswater-propertysearches.co.uk

Waste Water Services

Please provide a copy extract from the public sewer map.

The following quartiles have been printed as they fall within Thames' sewerage area:

TL2312SE
TL2311NW
TL2312SW
TL2311NE

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

Following examination of our statutory maps, Thames Water has been unable to find



any plans of water mains within this area. If you require a connection to the public water supply system, please write to:

New Connections / Diversions
Thames Water
Network Services Business Centre
Brentford
Middlesex
TW8 0EE

Tel: 0845 850 2777
Fax: 0207 713 3858
Email: developer.services@thameswater.co.uk

The following quartiles have not been printed as they are out of Thames' water catchment area. For details of the assets requested please contact the water company indicated below:

TL2312SE	Affinity Water
TL2311NW	Affinity Water
TL2312SW	Affinity Water
TL2311NE	Affinity Water

Affinity Water Ltd
Tamblin Way
Hatfield
AL10 9EZ

Tel: 0845 7823333

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 523750,212250
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
8206	n/a	n/a
8201	90	88.52
8209	89.6	88.25
8205	89.55	86.71
8212	n/a	87.77
8210	89.5	88
8202	89.75	86.81
8211	89.55	88.18
8301	89.45	88.1
8302	88.7	87.28
8305	n/a	n/a
8306	n/a	n/a
8303	88.4	86.98
9103	89.58	87.01
9106	89.6	86.76
811A	n/a	n/a
811B	n/a	n/a
921F	n/a	n/a
921E	n/a	n/a
921D	n/a	n/a
921C	n/a	n/a
9201	89.91	89.04
921A	n/a	n/a
921B	n/a	n/a
931E	n/a	n/a
931D	n/a	n/a
931C	n/a	n/a
931A	n/a	n/a
931B	n/a	n/a
8304	n/a	84.95
9002	89.3	86.3
8001	n/a	n/a
9105	89.7	86.56
9102	89.75	86.55
8102	90.26	87.59
8101	90.22	87.6
9104	89.92	87.02
9101	89.93	87
601H	n/a	n/a
6301	86.45	83.24
601F	n/a	n/a
621D	n/a	n/a
601E	n/a	n/a
6302	86.45	83.6
601D	n/a	n/a
6205	87.67	85.14
6103	88.88	84.17
601A	n/a	n/a
6102	88.9	86.67
6104	88.73	86.07
621B	n/a	n/a
631A	n/a	n/a
6207	89.25	87.73
6209	89.41	87.44
6206	88.93	86.83
6208	89.03	84.14
7201	88.91	86.52
7304	88.45	86.28
7302	88.37	85.68
7102	n/a	n/a
7001	n/a	n/a
7103	n/a	n/a
7101	n/a	n/a
8214	n/a	n/a
8213	n/a	n/a
641A	n/a	n/a
6401	85.91	82.58
5305	84.9	83.95
5304	84.96	83.95
531D	n/a	n/a
541B	n/a	n/a
5403	85.36	82.88
541A	n/a	n/a
6402	85.88	82.53
6406	86.21	82.94
6408	86.16	84.04
6404	86.04	82.65
6405	86.06	83.16
6407	86.33	83.87
7303	87.57	84.28
7301	87.67	84.19
7401	86.74	84.67
7402	86.51	85.03
5407	85	83.48
5406	85	82.73
5301	85.19	82.66
5303	85.15	82.67
531B	n/a	n/a
531C	n/a	n/a
5405	85.15	82.72
531A	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
5404	85.15	82.75
5401	85.3	82.32
5402	85.33	82.87
5202	84.85	81.97
5201	85	82.44
5302	85.11	82.56
5102	87.26	85.06
5104	87.26	85.04
5101	87.22	84.43
5103	87.22	84.56
6201	86.94	83.83
6202	86.92	84.08
6203	86.84	83.77
6210	n/a	n/a
6101	88.08	85.75
611B	n/a	n/a
6204	86.83	84.85
621C	n/a	n/a
5003	87.25	85.76
5002	87.19	85.72
5004	87.2	85.73
5001	87.4	85.6
5005	87.69	86.1
501A	n/a	n/a
601B	n/a	n/a
601C	n/a	n/a
6001	88.7	87.44
601G	n/a	n/a

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 523250,211750
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
081B	n/a	n/a
3901	83.5	79.57
4901	n/a	n/a
491A	n/a	n/a
1803	79.72	76.84
1804	79.74	76.98
081C	n/a	n/a
2802	80.62	77.6
2801	80.61	77.48
081D	n/a	n/a
181A	n/a	n/a
1802	84.22	81.47
1801	84.19	81.49
181B	n/a	n/a
2904	81.4	78.16
1904	82.04	78.46
1903	81.95	78.46
2903	83.16	78.4
2905	n/a	n/a
091A	n/a	n/a
1901	84.35	79.93
1902	84.37	79.9
191A	n/a	n/a
291B	n/a	n/a
291A	n/a	n/a
2901	82.58	80.58
2902	82.86	80.01
3902	83.3	78.27
081A	n/a	n/a
0804	n/a	n/a
0904	n/a	n/a
0803	n/a	n/a
0903	n/a	n/a
0901	84.93	80.52
0902	84.95	80.5
0801	83.74	80.79
0802	83.75	80.77
051A	n/a	n/a
0504	75.49	72.39
0503	75.36	73.99
0502	76.1	73.85
0501	75.88	74.6
0607	76.69	74.74
0608	76.62	73.85
0606	78.36	75.3
0605	78.26	75.28
0603	77.47	75.18
0602	80.62	75.77
0604	77.57	74.69
0601	80.5	75.74
1703	79.01	75.7
1704	78.89	75.66
0704	80.83	77.07
0703	80.9	77.36
0706	80.83	77.06
0705	80.85	77.36
0702	82.9	79.85
0701	82.91	79.81
1701	78.94	76.23
1702	79.02	76.3

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The width of the displayed area is 500m and the centre of the map is located at OS coordinates 523250,212250

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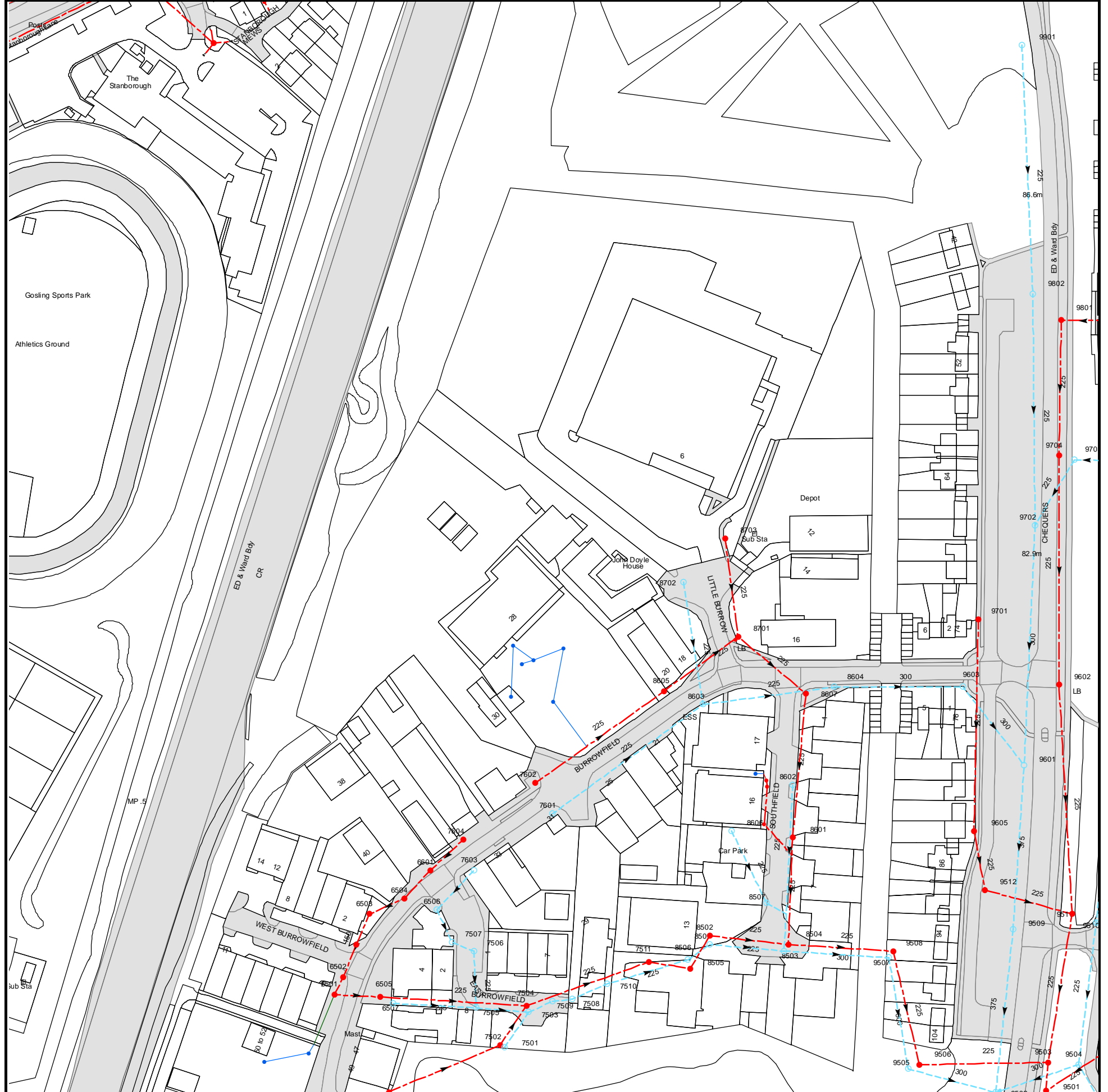
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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
201B	n/a	n/a
231A	n/a	n/a
231B	n/a	n/a
231E	n/a	n/a
221E	n/a	n/a
231C	n/a	n/a
231D	n/a	n/a
211B	n/a	n/a
201C	n/a	n/a
441D	n/a	n/a
441E	n/a	n/a
441F	n/a	n/a
431C	n/a	n/a
441B	n/a	n/a
441A	n/a	n/a
4306	85.38	82.82
4305	85.28	83.33
4304	85.29	82.51
3205	85.16	81.01
4201	85.06	81.57
4302	85.14	81.2
4303	85.33	82.08
4003	84.28	80.98
4002	84.31	80.54
4103	84.41	81.95
4101	84.54	80.83
4202	84.73	82.2
4102	84.67	81.42
4005	85.63	83.11
4001	85.6	83.06
431D	n/a	n/a
4404	85.53	82.63
431A	n/a	n/a
431B	n/a	n/a
4406	85.58	83
4407	85.44	82.65
4402	85.53	81.49
4405	85.6	82.39
441C	n/a	n/a
4401	85.72	83.15
4403	85.65	81.77
3005	83.77	79.34
3003	83.69	78.96
3004	83.7	79.17
301C	n/a	n/a
4007	n/a	n/a
4011	n/a	n/a
4017	n/a	n/a
4010	n/a	n/a
4006	83.58	81.08
4012	n/a	n/a
4009	n/a	n/a
401C	n/a	n/a
401B	n/a	n/a
401A	n/a	n/a
301B	n/a	n/a
3203	85.8	83.3
3207	86.07	83.32
3106	84.76	82.82
3103	84.74	82.36
3304	86.49	83.86
3302	86.49	83.43
311A	n/a	n/a
3007	84.41	82.3
3006	84.32	80.01
311B	n/a	n/a
3001	84.29	81.49
3002	84.35	79.69
311C	n/a	n/a
3107	84.62	80.39
3104	84.62	80.52
3303	86.06	82.81
3301	85.98	82.84
3105	84.75	80.39
3102	84.69	79.91
3206	84.82	82.4
3208	84.75	80.53
3204	84.76	82.63
3108	84.52	80.57
3101	84.53	80.03
3202	84.98	81.11
3201	84.88	82.45
1302	87.77	85.47
1304	87.81	85.91
2208	86.42	84.22
2207	86.45	84.99
2206	87.07	85.42
2203	86.97	85.35
2205	86.32	84.09
2202	86.33	83.7

Manhole Reference	Manhole Cover Level	Manhole Invert Level
221D	n/a	n/a
2204	85.88	83.68
221A	n/a	n/a
2201	85.89	83.33
221B	n/a	n/a
2004	85.33	83.11
221C	n/a	n/a
2001	85.33	82.81
2104	85.71	83.55
2103	85.75	83.25
2302	87.28	84.78
2301	87.3	84.3
2102	85.49	83.29
2101	85.57	82.97
211A	n/a	n/a
321C	n/a	n/a
321B	n/a	n/a
301A	n/a	n/a
321A	n/a	n/a
2006	84.2	81.95
2003	n/a	n/a
2007	83.63	81.5
2008	83.62	81.18
2005	84.87	82.64
2002	84.91	82.29
201A	n/a	n/a
0302	91.13	89.89
1301	89.05	86.4
1303	89.07	86.87
0404	91.1	88.93
0403	91.05	n/a
041A	n/a	n/a
2403	88.83	86.55
2401	88.79	85.05
1402	90.67	88.6
1401	91.34	85.76
2404	88.17	85.82
2402	88.25	84.68
0401	92.53	86.39
0402	92.53	89.88
0001	85.16	81.15
0002	85.22	81.13
001A	n/a	n/a
001B	n/a	n/a
001C	n/a	n/a
1209	n/a	n/a
1202	86.53	84.33
1203	86.6	84.38
1201	86.51	85.3
1204	86.68	85.33
0201	88.66	86.55
0307	89.31	88.05
0306	89.5	88.44
0305	89.83	87.57
131A	n/a	n/a
131B	n/a	n/a
0304	90.62	88.17
0303	90.57	89.26

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 523750,211750

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available



















Manhole Reference	Manhole Cover Level	Manhole Invert Level
651C	n/a	n/a
651B	n/a	n/a
861D	n/a	n/a
861C	n/a	n/a
9703	83.75	82.35
9704	83.8	81.8
9801	85.28	82.62
9802	85.78	83.68
9901	88.14	86.3
6601	83.97	82.85
7604	84.22	83.22
7603	84.15	82.68
761C	n/a	n/a
771B	n/a	n/a
761D	n/a	n/a
761B	n/a	n/a
7602	84.57	83.71
7601	84.38	83.04
761A	n/a	n/a
771A	n/a	n/a
8605	85.01	83.08
8702	85.27	83.26
8603	85.05	82.36
8703	85.69	83.36
8606	81.9	80.72
8701	84.6	82.27
591A	n/a	n/a
861B	n/a	n/a
8507	81.71	80.19
861A	n/a	n/a
8503	81.29	79.56
8504	81.27	79.98
8602	82.9	81.04
8601	82.19	80.79
8607	84.19	81.83
8604	83.78	81.28
9507	80.62	79.12
9508	80.71	79.42
9603	82.44	80.68
9605	n/a	n/a
9701	82.8	80.53
9512	80.59	78.91
9509	80.48	78.89
9601	81.41	80.33
9702	83.43	81.41
9602	81.93	80.24
9511	80.9	78.71
9510	81.07	79.49
6501	83.45	81.8
6502	83.4	81.92
651D	n/a	n/a
6503	83.61	82.19
6505	83.06	81.59
6504	83.8	82.59
6506	83.78	82.15
7507	83.94	81.95
7506	83.8	81.87
7509	83.37	80.28
7508	83.41	80.22
7510	n/a	n/a
7511	82.19	80.61
8506	81.83	80.02
8505	81.57	80.41
8501	81.42	79.98
8502	81.5	80.29
9502	79.53	77.65
9501	79.83	78.26
9505	79.89	78.63
9506	80.02	78.86
9504	80.61	78.9
9503	79.98	78.34
651A	n/a	n/a
6507	n/a	n/a
7505	83.59	80.41
7502	82.85	81.17
7501	82.86	80.44
7504	83.5	81.04
7503	83.42	80.34

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.








ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

-  **Foul:** A sewer designed to convey waste water from domestic and industrial sources to a treatment works.
-  **Surface Water:** A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.
-  **Combined:** A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.
-  **Trunk Surface Water**
-  **Trunk Foul**
-  **Storm Relief**
-  **Trunk Combined**
-  **Vent Pipe**
-  **Bio-solids (Sludge)**
-  **Proposed Thames Surface Water Sewer**
-  **Proposed Thames Water Foul Sewer**
-  **Gallery**
-  **Foul Rising Main**
-  **Surface Water Rising Main**
-  **Combined Rising Main**
-  **Sludge Rising Main**
-  **Proposed Thames Water Rising Main**
-  **Vacuum**





Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

-  Air Valve
-  Dam Chase
-  Fitting
-  Meter
-  Vent Column




Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

-  Control Valve
-  Drop Pipe
-  Ancillary
-  Weir






End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

-  Outfall
-  Undefined End
-  Inlet






Other Symbols

Symbols used on maps which do not fall under other general categories








-  /  Public/Private Pumping Station
-  Change of characteristic indicator (C.O.C.I.)
-  Invert Level
-  Summit

Areas

Lines denoting areas of underground surveys, etc.

-  Agreement
-  Operational Site
-  Chamber
-  Tunnel
-  Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

-  Foul Sewer
-  Surface Water Sewer
-  Combined Sewer
-  Gully
-  Culverted Watercourse
-  Proposed
-  Abandoned Sewer

Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plans are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
- 5) 'na' or '0' on a manhole level indicates that data is unavailable.
- 6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL's terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	BACS Payment	Telephone Banking	Cheque
<p>Call 0845 070 9148 quoting your invoice number starting CBA or ADS / OSS</p>	<p>Account number 90478703 Sort code 60-00-01 A remittance advice must be sent to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW. or email ps.billing@thameswater.co.uk</p>	<p>By calling your bank and quoting: Account number 90478703 Sort code 60-00-01 and your invoice number</p>	<p>Made payable to 'Thames Water Utilities Ltd' Write your Thames Water account number on the back. Send to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW or by DX to 151280 Slough 13</p>

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.



Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Thames Water Property Searches, Clearwater Court, Vastern Road, Reading RG1 8DB, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if he finds that you have suffered actual loss as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

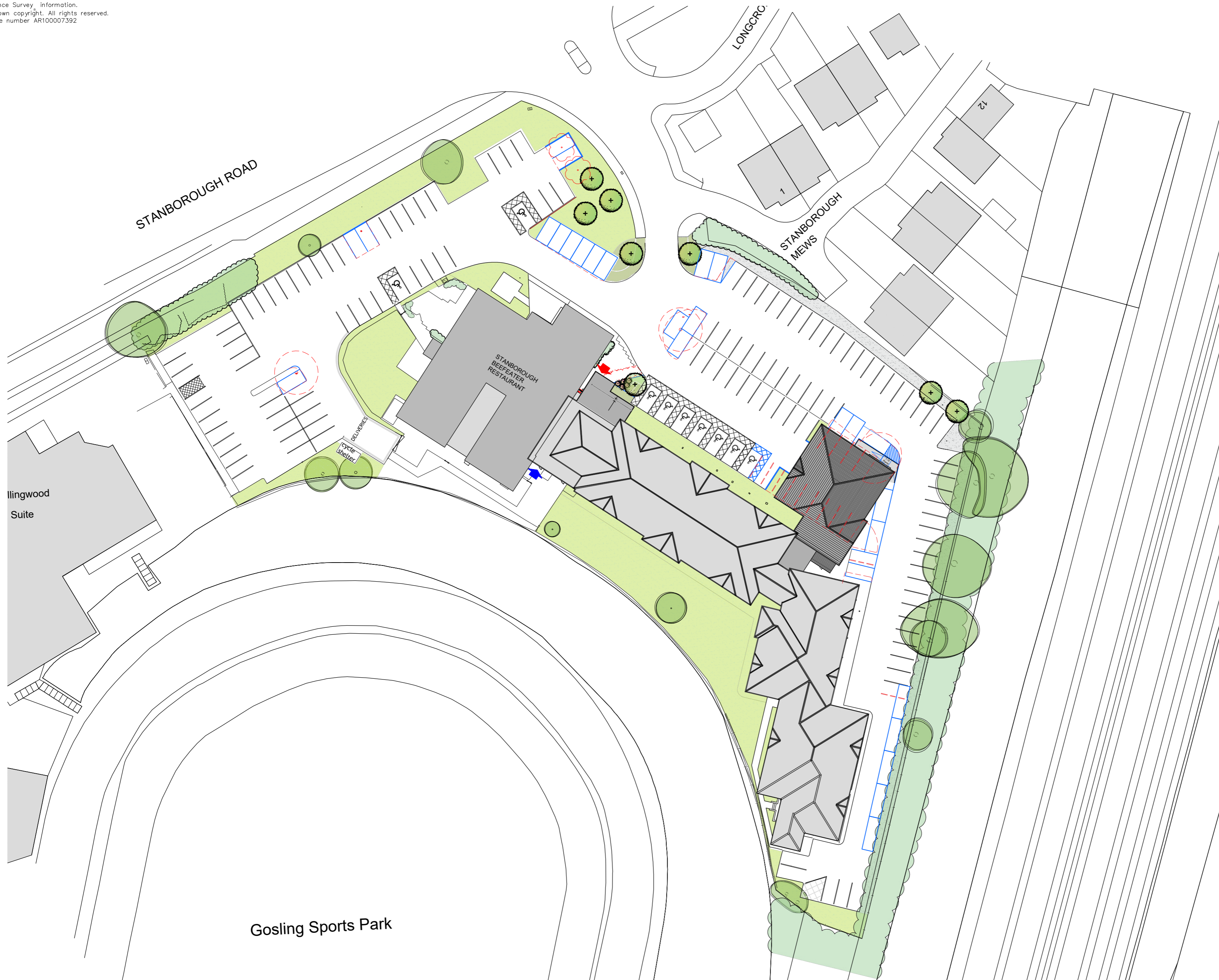
TPOs Contact Details

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

Welwyn Garden City



SITE AREA			0.95 Ha
HOTEL	EXISTING	PROPOSED	INCREASE / DECREASE
No. of Storeys	3	3	-
Bedrooms	120	144	+24

CAR PARKING	EXISTING	PROPOSED	INCREASE / DECREASE
Regular	143	153	10
Disabled	8	9	1
TOTAL	151	162	11
Cycle Parking	8	8	-

NOTE: The extension drainage is to connect to the existing Premier Inn hotel foul drainage system.

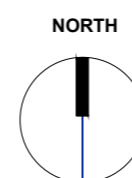
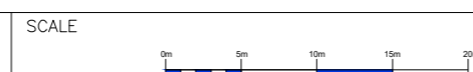
The new landscaping is to be the same as the current landscape planting strategy.

- KEY:**
- Proposed Car parking/kerbs
 - Existing Car parking kerbs removed
 - Existing tree to be removed
 - Existing shrub planting to be removed
 - Existing tree to be retained
 - Existing other vegetation to be retained
 - Proposed tree planting
 - Existing and proposed grass
 - Proposed shrub / groundcover planting
 - Proposed specimen shrub
 - Existing gravel

For Detail Landscaping proposal refer to :
 Indigo Landscape Architects Ltd.
 Drawing No: 780-SW-01 B

CLIENT

GENERAL NOTES
 All drawings are subject to full site survey. All dimensions are to be checked on site.



REV.	DESCRIPTION	DATE	INITIALS

ISSUE

PLANNING

CHQ Architects Ltd
 The Millings, 44 Whitehorse Street,
 Baldock, Hertfordshire SG7 6GQ
 Telephone: (01462) 895110
 Email: design@chq-architects.co.uk
 www.chq-architects.co.uk

PROJECT

Premier Inn
 Stanborough Road
 Welwyn Garden City
 Hertfordshire
 AL8 6DQ

DRAWING

Proposed Site Plan

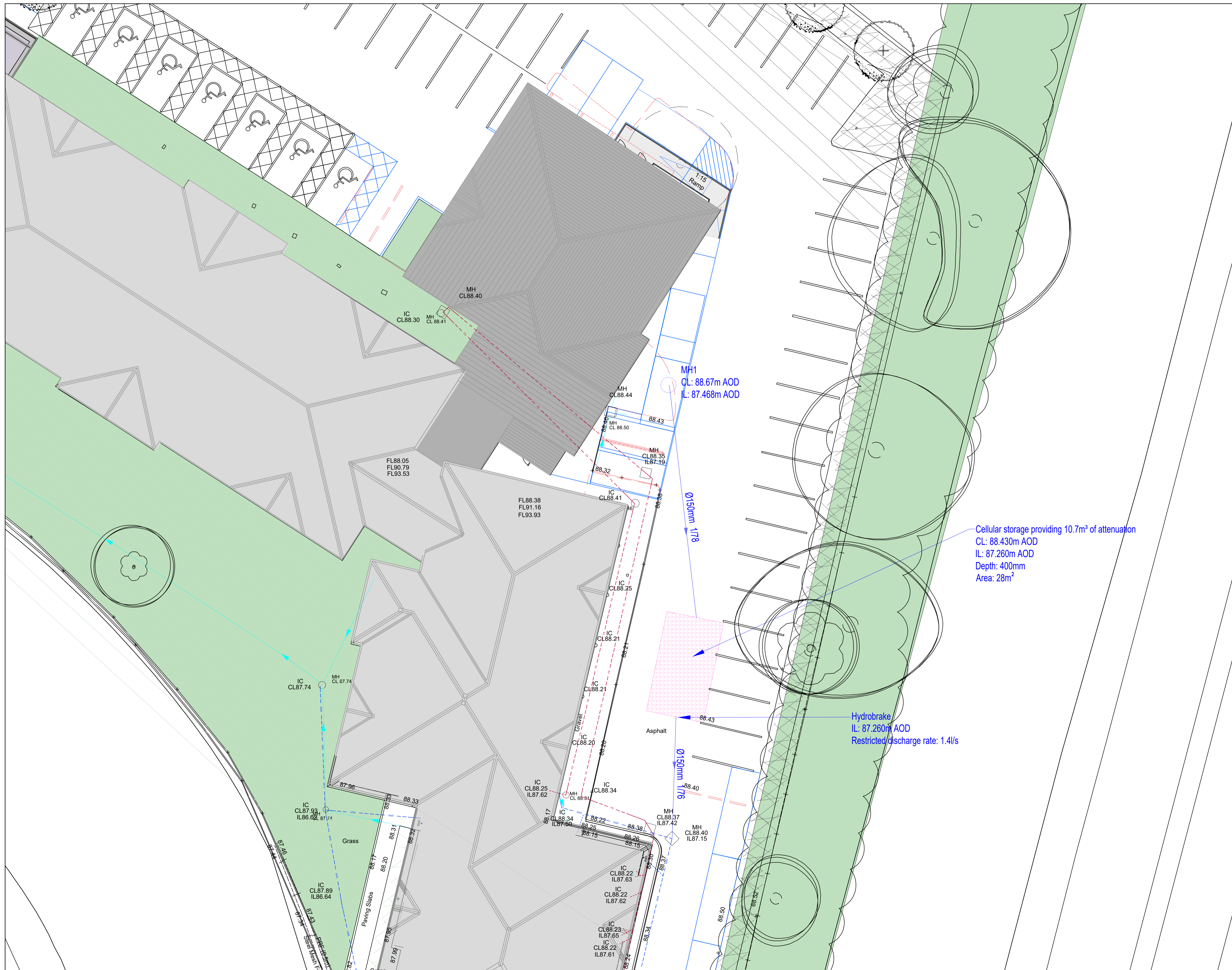
DATE	Jan 2018	DRAWN	FA
SCALE	1:500@A2	CHECKED	MRA

CHQ.15.11456-PL05

IH124 : Greenfield Peak Runoff		18022	Premier Inn, Stanborough Road, Welwyn																			
		Calculations By: PG	Checked By: TC	Date: 04/04/2018																		
Catchment Area	AREA	ha	0.95																			
Standard average annual rainfall 1941 - 1970	SAAR	mm	658																			
Soil Index (from FSR or Wallingford Procedure WRAP maps)*	SOIL		0.3																			
<p>*SOIL is the SPR for the soil type, and for larger sites is a weighted sum of the individual soil classes for the site, where:</p> $\text{SOIL} = \frac{0.1A_{\text{SOIL1}} + 0.3A_{\text{SOIL2}} + 0.37A_{\text{SOIL3}} + 0.47A_{\text{SOIL4}} + 0.53A_{\text{SOIL5}}}{\text{AREA}}$ <p>For smaller sites, use the SPR for the local soil type, as follows:</p> <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">SOIL TYPE</th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> <th style="text-align: center;">5</th> </tr> </thead> <tbody> <tr> <td>AREA</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0.95</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> </tr> <tr> <td>SPR</td> <td style="text-align: center;">0.1</td> <td style="text-align: center;">0.3</td> <td style="text-align: center;">0.37</td> <td style="text-align: center;">0.47</td> <td style="text-align: center;">0.53</td> </tr> </tbody> </table> <p style="margin-left: 20px;">SOIL: 0.3</p>					SOIL TYPE	1	2	3	4	5	AREA	0	0.95	0	0	0	SPR	0.1	0.3	0.37	0.47	0.53
SOIL TYPE	1	2	3	4	5																	
AREA	0	0.95	0	0	0																	
SPR	0.1	0.3	0.37	0.47	0.53																	
<p>QBAR = 0.00108 . (0.01AREA)^{0.89} . SAAR^{1.17} . SOIL^{2.17}</p> <p>* The site area is less than 50ha. Since the IoH124 methodology is not calibrated for sites less than 50ha in area, the calculation should be undertaken based on a 50ha site area and proportionately adjusted based on the ratio of the site size to 50ha.</p> <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td style="text-align: right;">QBAR_{50ha}</td> <td style="text-align: right;">l/s</td> <td style="text-align: right;">84.76</td> </tr> <tr> <td style="text-align: right;">QBAR/ha</td> <td style="text-align: right;">l/s/ha</td> <td style="text-align: right;">1.70</td> </tr> <tr> <td style="text-align: right;">QBAR_{site}</td> <td style="text-align: right;">l/s</td> <td style="text-align: right;">1.61</td> </tr> </table>					QBAR _{50ha}	l/s	84.76	QBAR/ha	l/s/ha	1.70	QBAR_{site}	l/s	1.61									
QBAR _{50ha}	l/s	84.76																				
QBAR/ha	l/s/ha	1.70																				
QBAR_{site}	l/s	1.61																				
		Hydrological Area	fig 4.2	6																		
		Return Period (years)	Growth Factor (table 4.3)	Discharge rate l/s																		
		1	0.85	1.37																		
		2	0.88	1.42																		
		10	1.62	2.61																		
		30	2.3	3.70																		
		50	2.62	4.22																		
		100	3.19	5.14																		
<p>Figures and table references from CIRIA C753 The SUDS Manual © CIRIA 2015</p>																						



Wallingford Procedure : Existing Peak Runoff		18022	Premier Inn, Stanborough Road, Welwyn		
		Calculations By: PG	Checked By: TC	Date: 04/04/2018	
Site Characteristics					
Site Area	AREA	ha		0.95	
Drained Catchment Area	AREA	ha		0.95	
Approximate Longest Drainage Path	L	m		64	
Difference in Ground Levels	ΔH	m		0.5	
Slope	Slope (S)			1: 128	
Permeable Surfaces (Rational Method runoff coefficient = 0.4)		ha		15%	
Impermeable Surfaces (Rational Method runoff coefficient = 0.95)		ha		85%	
Area Weighted Rational Method Runoff Coefficient				0.869	
Site parameters from The Wallingford Procedure for Europe: Best Practice Guide to urban drainage modelling, HR Wallingford, July 2000 (CD)					
60minute, 5 year return period rainfall	M5-60	mm		20	
Ratio of M5-60 to 2day, 5 year return period rainfall	r	-		0.40	
Time of Concentration					
Recommended Tc Method:	SCS: Sheet Flow				
Tc Method Choice:	SCS: Sheet Flow				
Shallow Concentrated Flow					
Surface Description				Paved	
Flow Length, L		m		64	
Land Slope		m/m	0.00781		
Velocity		m/s	0.55		
Tc		hr	0.03		
Time of Concentration		T_c	min	11.8	
Critical Storm Duration (minimum 5min)		T_{crit}	min	11.8	
Critical Storm Rainfall and Runoff					
Z _{1T_c}	0.54	*Wallingford Procedure Figure 3.6		Discharge Rate Q = 2.78CiA	
M5-T _{crit}	10.9				
C	0.869				
	Return Period (years)	Z2*	Depth (mm)	Intensity (mm/hr)	Discharge Rate l/s
	1	0.61	6.6	33.7	77.32
	2	0.79	8.6	43.6	100.13
	10	1.22	13.3	67.4	154.64
	30	1.49	16.2	82.3	188.86
	50	1.65	18.0	91.1	209.14
	100	1.91	20.8	105.5	242.10
*Wallingford Procedure Table 3.2					




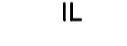
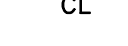


Cellular storage providing 10.7m³ of attenuation
 CL: 88.430m AOD
 IL: 87.260m AOD
 Depth: 400mm
 Area: 28m²

Hydrobrake
 IL: 87.260m AOD
 Restricted discharge rate: 1.4l/s

- NOTES**
- For planning purposes only;
 - Not for construction, subject to detailed design;
 - This drawing is not to be scaled;
 - Manholes, sewers and all other sewerage structures intended to convey sewerage are to be constructed in accordance with Sewers for Adoption 7th Edition.
 - All external drainage works shall be constructed in accordance with "Civil Engineering Specification for the Water Industry" 7th Edition, "Sewers for Adoption" 7th edition and B.S.E.N752 and to the Building Regulations 2015 Part H for private drainage.
 - Class of bedding in accordance with Highway Authority's Design Manual for Roads and Bridges.
 - Manhole and drainage covers comply with BS.EN 124. Manhole cover within block paved areas and building to be recessed. Cover strengths to be as follows:
 - Class E600 in areas subject to high point loads;
 - Class D400 in areas subject to heavy traffic such as access roads;
 - Class C250 in areas subject to light traffic, such as car parks;
 - Class B125 (with minimum 100mm deep frame) to be used in landscape & non-trafficked areas such as pedestrian areas.
 - All surface water storage arrangements are designed to accommodate the critical 1 in 100 year event including 40% allowance for climate change;
 - Attenuation up to Greenfield runoff rates;
 - External levels similar to the ones presented in the topographic survey undertaken by 40seven in 2008 (Drawing No. 52001_101 A) and the ones presented in the survey undertaken by Berry Geomatics in February 2018 (Drawing No. 18/18);
 - Proposed layout based on CHQ Architects Proposed Site Plan Drawing No. CHQ.15.11456-PL05.

KEY

	SURFACE WATER DRAINS
	CELLULAR STORAGE
	MANHOLE
	INVERT LEVEL
	COVER LEVEL

REV	DATE	AMENDMENTS	DRAW	APPR

WATER | ENVIRONMENT
 6 Coppergate Mews, 103 Brighton Road, Surbiton, London, KT6 5NE
 Tel: 020 8545 9720
 Email: contact@waterenvironment.co.uk web: www.waterenvironment.co.uk

CLIENT
 CHQ Architects


JOB TITLE
 Premier Inn, Standborough Road
 Welwyn Garden City

DRAWING TITLE
 Surface Water Drainage
 General Arrangement

DRAWING NUMBER 18022-200	REV
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SCALE 1:125 @ A1	DATE 01-05-2018
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DRAWN BY PG	CHECKED BY TC	APPROVED BY TC
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Micro Drainage		Network 2017.1.2

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model	
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 523587 211944
Data Type	Point
Maximum Rainfall (mm/hr)	75
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.024	4-8	0.009

Total Area Contributing (ha) = 0.033

Total Pipe Volume (m³) = 0.433

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
2	88.670	1.202	Open Manhole	1200	1.000	87.468	150				
4	88.480	1.220	Open Manhole	1200	1.001	87.260	150	1.000	87.260	150	
	88.430	1.280	Open Manhole	0		OUTFALL		1.001	87.150	150	

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PIPELINE SCHEDULES for Storm


Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	150	2	88.670	87.468	1.052	Open Manhole	1200
1.001	o	150	4	88.480	87.260	1.070	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	16.150#	77.6	4	88.480	87.260	1.070	Open Manhole	1200
1.001	8.340#	75.8		88.430	87.150	1.130	Open Manhole	0


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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.033	0.033	0.033
1.001	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.033	0.033	0.033

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.001		88.430	87.150	0.000	0	0

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Online Controls for Storm


Hydro-Brake® Optimum Manhole: 4, DS/PN: 1.001, Volume (m³): 1.6

Unit Reference	MD-SHE-0053-1400-1220-1400
Design Head (m)	1.220
Design Flow (l/s)	1.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	53
Invert Level (m)	87.260
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.220	1.4
Flush-Flo™	0.237	1.1
Kick-Flo®	0.475	0.9
Mean Flow over Head Range	-	1.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.0	1.200	1.4	3.000	2.1	7.000	3.1
0.200	1.1	1.400	1.5	3.500	2.3	7.500	3.2
0.300	1.1	1.600	1.6	4.000	2.4	8.000	3.3
0.400	1.0	1.800	1.7	4.500	2.5	8.500	3.4
0.500	0.9	2.000	1.7	5.000	2.7	9.000	3.5
0.600	1.0	2.200	1.8	5.500	2.8	9.500	3.6
0.800	1.2	2.400	1.9	6.000	2.9		
1.000	1.3	2.600	2.0	6.500	3.0		

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Storage Structures for Storm

Cellular Storage Manhole: 4, DS/PN: 1.001

Invert Level (m) 87.260 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	0.0	0.0	0.401	28.0	0.0
0.001	28.0	0.0	0.402	0.0	0.0

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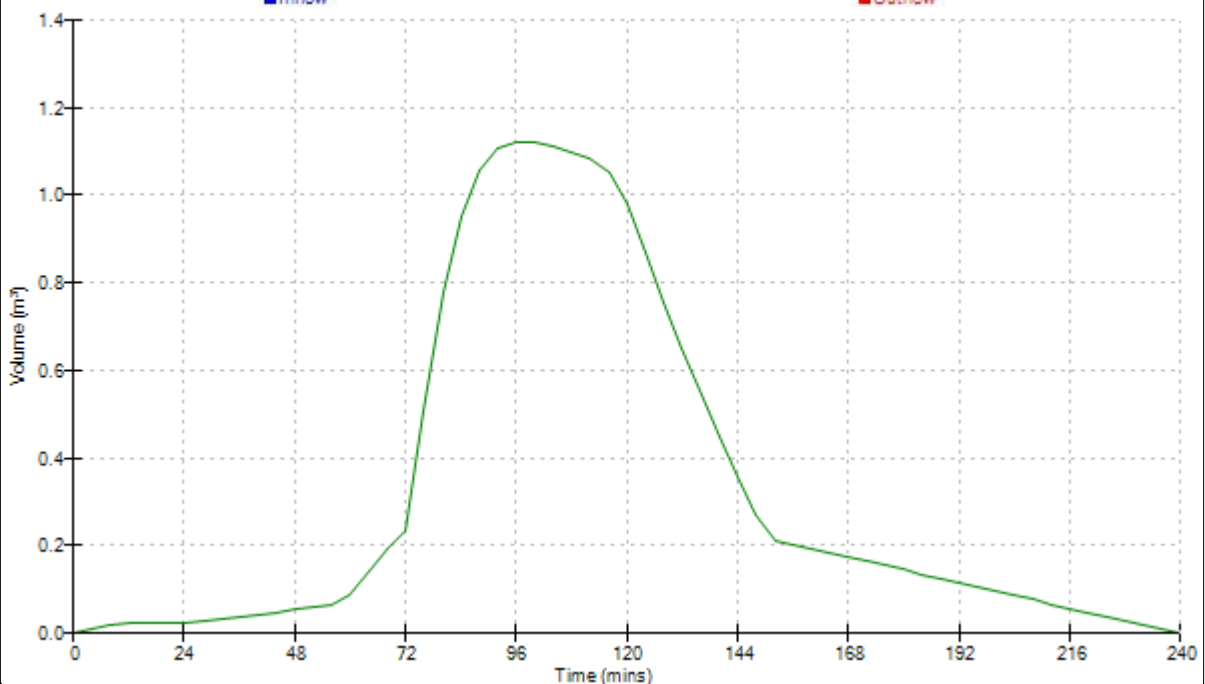
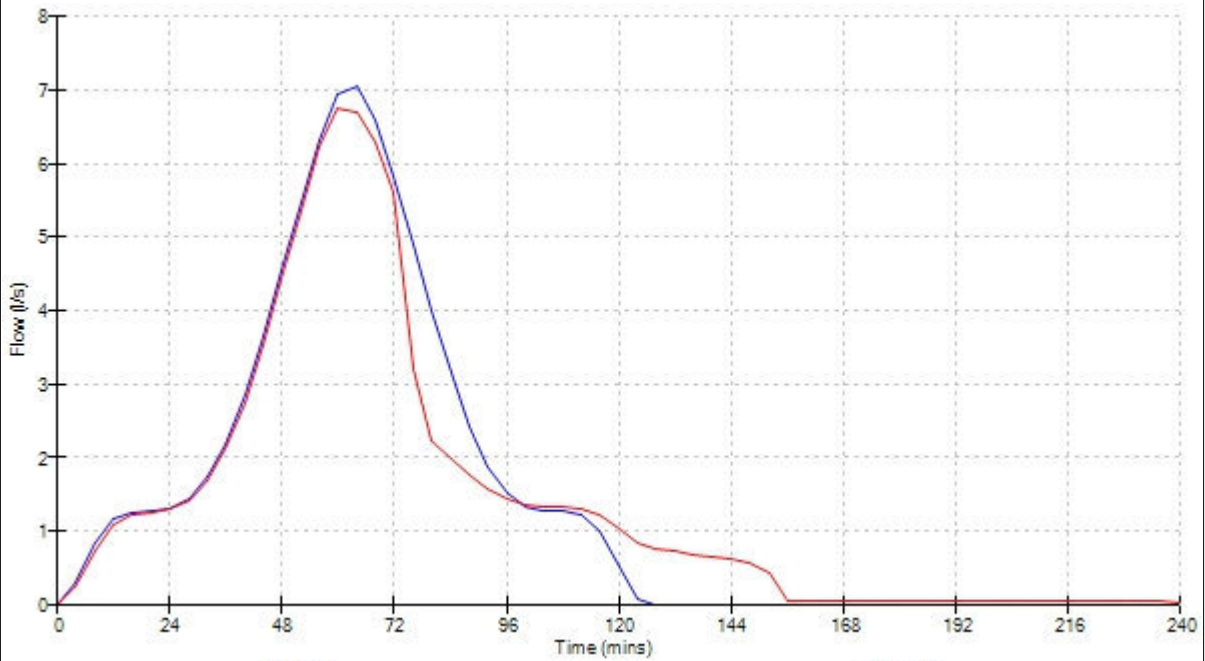
Micro Drainage Network 2017.1.2

Rainfall Hyetograph for 120 minute 100 year Winter I+40%
for Pipe 1.000 (Storm)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
4	5.084	28	19.068	52	73.545	76	61.287	100	16.971
8	12.491	32	23.218	56	84.072	80	49.456	104	16.434
12	15.646	36	29.693	60	91.542	84	38.753	108	16.427
16	16.427	40	38.753	64	91.542	88	29.693	112	15.646
20	16.434	44	49.456	68	84.072	92	23.218	116	12.492
24	16.971	48	61.287	72	73.545	96	19.068	120	5.084



Graphs for Pipe 1.000 US/MH 2 (Storm)
120 minute 100 year Winter I+40%
Status: FLOOD RISK



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Rainfall Hyetograph for 120 minute 100 year Winter I+40%
for Pipe 1.001 (Storm)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
4	5.084	28	19.068	52	73.545	76	61.287	100	16.971
8	12.491	32	23.218	56	84.072	80	49.456	104	16.434
12	15.646	36	29.693	60	91.542	84	38.753	108	16.427
16	16.427	40	38.753	64	91.542	88	29.693	112	15.646
20	16.434	44	49.456	68	84.072	92	23.218	116	12.492
24	16.971	48	61.287	72	73.545	96	19.068	120	5.084

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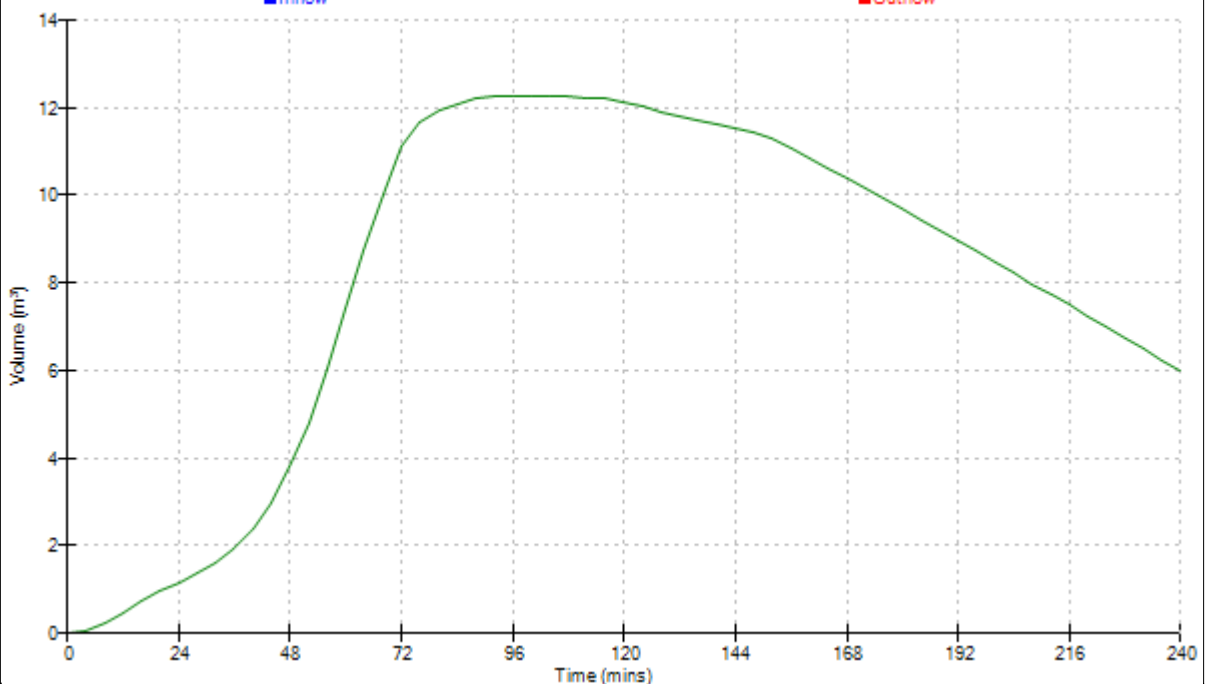
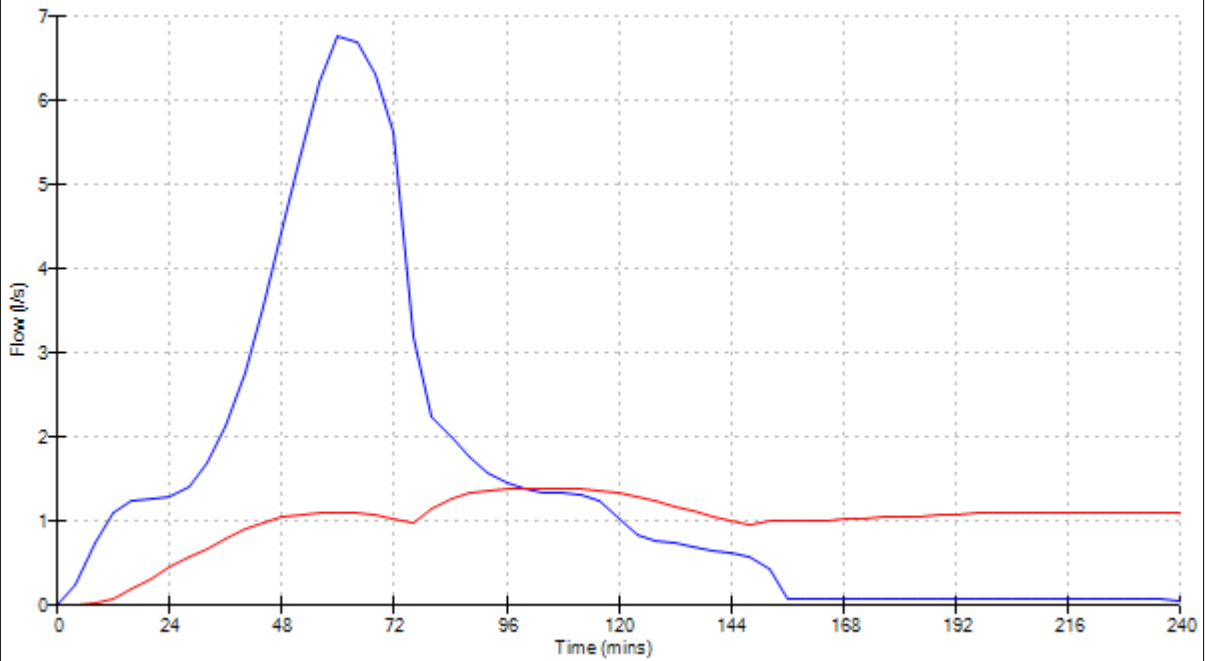
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Graphs for Pipe 1.001 US/MH 4 (Storm)
120 minute 100 year Winter I+40%
Status: FLOOD RISK



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Design Audit Report for Storm

```

Filename      C:\USERS\WATERENVIRONMENT\DESKTOP\PROJECTS
                OLD\18022 DRAINAGE STRATEGY
                MD_20180406_V2.MDX
Network Name   Storm
Date Audited  30/04/2018 11:20
Pipes         2
Current Network Slope (1:X)  77.0
Storms Used (mins)
    15min Summer, 30min Summer, 60min Summer,
    120min Summer, 180min Summer, 240min Summer,
    360min Summer, 480min Summer, 600min Summer,
    720min Summer, 960min Summer, 1440min
    Summer, 2160min Summer, 2880min Summer,
    4320min Summer, 5760min Summer, 7200min
    Summer, 8640min Summer, 10080min Summer,
    15min Winter, 30min Winter, 60min Winter,
    120min Winter, 180min Winter, 240min Winter,
    360min Winter, 480min Winter, 600min Winter,
    720min Winter, 960min Winter, 1440min
    Winter, 2160min Winter, 2880min Winter,
    4320min Winter, 5760min Winter, 7200min
    Winter, 8640min Winter, 10080min Winter

```


Audit	Failures	Status
Manhole Sizes	0	Passed
Surcharge	0	Passed
Flood	0	Passed
Storage	0	Passed
Pipe Diameters	0	Passed
Pipe Lengths	0	Passed
Coordinate Accuracy	2	Failed
Cover Levels	2	Failed
Backdrops	0	Passed
Full Bore Velocity	0	Passed
Proportional Velocity	2	Failed
Crossings/Conflicts	0	Passed
Manhole Headloss	0	Passed
ICP Audit	0	Not Run

Manhole Size Audit

All Manhole Sizes comply with manhole size settings.

Surcharge Audit

No pipes exceeded the 100 mm surcharge limit for the 2 year +0% climate change storm.

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Flood Audit

No pipes flood for the 100 year +40% climate change storm.

Storage Audit

Storage Volume is at typical design values.

Pipe Diameter Audit

All pipe diameters are ≥ 150 mm.

Pipe Length Audit

All pipe lengths are ≤ 100.000 m.

Coordinate Accuracy Audit

The following pipes have coordinate-length errors greater than 1.000 m.

PN	Length (m)	Coord Distance (m)	Error (m)
1.000	16.150	20.652	4.502
1.001	8.340	11.002	2.662

Upstream Cover Level Audit


The following pipes have Upstream Cover Depths outside of the range 1.300-6.000 m.

PN	USIL (m)	Diameter (mm)	USCL (m)	Depth (m)
1.000	87.468	150	88.670	1.052
1.001	87.260	150	88.480	1.070

Downstream Cover Level Audit

The following pipes have Downstream Cover Depths outside of the range 1.300-6.000 m.

PN	DSIL (m)	Diameter (mm)	DSCL (m)	Depth (m)
1.000	87.260	150	88.480	1.070
1.001	87.150	150	88.430	1.130

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Backdrop Audit

All backdrops are within the range 0.200-1.500m.

Full Bore Velocity Audit

All pipes have Full Bore Velocity within the range 1.00-3.00 m/s.

Proportional Velocity Audit

The following pipes have Proportional Velocity outside of the range 1.00-3.00 m/s for the 2 year +0% climate change storm.

PN	Storm (mins)	Velocity (m/s)
1.000	15min Winter	0.86
1.001	120min Winter	0.59

Crossings / Conflicts Audit

The following filter settings were used to determine the crossings and conflicts.

Vertical Separation (m): 0.500
Horizontal Separation (m): 0.500
Networks included: Storm
Networks excluded:

No crossings or conflicts were located for the current network based on the settings above.

Manhole Headloss Audit

All manholes have sufficient headloss.

Interim Code of Practice

The Interim Code of Practice Audit was not completed by user request