# Flood Risk Assessment and Surface Water Drainage Strategy for Planning

**Prepared for:**
Cherrytrees Care

**December 2023**

**Location:**
Cherrytrees Care
15-17 Claremont Avenue
Woking
GU22 7SF

**Our reference:**
93454-Munro-ClaremontAv

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# Document Issue Record

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|---|---|---|---|---|---|
| **Location:** | Cherrytrees Care, 15-17 Claremont Avenue, Woking, GU22 7SF | | | | |
| **Application:** | Cherrytrees Care | | | | |
| **Prepared for:** | Alterations and extensions to the existing building to provide improved accommodation | | | | |
| **Title:** | Flood Risk Assessment and Surface Water Drainage Strategy for Planning | | | | |
| **Project No.:** | 93454 | **Date:** | 12th December 2023 | **Issue No.:** | 1.1 |
| **Written By:** | A.Rousou, Bsc (Hons) | **Checked By:** | E. Bouet, BSc (Hons) | **Authorised By:** | E. Bouet, BSc (Hons) |

## 1. Introduction

1.1. This Flood Risk Assessment and Surface Water Drainage Strategy has been prepared by Unda Consulting Limited on behalf of Cherrytrees Care, in support of a planning application for alterations and extensions to the existing building to provide improved accommodation at Cherrytrees Care, 15-17 Claremont Avenue, Woking, GU22 7SF. This report assesses flood risk and surface water drainage for the proposed development.

1.2. The proposed planning application is for alterations and extensions to the existing building to provide improved accommodation. Post development the total increase in roof area will amount to approximately 72m².

1.3. In order to mitigate flood risk posed by post development runoff, adequate control measures will be required within the site. This will ensure that surface water runoff is dealt with at source and the flood risk off site is not increased.

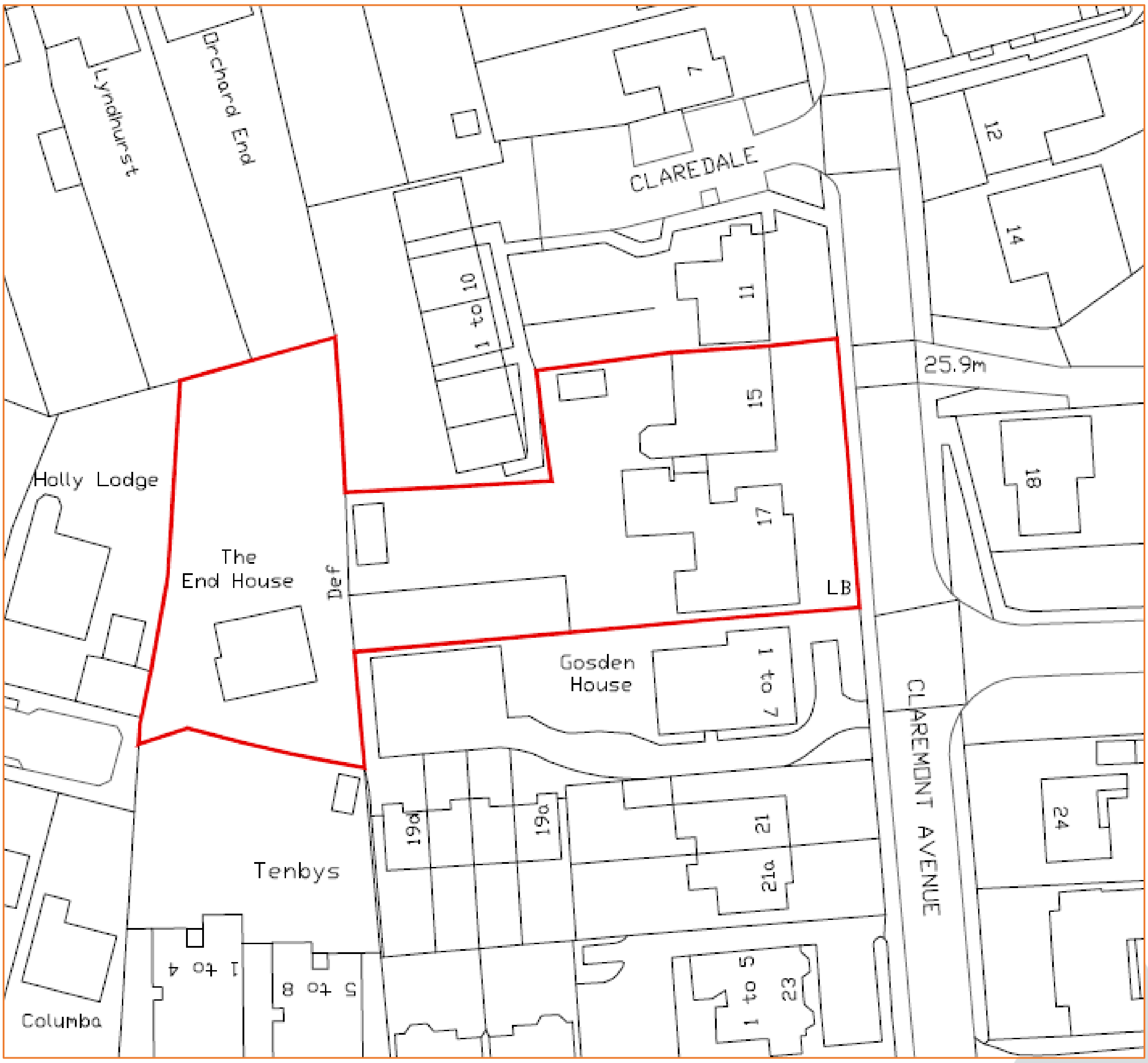


**Figure 1: Site location plan (Source: Amber Architecture)**

## 2. Existing Site:

2.1. The site is currently occupied by a care facility.

2.2. The surrounding area is predominantly residential.


**Figure 2: Site location (Source: Google)**

**Site Topography:**

2.3. A topographical survey has been undertaken at the site by Ground Surveys Ltd and had been provided by the client for inclusion within the report.

**Existing Ground Conditions:**

2.4. The 1:50,000 BGS map shows the site to be located upon the bedrock of Bagshot Formation - Sand.

2.5. BGS mapping indicates that the site is not underlined by superficial deposits.

2.6. The soil type taken from the BGS UKSO Soil Map Viewer, shows a soil parent material of Fluvial Sands and Gravels with a soil texture of sandy to sandy loam.

2.7. There are no BGS borehole logs located within the site extents.

2.8. The published Environment Agency Source Protection Zones map shows the site is not located within a Groundwater Source Protection Zone.

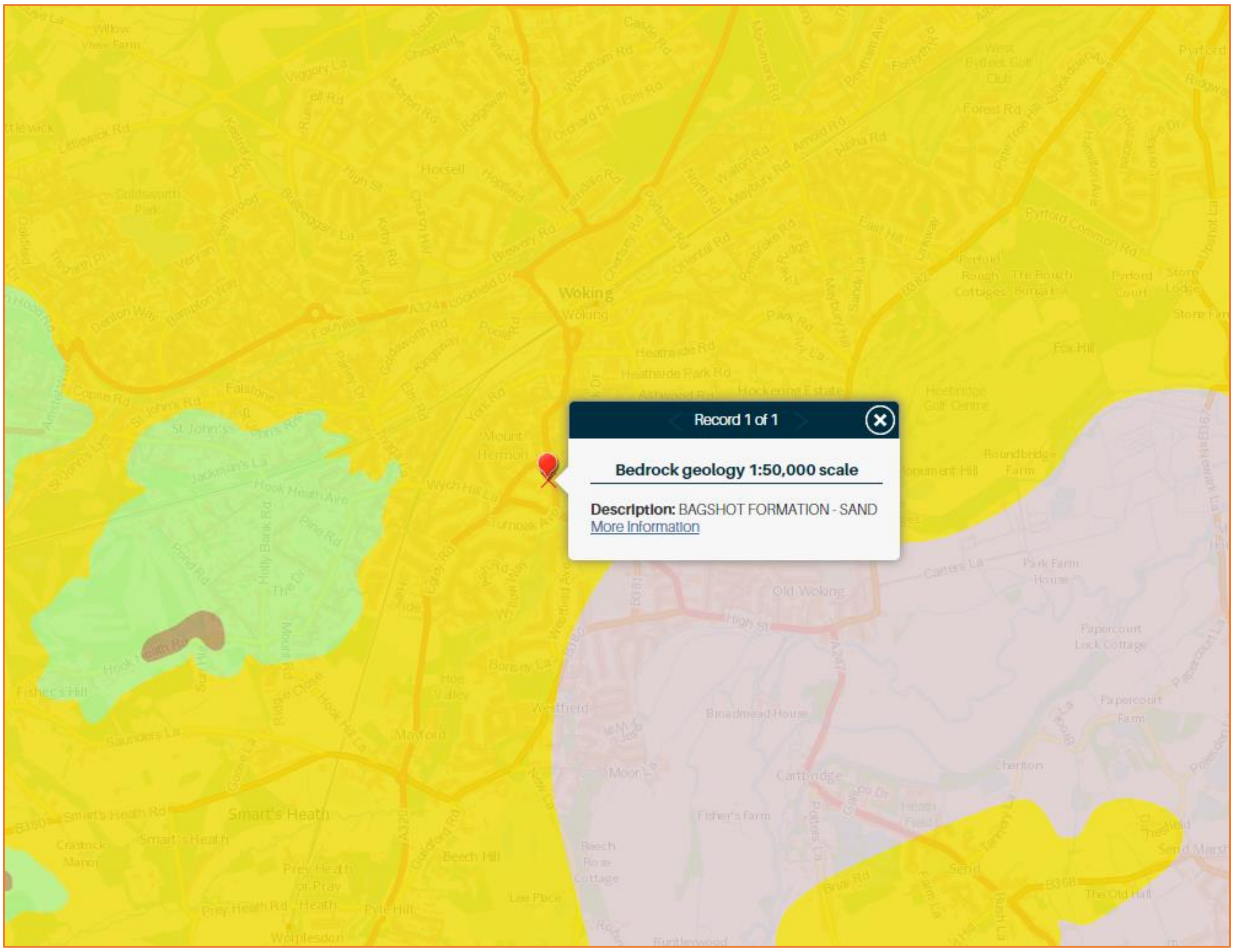


**Figure 3: BGS Bedrock Geology (Source: BGS)**

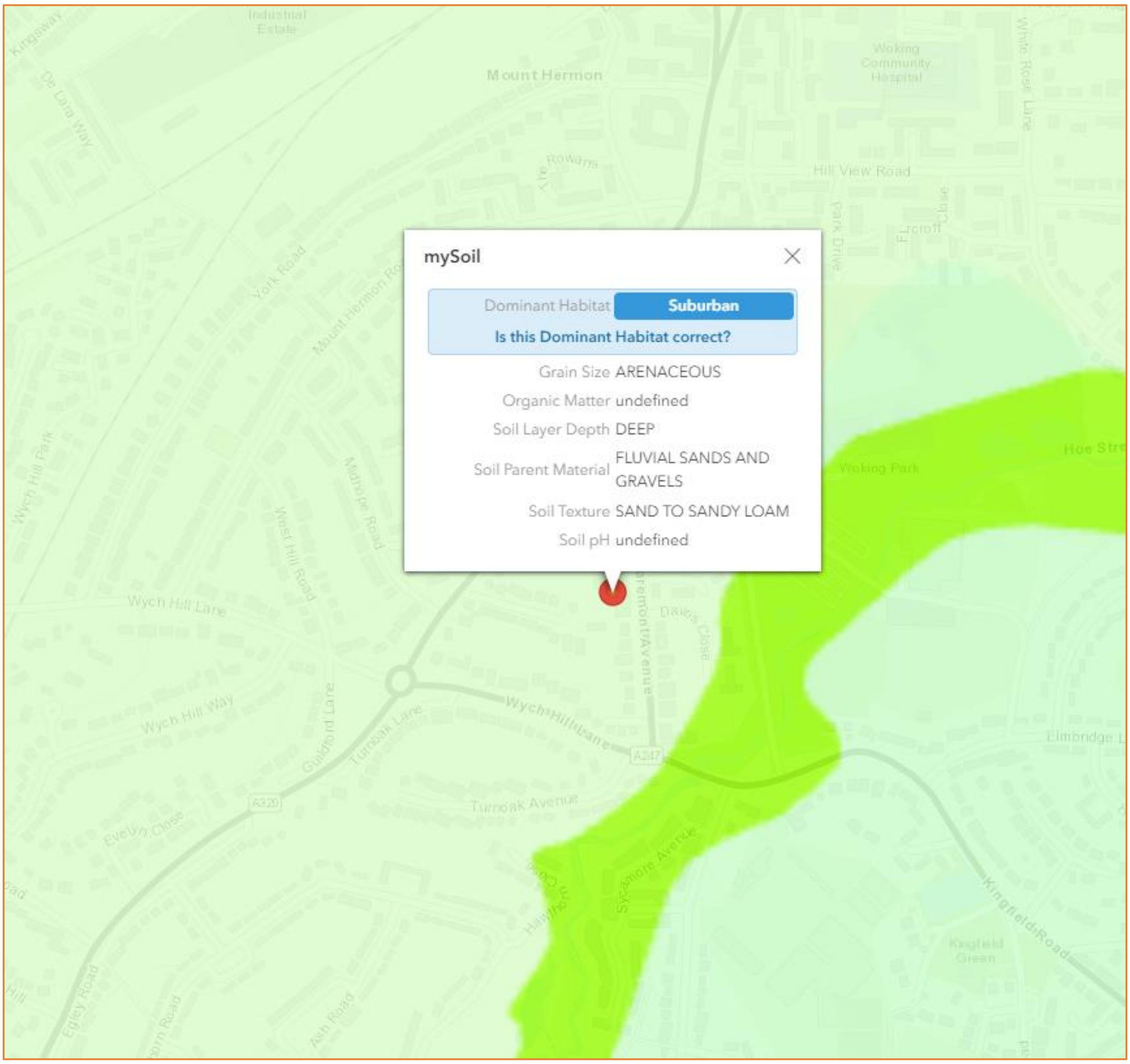


**Figure 5: Soil Map (Source: UK Soils, BGS)**

**Nearby Watercourses / Drainage Features:**

2.9. The Hoe stream is located approximately 172m south east of the site.

## 3. Development Proposals:

**Proposed Development:**

3.1. The proposed planning application is for alterations and extensions to the existing building to provide improved accommodation. Post development the total increase in roof area will amount to approximately $72m^2$.

3.2. This strategy will solely focus on the proposed increase in roof area.

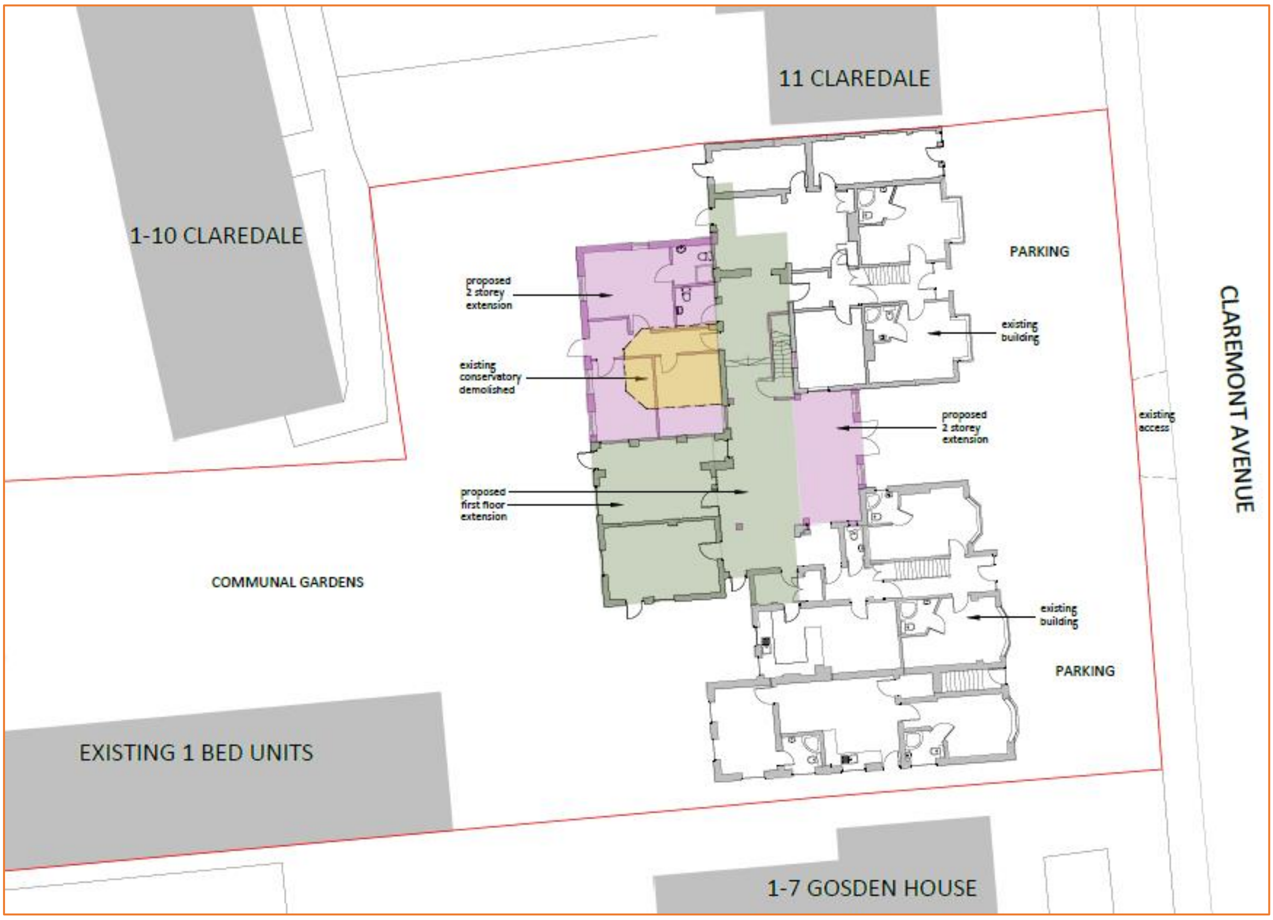


**Figure 6: Proposed Site Plan (Source: Amber Architecture)**

**Vulnerability to flooding:**

3.3. The NPPF classifies property usage by vulnerability to flooding. The site will remain "more vulnerable", as the application is for alterations and extensions to the existing building to provide improved accommodation.

3.4. Accordingly, it is considered that the vulnerability of the site as a whole will remain the same. However, there will be an intensification of site usage.

## 4. Flood Risk Assessment:

**Flood Zones:**

4.1. Within planning, 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 website.

| 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 1: Environment Agency Flood Map for Planning (Rivers and Sea) (Source: EA)**

4.2. The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.

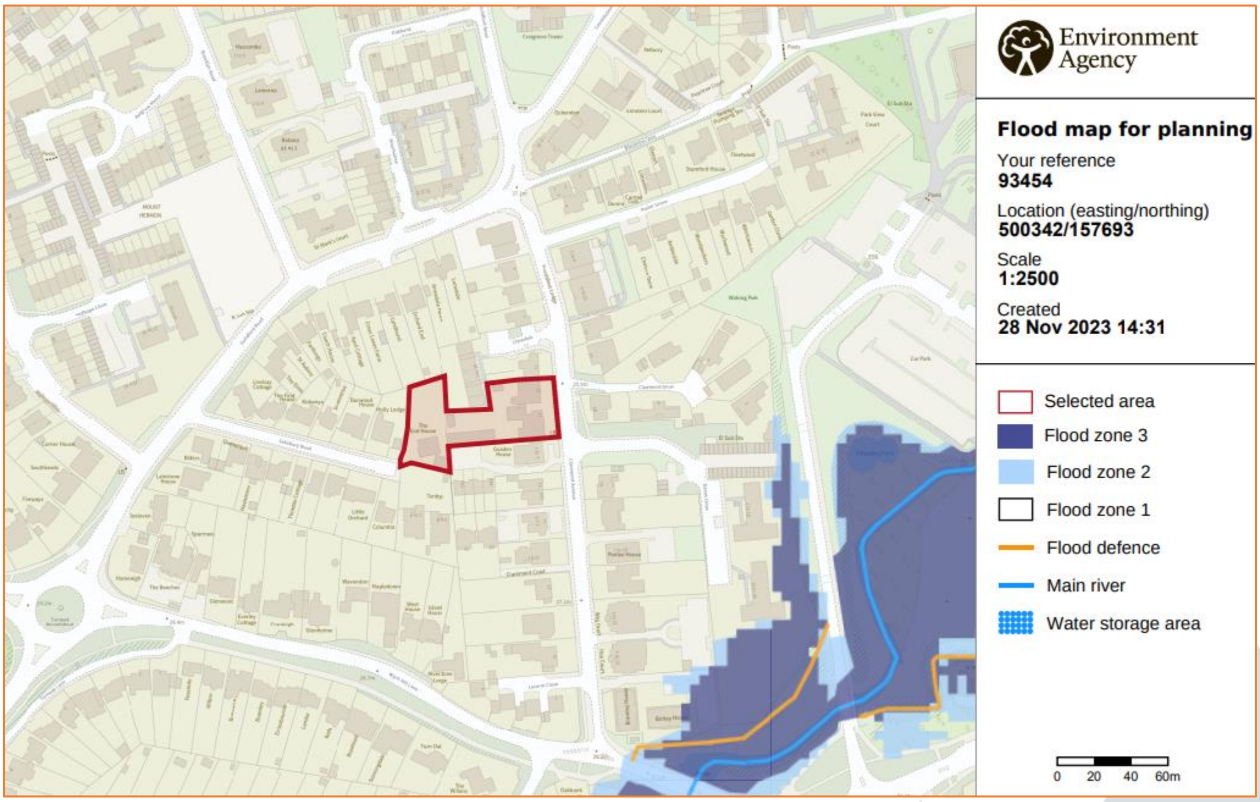


**Figure 7: Environment Agency Flood Map for Planning (Rivers and Sea) (Source: EA)**

4.3. The proposed site is located within Flood Zone 1 (Low Probability) which means it is defined as land having less than a 1:1000 annual probability of fluvial flooding.

**Fluvial:**

4.4. Due to the site topography and distance to the nearest watercourse, the risk of fluvial flooding is considered to be very low.

**Tidal:**

4.5. Given the site's topography and distance to the nearest watercourse, the risk of tidal flooding is considered to be very low.

**Historical flood events:**

4.6. According to the EA, the site has not previously been flooded.

**Pluvial:**

4.7. Pluvial (surface water) flooding happens when rainwater does not drain away through the normal drainage systems or soak into the ground, but instead it lies on or flows over the ground instead.

4.8. In 2013 the EA, working with Lead Local Flood Authorities (LLFAs), produced an updated Flood Map for Surface Water. It is considered to represent a significant improvement on the previous surface water flood maps available, both in terms of method and representation of the risk of flooding. The modelling techniques and data used are considerably improved, and also incorporated locally produced mapping where this is available to represent features best modelled at a local scale.

4.9. The Flood Map for Surface Water assesses flooding scenarios as a result of rainfall with the following chance of occurring in any given year (annual probability of flooding is shown in brackets):

- 1:30 (3.3%)
- 1:100 (1%)
- 1:1000 (0.1%)

4.10. The mapping below shows the Risk of Flooding from Surface Water where the site is located on the crosshair. Please note that the EA to not consider this information suitable to be used to identify the risk to individual properties or sites. It is useful to raise awareness in areas which may be at risk and may require additional investigation.

4.11. The EA Risk of Flooding from Surface Water Map suggests that the area of the site being developed lies within an area of "Very Low" to "Medium" risk of flooding from surface water.

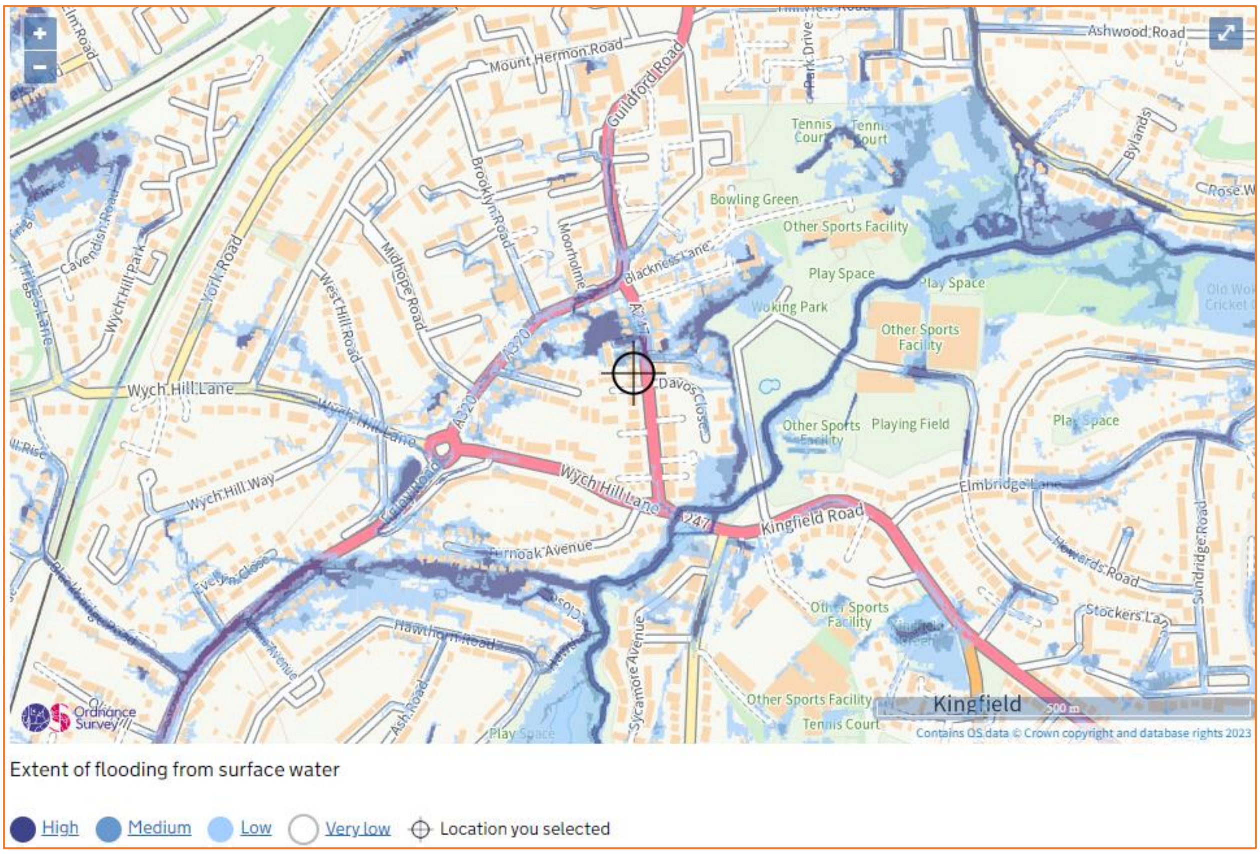


**Figure 8: Extract from Environment Agency RoFSW map (Source: EA)**

**Groundwater:**

4.12. Groundwater flooding occurs as a result of water rising up from the underlying rocks or from water flowing from abnormal springs. This tends to occur after much longer periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. Groundwater tends to flow from areas where the ground level is high, to areas where the ground level is low. In low-lying areas, the water table is usually at shallower depths anyway, but during very wet periods, with all the additional groundwater flowing towards these areas, the water table can rise to the surface causing groundwater flooding.

4.13. Groundwater flooding is most likely to occur in low-lying areas underlain by permeable rocks (aquifers). These may be extensive, regional aquifers, such as chalk or sandstone, or may be localised sands or river gravels in valley bottoms underlain by less permeable rocks. Groundwater flooding takes longer to dissipate because groundwater moves much more slowly than surface water and will take time to flow away underground.

4.14. The Woking Borough Council SFRA (2015) indicates that the site is located within area with limited potential for groundwater flooding to occur.

4.15. No further information has been provided to suggest that the site has flooded from groundwater flooding previously.

**Sewer:**

4.16. Sewer flooding occurs when the sewer network cannot cope with the volume of water that is entering it. It is often experienced during times of heavy rainfall when large amounts of surface water overwhelm the sewer network causing flooding. Temporary problems such as blockages, siltation, collapses and equipment or operational failures can also result in sewer flooding.

4.17. All Water Companies have a statutory obligation to maintain a register of properties/areas which have reported records of flooding from the public sewerage system, and this is shown on the DG5 Flood Register. This includes records of flooding from foul sewers, combined sewers and surface water sewers which are deemed to be public and therefore maintained by the Water Company. The DG5 register records of flood incidents resulting in both internal property flooding and external flooding incidents. Once a property is identified on the DG5 register, water companies can typically put funding in place to address the issues and hence enable the property to be removed from the register. It should be noted that flooding from land drainage, highway drainage, rivers/watercourses and private sewers is not recorded within the register.

4.18. According to the Woking Borough Council SFRA (2015) the postcode area GU227 has had 7-9 records of sewer flooding from the past 20 years.

4.19. No further information has been provided to suggest that the site has flooded from sewer surcharge flooding previously.

**Other Sources:**

4.20. The EA Risk of Flooding from Reservoirs Map suggests that the is not within the "Maximum extent of flooding" from reservoir failure, therefore, the EA advise on their website that reservoir flooding is extremely unlikely. The risk to the site from reservoir flooding is therefore minimal and is far lower than that relating to the potential for fluvial flooding to occur.

4.21. No further information has been provided to suggest the site is susceptible to from the failure of reservoirs, canals or other artificial infrastructure from the risk of flooding.

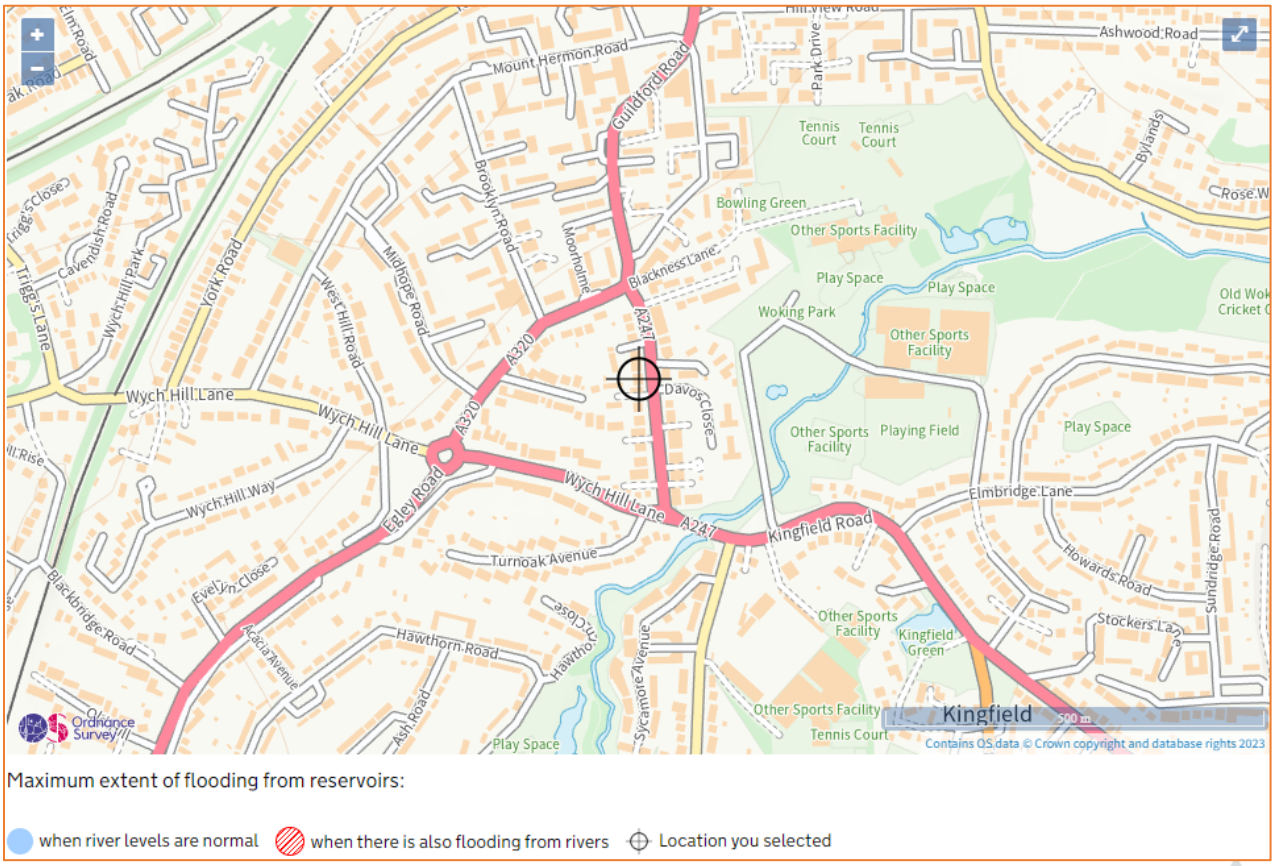


**Figure 10: Extract from Environment Agency Reservoir Flooding map (Source: EA)**

## 5. Surface Water Drainage Strategy:

5.1. In order to mitigate flood risk posed by post development runoff, adequate control measures will need to be considered within the site. This will ensure that surface water runoff is dealt with at source and flood risk is not increased elsewhere.

**Drainage Hierarchy:**

5.2. The drainage strategy for the site has been prepared according to the drainage discharge hierarchy from CIRIA C753 The Suds Manual, as follows:

- Infiltration to the maximum extent that is practical;
- Discharge to surface waters;
- Discharge to surface water sewer;
- Discharge to a combined sewer.

**Infiltration Potential:**

5.3. The 1:50,000 BGS map shows the site to be located upon the bedrock of Bagshot Formation – Sand. Therefore, infiltration SuDS are considered feasible at the site.

5.4. In the absence of in-situ testing, an assumed infiltration rate has been utilised based on the below coefficients. Table 25.1 of the CIRIA C753 The Suds Manual 2015 (Figure 11) provides typical infiltration coefficients based on soil texture.

| Soil type/texture | ISO 14688-1 description (after Blake, 2010) | Typical infiltration coefficients (m/s) |
|---|---|---|
| **Good infiltration media** | | |
| ▪ gravel | Sandy GRAVEL | $3 \times 10^{-4} - 3 \times 10^{-2}$ |
| ▪ sand | Slightly silty slightly clayey SAND | $1 \times 10^{-5} - 5 \times 10^{-5}$ |
| ▪ loamy sand | Silty slightly clayey SAND | $1 \times 10^{-4} - 3 \times 10^{-5}$ |
| ▪ sandy loam | Silty clayey SAND | $1 \times 10^{-7} - 1 \times 10^{-5}$ |
| **Poor infiltration media** | | |
| ▪ loam | Very silty clayey SAND | $1 \times 10^{-7} - 5 \times 10^{-6}$ |
| ▪ silt loam | Very sandy clayey SILT | $1 \times 10^{-7} - 1 \times 10^{-5}$ |
| ▪ chalk (structureless) | N/A | $3 \times 10^{-8} - 3 \times 10^{-6}$ |
| ▪ sandy clay loam | Very clayey silty SAND | $3 \times 10^{-10} - 3 \times 10^{-7}$ |
| **Very poor infiltration media** | – | |
| ▪ silty clay loam | – | $1 \times 10^{-8} - 1 \times 10^{-6}$ |
| ▪ clay | Can be any texture of soil described above | $< 3 \times 10^{-8}$ |
| ▪ till | | $3 \times 10^{-9} - 3 \times 10^{-6}$ |
| **Other** | | |
| ▪ rock* (note mass infiltration capacity will depend on the type of rock and the extent and nature of discontinuities and any infill) | N/A | $3 \times 10^{-9} - 3 \times 10^{-5}$ |

**Figure 11: Typical Infiltration Coefficients Based on Soil Texture (Source: Table 25.1 of the CIRIA C753)**

5.5. Given the underlying strata an assumed minimum infiltration rate of $1 \times 10^{-5}$ m/s has been utilised for this assessment. However, given the underlying bedrock geology the true infiltration rate is likely to be greater than that used within this assessment.

**Proposed Discharge Rate:**

5.6. Greenfield runoff rates for the area of the site being attenuated have been calculated as 0.0 l/s for the 1:1 annual runoff event, 0.1 l/s for the 1:30 year event and 0.1 l/s for the 1:100-year event. Refer to calculations in appendix.

5.7. Post development the total increase in roof area will amount to approximately $72m^2$. Therefore, $72m^2$ of roof area will discharge into a cellular storage soakaway.

5.8. All new ground surfaces will be of permeable construction.

**Cellular Storage Soakaway:**

5.9. The surface water runoff from 72m$^2$ of roof area will discharge into the cellular storage soakaway.

5.10. The proposed development comprises some 72m$^2$ of potentially impermeable surfacing. In order to comply with CIRIA C753 The SuDS Manual, a 10% allowance will be added to take into account future urban creep. Applying a 10% allowance to all new roof area (72m$^2$) gives a value of 79.2m$^2$. Therefore, all drainage calculations have been made on the basis of a total impermeable area of 79.2m$^2$.

5.11. Preliminary calculations indicate that sufficient storage required to attenuate runoff from the proposed impermeable areas (79.2m$^2$) arising from the critical 1:100 year + 45% climate change event can be provided within cellular storage of dimensions 14m$^2$ x 0.40m deep x 0.95 (voids).

5.12. Preliminary calculations indicate that approximately 5.32m$^3$ of storage is required to attenuate the runoff for all storms up to and including the 1:100 year + 45% climate change event.

5.13. *Please note that the levels and locations of the cellular storage within the Causeway calculations are arbitrary for modelling purposes.*

5.14. All preliminary surface water drainage calculations have been undertaken using Causeway software. Refer to the appendix.

**Water Quality:**

5.15. Water quality has been assessed in line with the Simple Index approach from Chapter 26 of CIRIA C753 The SuDS Manual:

Step 1 – Allocate suitable pollution hazard indices for the proposed land use.
Step 2 – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index.

5.16. Runoff from roof areas is considered to be uncontaminated and does not warrant any form of treatment process to improve water quality. Nevertheless, it is suggested to include debris / sediment traps on any new drainage.

**Design Exceedance:**

5.17. Should the onsite drainage system fail under extreme rainfall events or blockage, flooding may occur within the site. In the event of the drainage system failure, the runoff flow can be managed through detailing the new external levels to direct water away from structures.

**Adoption and Maintenance:**

5.18. It is proposed that all SuDS facilities will be maintained privately by the end users.

5.19. A draft Maintenance Schedule is outlined in the Table below.

*Cellular Storage:*

5.20. It is not envisaged that silt build up within the cellular crate systems will require a rigorous maintenance regime so long as silt is removed from upstream catch pits and inspection chambers on a regular basis. Notwithstanding this, a suitable maintenance regime for the systems will comprise of routine inspection and silt removal (as necessary). Inspection should be undertaken using CCTV equipment offered up the inspection tunnels located within the crate system. Camera access can be gained via inspection chambers and inlet pipework located at each end of the tunnels.

5.21. Silt removal can be achieved by jetting the inspection tunnels. Jetting should be undertaken in accordance with current jetting guidelines, in particular the Code of Practice for Sewer Jetting published by The Water Research Centre. Jetting at 150bar at 300l/min should be more than adequate in removing any build-up of material within the tunnel. The crate system will take higher pressures. However, unlike regular jetting which relies heavily on high pressure to remove hardened deposits on the inner bore of pipes, effective cleansing of a crate system relies more on the delivery flow rate to flush solids back through the system.

5.22. A standard jet head with rear facing nozzles should be used. The head should be fed to the far end of the crate tunnel via the nearest inspection chamber, activated and retracted. As the nozzle is removed, debris will be swept back into the inspection chamber where it can then be removed with the use of a standard gully sucker. This method will ensure the effective removal of gross solids (carrier bags, cans, leaf litter etc.) from the system. Whilst 100% removal cannot be guaranteed, it has been shown that this jetting method will also remove an element of finer material which would otherwise be 'lost' within the system.

*Pipework and Catchpits:*

5.23. It is not envisaged that silt build up within the pipework systems will require a rigorous maintenance regime so long as silt is removed from upstream catch pits on a regular basis. Notwithstanding this, a suitable maintenance regime for the systems will comprise of routine inspection (every three months) and silt removal (as necessary).

| Drainage Element | Maintenance Requirement | Frequency |
|---|---|---|
| **Gutters & Downpipes** | Inspect and remove silt/ debris | To be inspected every three months and silt/ debris removed as necessary. |
| **Catchpits and Inspection Chambers** | Inspect and remove silt | To be inspected every three months and silt/ debris removed as necessary. Flow control to be checked for blockages. |
| **Cellular Storage** | Inspect and remove debris | CCTCV inspection following first storm event. Monthly CCTV inspections for first 3 months. 6 monthly CCTV inspections thereafter. Jetting to remove silt as necessary. |

**Table 2: Suggested Maintenance Regime for Elements of the Drainage Infrastructure**

Note: In addition to the above maintenance requirements, it is recommended that all drainage elements are inspected:

- Following the first storm event
- Monthly for the first 3 months following commissioning.

## 6. Flood Risk Mitigation:

**Physical Design Measures:**

6.1. To help protect against flooding during extreme events, the applicant has agreed to implement flood resistant design measures into the proposal, in consultation with the Local Authority building control department.

6.2. As such, the following measures are recommended where they can practically and feasibly be implemented:

- Closed-cell foam used in wall cavities;
- Exterior ventilation outlets, utility points and air bricks fitted with removable waterproof covers;
- Ground floor electrical main ring run from 600mm above finished ground floor level;
- Electrical incomer and meter situated 600mm above finished ground floor level;
- Boilers, control and water storage / immersion installed 600mm above finished ground floor level;
- Raised wiring and power outlets at least 600mm above finished ground floor level;
- Plumbing insulation of closed-cell design;
- Manhole covers secured;
- Anti-syphon fitted to all toilets;
- Use of MDF carpentry (i.e. skirting, architrave, built-in storage) avoided at ground floor level;

6.3. A flood proof door should be installed for external ground floor level doors, or demountable 600mm flood defence barriers to defend lower level doorways and low windows if flood doors are not practical or other planning constraints prevent it.

6.4. It is also recommended that self-closing air bricks and demountable flood defence barriers to defend ground level doorways and low windows up to 600mm above finished ground floor level are installed if flood doors are not practical or other planning constraints prevent it.

6.5. Flood resistance measures (such as demountable flood barriers) are recommended to a maximum height of 600mm above ground level, as depths over 600mm can cause structural problems.

**Safe Escape:**

6.6. The NPPF requires a route of safe escape for all residents and uses to be provided from residential properties in Flood Zone 3. Safe escape is usually defined as being though slow-moving flood water no deeper than 25cm.

6.7. The proposed planning application is for alterations and extensions to the existing building to provide improved accommodation, and the site is located entirely within Flood Zone 1, therefore a route of safe escape is not required.

6.8. In the absence of safe escape, residents should follow the warning and evacuation procedure detailed in the following section.

**Flood Warning:**

6.9. As the UK's official weather service, the Met Office is responsible for issuing weather warnings, which warn of impacts caused by severe weather. The Met Office provide warnings up to seven days ahead for rain, thunderstorms, wind, snow, lightning, ice and fog.

6.10. Met Office weather warnings are available in a number of ways, which make it easy to get the very latest information wherever you are. These include the Met Office app and website, social media, email alerts, TV, radio and RSS.

6.11. It is recommended that the site owner sign up to the National Severe Weather Warning Service. More information can be found here: https://www.metoffice.gov.uk/weather/guides/warnings.

6.12. The Met Office issues weather warnings, through the National Severe Weather Warning Service, when severe weather has the potential to bring impacts to the UK. These warnings are given a colour (yellow, amber or red) depending on a combination of both the impact the weather may have and the likelihood of those impacts occurring.

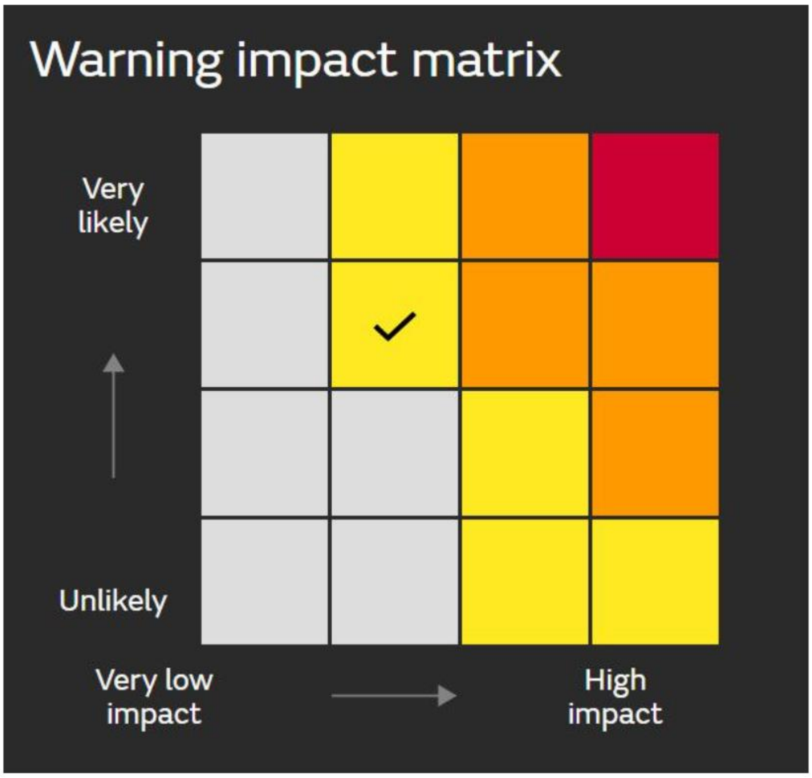


**Figure 12: Met Office Weather Warning Impact Matrix (Source: Met Office)**

6.13. Yellow Warning: Yellow warnings can be issued for a range of weather situations. Many are issued when it is likely that the weather will cause some low level impacts, including some disruption to travel in a few places. Many people may be able to continue with their daily routine, but there will be some that will be directly impacted and so it is important to assess if you could be affected. Other yellow warnings are issued when the weather could bring much more severe impacts to the majority of people but the certainty of those impacts occurring is much lower. It is important to read the content of yellow warnings to determine which weather situation is being covered by the yellow warning.

6.14. Amber Warning: There is an increased likelihood of impacts from severe weather, which could potentially disrupt your plans. This means there is the possibility of travel delays, road and rail closures, power cuts and the potential risk to life and property. You should think about changing your plans and taking action to protect yourself and your property. You may want to consider the impact of the weather on your family and your community and whether there is anything you need to do ahead of the severe weather to minimise the impact.

6.15. Red Warning: Dangerous weather is expected and, if you haven't already done so, you should take action now to keep yourself and others safe from the impact of the severe weather. It is very likely that there will be a risk to life, with substantial disruption to travel, energy supplies and possibly widespread damage to property and infrastructure. You should avoid travelling, where possible, and follow the advice of the emergency services and local authorities.

**Flood Plan:**

6.16. It is recommended that the applicant and future owners, occupiers and Landlords of the property prepare a flood plan to protect life and property during a flood event:

*Before a flood:*

- Find out if you are at risk of flooding.
- Find out if you can receive flood warnings.
- Prepare and keep a list of all your important contacts to hand or save them on your mobile phone.
- Think about what items you can move now and what you would want to move to safety during a flood such as pets, cars, furniture, and electrical equipment.
- Know how to turn off gas, electricity and water supplies.

- Prepare a flood kit of essential items and keep it handy. It can include copies of important documents, a torch, a battery-powered or wind-up radio, blankets and warm clothing, waterproofs, rubber gloves and a first aid kit including all essential medication.
- Consider buying flood protection products such as flood boards and airbrick covers to help reduce flood water getting into your property.

*During a flood:*

- Tune into your local radio station on a battery or wind-up radio.
- Fill jugs and saucepans with water.
- Grab your flood kit - if you have prepared one.
- Collect blankets, torch, first aid kit, medication and food.
- Move important documents, personal items, valuables, and lightweight belongings upstairs or to high shelves.
- Raise large items of furniture or put them in large bags if you have them.
- Move people, outdoor belongings, cars and pets to higher ground.
- Switch off water, gas and electricity at mains when water is about to enter your home. Do not touch sources of electricity when standing in water.
- Fit flood protection products, if you have them, for example flood boards, airbrick covers, sandbags.
- Put plugs in sinks and baths. Weigh them down with a pillowcase or plastic bag filled with soil.
- If you do not have non-return valves fitted, plug water inlet pipes with towels or cloths.
- Move your family and pets upstairs or to a high place with a means of escape.
- Listen to the advice of the emergency service and evacuate if told to do so.
- Avoid walking or driving through flood water. Six inches of fast-flowing water can knock over an adult and two feet of water can move a car.

*After a flood:*

- If you have flooded, contact your insurance company as soon as possible.
- Take photographs and videos of your damaged property as a record for your insurance company.
- If you do not have insurance, contact your local authority for information on grants and charities that may help you.
- Flood water can contain sewage, chemicals and animal waste. Always wear waterproof outerwear, including gloves, wellington boots and a face mask.
- Have your electrics, central heating and water checked by qualified engineers before switching them back on.

**Fluvial floodplain storage:**

6.17. The NPPF requires that where development is proposed in undefended areas of floodplain, which lie outside of the functional floodplain, the implications of ground raising operations for flood risk elsewhere needs to be considered. Raising existing ground levels may reduce the capacity of the floodplain to accommodate floodwater and increase the risk of flooding by either increasing the depth of flooding to existing properties at risk or by extending the floodplain to cover properties normally outside of the floodplain. Flood storage capacity can be maintained by lowering ground levels either within the curtilage of the development or elsewhere in the floodplain, in order to maintain at least the same volume of flood storage capacity within the floodplain.

6.18. In undefended tidal areas, raising ground levels is unlikely to impact on maximum tidal levels so the provision of compensatory storage should not be necessary.

6.19. For development in a defended flood risk area, the impact on residual flood risk to other properties needs to be considered. New development behind flood defences can increase the residual risk of flooding if the flood defences are breached or overtopped by changing the conveyance of the flow paths or by displacing flood water elsewhere. If the potential impact on residual risk is unacceptable then mitigation should be provided.

6.20. The site is situated in Flood Zone 1 when using the Environment Agency Flood Map for Planning (Rivers and Sea). No fluvial floodwater would be displaced by the proposed development.

## 7. Discussion and Conclusions:

7.1. This Flood Risk Assessment and Surface Water Drainage Strategy has been prepared by Unda Consulting Limited on behalf of Cherrytrees Care, in support of a planning application for alterations and extensions to the existing building to provide improved accommodation at Cherrytrees Care, 15-17 Claremont Avenue, Woking, GU22 7SF. This report assesses flood risk and surface water drainage for the proposed development.

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7.4. This strategy will solely focus on the proposed increase in roof area.

7.5. The 1:50,000 BGS map shows the site to be located upon the bedrock of Bagshot Formation - Sand.

7.6. BGS mapping indicates that the site is not underlined by superficial deposits.

7.7. The soil type taken from the BGS UKSO Soil Map Viewer, shows a soil parent material of Fluvial Sands and Gravels with a soil texture of sandy to sandy loam.

7.8. The published Environment Agency Source Protection Zones map shows the site is not located within a Groundwater Source Protection Zone.

7.9. The Hoe stream is located approximately 172m south east of the site.

*Flood Risk Discussion*

7.10. The proposed site is located within Flood Zone 1 (Low Probability) which means it is defined as land having less than a 1:1000 annual probability of fluvial flooding.

7.11. According to the EA, the site has not previously been flooded.

7.12. The EA Risk of Flooding from Surface Water Map suggests that the area of the site being developed lies within an area of "Very Low" to "Medium" risk of flooding from surface water.

7.13. The Woking Borough Council SFRA (2015) indicates that the site is located within area with limited potential for groundwater flooding to occur.

7.14. According to the Woking Borough Council SFRA (2015) the postcode area GU227 has had 7-9 records of sewer flooding from the past 20 years.

*Surface Water Drainage Strategy Discussion*

7.15. The 1:50,000 BGS map shows the site to be located upon the bedrock of Bagshot Formation – Sand. Therefore, infiltration SuDS are considered feasible at the site.

7.16. Given the underlying strata an assumed minimum infiltration rate of $1 \times 10^{-5}$ m/s has been utilised for this assessment. However, given the underlying bedrock geology the true infiltration rate is likely to be greater than that used within this assessment.

7.17. Greenfield runoff rates for the area of the site being attenuated have been calculated as 0.0 l/s for the 1:1 annual runoff event, 0.1 l/s for the 1:30 year event and 0.1 l/s for the 1:100-year event. Refer to calculations in appendix.

7.18. Post development the total increase in roof area will amount to approximately $72m^2$. Therefore, $72m^2$ of roof area will discharge into a cellular storage soakaway.

7.19. All new ground surfaces will be of permeable construction.

7.20. The surface water runoff from $72m^2$ of roof area will discharge into the cellular storage soakaway.

7.21. The proposed development comprises some 72m$^2$ of potentially impermeable surfacing. In order to comply with CIRIA C753 The SuDS Manual, a 10% allowance will be added to take into account future urban creep. Applying a 10% allowance to all new roof area (72m$^2$) gives a value of 79.2m$^2$. Therefore, all drainage calculations have been made on the basis of a total impermeable area of 79.2m$^2$.

7.22. Preliminary calculations indicate that sufficient storage required to attenuate runoff from the proposed impermeable areas (79.2m$^2$) arising from the critical 1:100 year + 45% climate change event can be provided within cellular storage of dimensions 14m$^2$ x 0.40m deep x 0.95 (voids).

7.23. Preliminary calculations indicate that approximately 5.32m$^3$ of storage is required to attenuate the runoff for all storms up to and including the 1:100 year + 45% climate change event.

7.24. *Please note that the levels and locations of the cellular storage within the Causeway calculations are arbitrary for modelling purposes.*

7.25. Runoff from roof areas is considered to be uncontaminated and does not warrant any form of treatment process to improve water quality. Nevertheless, it is suggested to include debris / sediment traps on any new drainage.

7.26. Should the onsite drainage system fail under extreme rainfall events or blockage, flooding may occur within the site. In the event of the drainage system failure, the runoff flow can be managed through detailing the new external levels to direct water away from structures.

7.27. This drainage strategy has been undertaken in accordance with the principles set out in NPPF. We can conclude that providing the development adheres to the conditions advised above, the said development proposals can be accommodated without increasing flood risk within the locality in accordance with objectives set by Central Government and the EA.

Unda Consulting Limited

December 2023

# 8. Appendix

**A - Proposed Plans:**

- Proposed Site Plans – Amber Architecture;
- Topographical Survey – Ground Surveys Ltd.

**B– Causeway Calculations:**

- IH124 Pre-Development Greenfield Runoff Calculations for the area of the site being attenuated;
- Cellular Storage Soakaway (Depth/Area/Inf Area Storage Structure) Calculations.

**C - Drainage Layout Plans:**

- Proposed Site Drainage Layout.


AMBER ARCHITECTURE

Amber Architecture Limited
30 Barrington Drive
Harefield
Middlesex
UB9 6RL

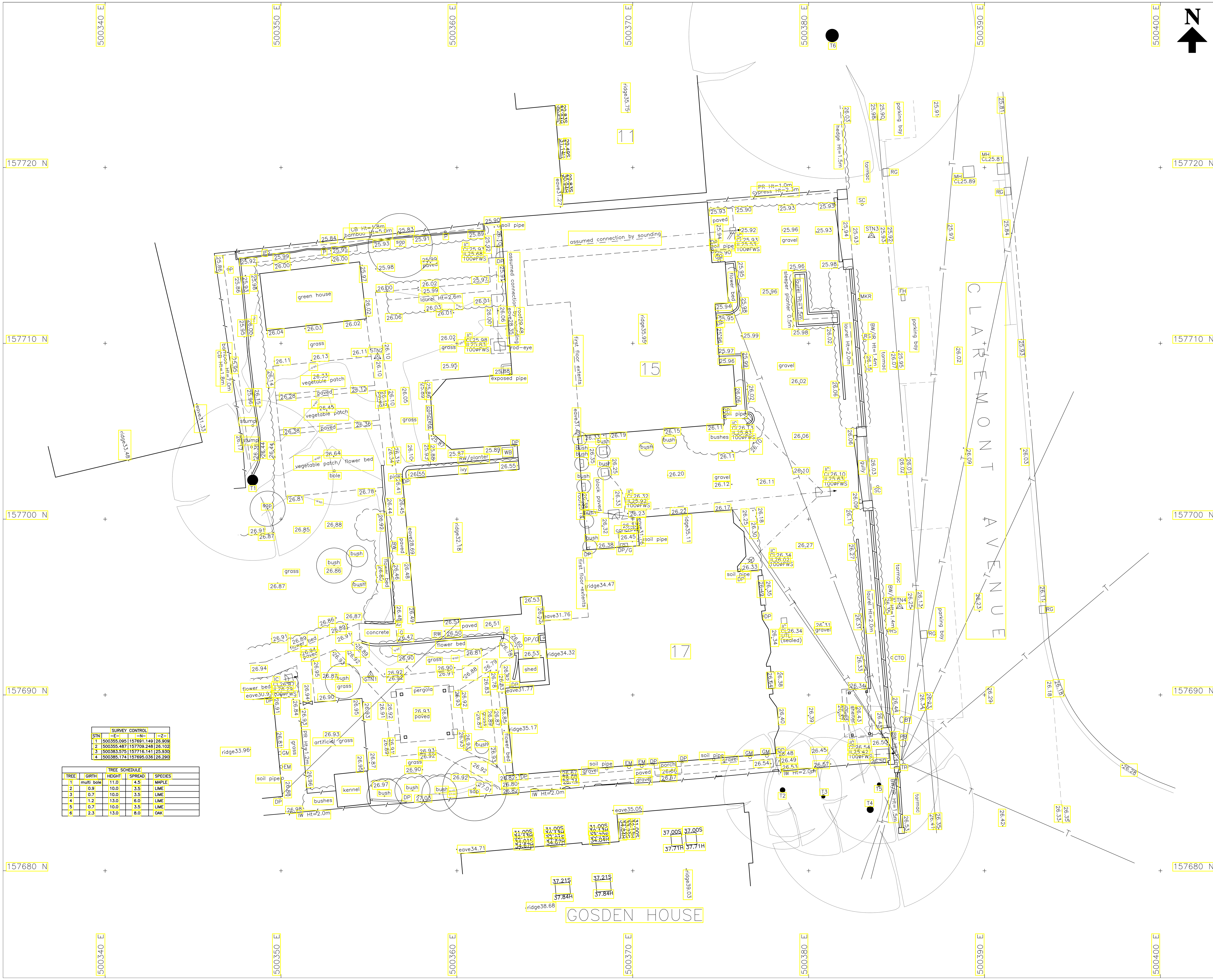
CHERRYTREES CARE HOME
15-17 CLAREMONT AVENUE
WOKING
GU22 7SF

SITE BLOCK PLAN

1:200

25.11.2023

6088 / 02p2




| SURVEY CONTROL | | | |
|---|---|---|---|
| STN | -E- | -N- | -Z- |
| 1 | 500355.095 | 157691.149 | 26.909 |
| 2 | 500355.487 | 157709.248 | 26.102 |
| 3 | 500383.575 | 157716.141 | 25.930 |
| 4 | 500385.174 | 157695.036 | 26.290 |

| TREE SCHEDULE | | | | |
|---|---|---|---|---|
| TREE | GIRTH | HEIGHT | SPREAD | SPECIES |
| 1 | multi bole | 11.0 | 4.5 | MAPLE |
| 2 | 0.9 | 10.0 | 3.5 | LIME |
| 3 | 0.7 | 10.0 | 3.5 | LIME |
| 4 | 1.2 | 13.0 | 6.0 | LIME |
| 5 | 0.7 | 10.0 | 3.5 | LIME |
| 6 | 2.3 | 13.0 | 8.0 | OAK |

## LEGEND

### FEATURE STYLES

SURVEY CONTROL
FENCE
HEDGE
FWS
SWS
POWER LINE (OVERHEAD)
TELECOM LINE (OVERHEAD)
EMBANKMENT

### FENCE TYPES

| | |
|---|---|
| BWR | Barbed Wire |
| CB | Close Board |
| CI | Corrugated Iron |
| CL | Chain Link |
| CP | Chestnut Paling |
| CPL | Conc Panel |
| CW | Chicken Wire |
| IW | Interwoven |
| IR | Iron Railing |
| OB | Openboard |
| PR | Post and rail |
| PW | Post and Wire |

### FEATURE ABREVIATIONS

| | |
|---|---|
| BS | Bus Stop |
| BT | Telecom Cover |
| BTB | Telecom Box/Booth |
| BW | Brick Wall |
| CB | Concrete Bollard |
| CL | Cover Level |
| CTO | Cable TV Outlet |
| EB | Electric Box |
| EC | Electric Cover |
| EM | Electric Meter |
| ELB | Electric Light Bollard |
| EP | Electricity Pole |
| FH | Fire Hydrant |
| FL | Floor level |
| G | Gully |
| GM | Gas Meter |
| GV | Gas Valve |
| IC | Inspection Chamber |
| IL | Invert Level |
| KLS | Keep Left Sign |
| KO | Kerb Offset |
| LP | Lamp Post |
| MB | Metal Bollard |
| MH | Manhole |
| MKR | Marker |
| P | Post |
| PB | Post Box |
| RG | Road Gully |
| RNB | Road Name Board |
| RS | Road Sign |
| RW | Retaining Wall |
| SC | Stopcock |
| SV | Sluice Valve |
| TL | Traffic Light |
| TP | Telegraph Pole |
| UTL | Unable To Lift Cover |
| WB | Water Butt |
| WL | Water Level |
| WM | Water Meter |

DATUM
GRID – ORDNANCE SURVEY NATIONAL GRID (OSTN15)
LEVELS – ORDNANCE SURVEY (OSGM15)

## NOTES

Surveyed boundaries are not necessarily the site legal boundaries. Client should refer to the relevant Land Registry document for confirmation of title.

Every effort has been made to show all features, however those hidden or obscured at the time of survey cannot be shown.

Tree canopy measured values are written as maximium spreads. Tree species and condition to be confirmed by an arboriculturist

Drainage and service covers that were buried, obscured or not visible at the time of the survey cannot be shown. Sewer connections between manholes are assumed to be straight and only pipes visible from the cover are shown.


SURVEYED BY
Ground Surveys ltd
land & engineering surveyors

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CLIENT
AMBER ARCHITECTURE LTD

SITE
CHERRYTREES CARE HOME
CLAREMONT AVENUE
WOKING
SURREY
GU22 7SF

TITLE
SITE SURVEY

AS EXISTING

| SCALE | DATE |
|---|---|
| 1/100 (A1) | OCT 2023 |
| DRAWING No. 01 | JOB No. 7866 |

## Design Settings

| | | | |
|---|---|---|---|
| Rainfall Methodology | FSR | Maximum Time of Concentration (mins) | 30.00 |
| Return Period (years) | 100 | Maximum Rainfall (mm/hr) | 50.0 |
| Additional Flow (%) | 0 | Minimum Velocity (m/s) | 1.00 |
| FSR Region | England and Wales | Connection Type | Level Soffits |
| M5-60 (mm) | 20.000 | Minimum Backdrop Height (m) | 0.200 |
| Ratio-R | 0.400 | Preferred Cover Depth (m) | 1.200 |
| CV | 0.750 | Include Intermediate Ground | ✓ |
| Time of Entry (mins) | 4.00 | Enforce best practice design rules | ✓ |

## Nodes

| Name | Area (ha) | T of E (mins) | Cover Level (m) | Easting (m) | Northing (m) | Depth (m) |
|---|---|---|---|---|---|---|
| MH1 | 0.008 | 4.00 | 10.000 | 100.000 | 100.000 | 0.401 |

## Simulation Settings

| | | | |
|---|---|---|---|
| Rainfall Methodology | FSR | Drain Down Time (mins) | 240 |
| FSR Region | England and Wales | Additional Storage (m³/ha) | 0.0 |
| M5-60 (mm) | 20.000 | Check Discharge Rate(s) | ✓ |
| Ratio-R | 0.400 | 1 year (l/s) | 0.0 |
| Summer CV | 0.750 | 30 year (l/s) | 0.1 |
| Winter CV | 0.840 | 100 year (l/s) | 0.1 |
| Analysis Speed | Normal | Check Discharge Volume | x |
| Skip Steady State | x | | |

**Storm Durations**

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

| Return Period (years) | Climate Change (CC %) | Additional Area (A %) | Additional Flow (Q %) |
|---|---|---|---|
| 100 | 45 | 0 | 0 |

## Pre-development Discharge Rate

| | | | |
|---|---|---|---|
| Site Makeup | Greenfield | Growth Factor 30 year | 2.40 |
| Greenfield Method | IH124 | Growth Factor 100 year | 3.19 |
| Positively Drained Area (ha) | 0.007 | Betterment (%) | 0 |
| SAAR (mm) | 649 | QBar | 0.0 |
| Soil Index | 3 | Q 1 year (l/s) | 0.0 |
| SPR | 0.40 | Q 30 year (l/s) | 0.1 |
| Region | 6 | Q 100 year (l/s) | 0.1 |
| Growth Factor 1 year | 0.85 | | |

## Node MH1 Depth/Area Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.03600 | Safety Factor | 2.0 | Invert Level (m) | 9.599 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity | 0.95 | Time to half empty (mins) | 160 |

| Depth (m) | Area (m²) | Inf Area (m²) | Depth (m) | Area (m²) | Inf Area (m²) | Depth (m) | Area (m²) | Inf Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 14.0 | 14.0 | 0.400 | 14.0 | 14.0 | 0.401 | 0.0 | 14.0 |

**Results for 100 year +45% CC 15 minute summer. 255 minute analysis at 1 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 15 minute summer | MH1 | 19 | 9.756 | 0.157 | 5.5 | 2.0885 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 15 minute summer | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 15 minute winter. 255 minute analysis at 1 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 15 minute winter | MH1 | 19 | 9.775 | 0.176 | 5.5 | 2.3389 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
| --- | --- | --- | --- |
| 15 minute winter | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 30 minute summer. 270 minute analysis at 1 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 30 minute summer | MH1 | 33 | 9.802 | 0.203 | 4.8 | 2.7039 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 30 minute summer | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 30 minute winter. 270 minute analysis at 1 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 30 minute winter | MH1 | 33 | 9.828 | 0.229 | 4.2 | 3.0488 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 30 minute winter | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 60 minute summer. 300 minute analysis at 1 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 60 minute summer | MH1 | 63 | 9.848 | 0.249 | 3.5 | 3.3175 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 60 minute summer | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 60 minute winter. 300 minute analysis at 1 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 60 minute winter | MH1 | 62 | 9.882 | 0.283 | 2.7 | 3.7618 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 60 minute winter | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 120 minute summer. 360 minute analysis at 2 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 120 minute summer | MH1 | 122 | 9.888 | 0.289 | 2.2 | 3.8391 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 120 minute summer | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 120 minute winter. 360 minute analysis at 2 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 120 minute winter | MH1 | 120 | 9.927 | 0.328 | 1.7 | 4.3560 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 120 minute winter | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 180 minute summer. 420 minute analysis at 4 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 180 minute summer | MH1 | 180 | 9.911 | 0.312 | 1.7 | 4.1514 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 180 minute summer | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 180 minute winter. 420 minute analysis at 4 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 180 minute winter | MH1 | 176 | 9.933 | 0.334 | 1.2 | 4.4409 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 180 minute winter | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 240 minute summer. 480 minute analysis at 4 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol ($m^3$) | Flood ($m^3$) | Status |
|---|---|---|---|---|---|---|---|---|
| 240 minute summer | MH1 | 240 | 9.903 | 0.304 | 1.3 | 4.0403 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 240 minute summer | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 240 minute winter. 480 minute analysis at 4 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 240 minute winter | MH1 | 236 | 9.963 | 0.364 | 1.0 | 4.8397 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 240 minute winter | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 360 minute summer. 600 minute analysis at 8 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 360 minute summer | MH1 | 360 | 9.917 | 0.318 | 1.0 | 4.2279 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 360 minute summer | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 360 minute winter. 600 minute analysis at 8 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 360 minute winter | MH1 | 352 | 9.960 | 0.361 | 0.7 | 4.7987 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 360 minute winter | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 480 minute summer. 720 minute analysis at 8 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol ($m^3$) | Flood ($m^3$) | Status |
|---|---|---|---|---|---|---|---|---|
| 480 minute summer | MH1 | 480 | 9.932 | 0.333 | 0.8 | 4.4272 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 480 minute summer | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 480 minute winter. 720 minute analysis at 8 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 480 minute winter | MH1 | 464 | 9.969 | 0.370 | 0.6 | 4.9250 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 480 minute winter | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 600 minute summer. 840 minute analysis at 15 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 600 minute summer | MH1 | 600 | 9.919 | 0.320 | 0.6 | 4.2550 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 600 minute summer | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 600 minute winter. 840 minute analysis at 15 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 600 minute winter | MH1 | 585 | 9.969 | 0.370 | 0.5 | 4.9264 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 600 minute winter | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 720 minute summer. 960 minute analysis at 15 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 720 minute summer | MH1 | 690 | 9.942 | 0.343 | 0.5 | 4.5563 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
| --- | --- | --- | --- |
| 720 minute summer | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 720 minute winter. 960 minute analysis at 15 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 720 minute winter | MH1 | 690 | 9.969 | 0.370 | 0.4 | 4.9155 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 720 minute winter | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 960 minute summer. 1200 minute analysis at 15 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 960 minute summer | MH1 | 795 | 9.910 | 0.311 | 0.4 | 4.1423 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 960 minute summer | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 960 minute winter. 1200 minute analysis at 15 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 960 minute winter | MH1 | 900 | 9.966 | 0.367 | 0.3 | 4.8803 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 960 minute winter | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 1440 minute summer. 1680 minute analysis at 30 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 1440 minute summer | MH1 | 1050 | 9.873 | 0.274 | 0.3 | 3.6425 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 1440 minute summer | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 1440 minute winter. 1680 minute analysis at 30 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 1440 minute winter | MH1 | 1110 | 9.889 | 0.290 | 0.2 | 3.8585 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 1440 minute winter | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 2160 minute summer. 2400 minute analysis at 60 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 2160 minute summer | MH1 | 1440 | 9.825 | 0.226 | 0.2 | 3.0022 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 2160 minute summer | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 2160 minute winter. 2400 minute analysis at 60 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol ($m^3$) | Flood ($m^3$) | Status |
|---|---|---|---|---|---|---|---|---|
| 2160 minute winter | MH1 | 1560 | 9.857 | 0.258 | 0.2 | 3.4342 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 2160 minute winter | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 2880 minute summer. 3120 minute analysis at 60 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol ($m^3$) | Flood ($m^3$) | Status |
|---|---|---|---|---|---|---|---|---|
| 2880 minute summer | MH1 | 1860 | 9.787 | 0.188 | 0.2 | 2.4982 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 2880 minute summer | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 2880 minute winter. 3120 minute analysis at 60 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol ($m^3$) | Flood ($m^3$) | Status |
|---|---|---|---|---|---|---|---|---|
| 2880 minute winter | MH1 | 1980 | 9.765 | 0.166 | 0.1 | 2.2102 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 2880 minute winter | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 4320 minute summer. 4560 minute analysis at 60 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 4320 minute summer | MH1 | 2640 | 9.749 | 0.150 | 0.1 | 1.9942 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 4320 minute summer | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 4320 minute winter. 4560 minute analysis at 60 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 4320 minute winter | MH1 | 2820 | 9.798 | 0.199 | 0.1 | 2.6422 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 4320 minute winter | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 5760 minute summer. 6000 minute analysis at 60 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 5760 minute summer | MH1 | 3360 | 9.749 | 0.150 | 0.1 | 1.9942 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 5760 minute summer | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 5760 minute winter. 6000 minute analysis at 60 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol ($m^3$) | Flood ($m^3$) | Status |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 5760 minute winter | MH1 | 3540 | 9.798 | 0.199 | 0.1 | 2.6422 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
| --- | --- | --- | --- |
| 5760 minute winter | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 7200 minute summer. 7440 minute analysis at 60 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 7200 minute summer | MH1 | 4080 | 9.749 | 0.150 | 0.1 | 1.9942 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 7200 minute summer | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 7200 minute winter. 7440 minute analysis at 60 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 7200 minute winter | MH1 | 4200 | 9.781 | 0.182 | 0.1 | 2.4262 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 7200 minute winter | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 8640 minute summer. 8880 minute analysis at 60 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 8640 minute summer | MH1 | 4740 | 9.733 | 0.134 | 0.1 | 1.7782 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 8640 minute summer | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 8640 minute winter. 8880 minute analysis at 60 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 8640 minute winter | MH1 | 4740 | 9.733 | 0.134 | 0.1 | 1.7782 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 8640 minute winter | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 10080 minute summer. 10320 minute analysis at 60 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 10080 minute summer | MH1 | 5460 | 9.733 | 0.134 | 0.1 | 1.7782 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 10080 minute summer | MH1 | Infiltration | 0.1 |

**Results for 100 year +45% CC 10080 minute winter. 10320 minute analysis at 60 minute timestep. Mass balance: 100.00%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 10080 minute winter | MH1 | 60 | 9.599 | 0.000 | 0.0 | 0.0000 | 0.0000 | OK |

| Link Event | US Node | Link | Outflow (l/s) |
|---|---|---|---|
| 10080 minute winter | MH1 | Infiltration | 0.0 |

**Notes:**

1. Discharge of surface water via a cellular storage soakaway. Preliminary calculations indicate that sufficient storage required to attenuate runoff arising from the proposed impermeable areas being attenuated, during the critical 1 in 100 year + 45% Climate Change event, can be provided within a cellular storage soakaway of dimensions 14$m^2$ x 0.4m deep x 0.95 (voids).
2. Onsite levels will be adjusted to provide a sufficient design exceedance route.

**Legend**

- Proposed Cellular Storage Soakaway
- Proposed Surface Water Pipework
- Proposed Surface Water Downpipe
- Design Exceedance Route


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**Client:** Cherrytrees Care

**Site Address:**
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Woking
GU22 7SF

| Job Reference: | Date: |
|---|---|
| 93454-Munro-ClaremontAv | 7-Dec-23 |
| **Drawing Number:** | **Revision:** |
| 93454-01 | v1.1 |

| Designed by: | Drawn by: | Checked by: |
|---|---|---|
| AR | AR | EB |

**Scale:** 1:100@A2

**Disclaimer:** The drawings provided are for planning purposes only.