

LAND NORTH OF WHYCHURCH FARM AND WEST OF CRUDWELL ROAD
FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

GLEESON LAND LTD

26 FEBRUARY 2025



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Appendices

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1.0 Introduction

Context

- 1.1. This Flood Risk Assessment (FRA) has been prepared by Abley Letchford Partnership Ltd (ALP), on behalf of Gleasons Land Ltd to support an outline planning permission for residential development of 149 dwellings, including the creation of new vehicular access with footways, public open space, children's play areas, allotments, community orchard, landscape planting, surface water attenuation, and associated infrastructure on land south of Filands and to the north of Whychurch Farm, Malmesbury.

Development Proposals

- 1.2. The proposals are for an outline planning application (with all matters reserved except access) for a residential development, including the construction of up to 149 dwellings, new vehicular access with footways and cycleways, public open space, landscape and associated infrastructure. An Illustrative Masterplan is included within **Appendix A**.

Requirement for a Flood Risk Assessment

- 1.3. The requirement for a FRA is set out in Section 14 of the revised National Planning Policy Framework (NPPF) as revised in December 2024.
- 1.4. The footnote accompanying Paragraph 181 states:
'A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.'
- 1.5. The site is a greenfield site that comprises of farmland with established hedges. The area of the site is approximately 12 hectares. As the site area extends greater than 1 hectare, a site-specific flood risk assessment is required. To comply with the requirements of the NPPF, matters related to flood risk and drainage are addressed within this report.

Report Aim and Formation

- 1.6. The principal aims of this report are to demonstrate that the proposed development complies with national and local planning policy in respect to flood risk and to demonstrate that a suitable drainage strategy can be provided as part of development.
- 1.7. This report will also summarise the impacts the development could have on flood risk to the surrounding area and outlines the mitigation strategies that will be implemented to minimise this risk.
- 1.8. The drainage design embraces the guiding principles of Sustainable Drainage Systems (SuDS) which are central to the design of the surface water drainage strategy for the proposed development.



Report Structure

1.9. This report addresses the requirements of revised NPPF and considers the following aspects:

- Section 2: Policy and Sources of Information – a review of policy relevant to the assessment and sources of information used to inform the assessment.
- Section 3: Site Setting – a description of the site location, topography, geology and hydrology.
- Section 4: Overview of Flood Risk – a review of data for flooding from all sources to determine the baseline flood risk to the site and an assessment of the impacts of the development on flood risk.
- Section 5: Sequential Test and Exception Test – a description of the proposed development and a classification of the vulnerability in the context of the Sequential Test and Exception Test.
- Section 6: Flood Risk Mitigation – the mitigation measures implemented to manage the potential flood risk to the development.
- Sections 7 and 8: Drainage Strategy – a summary of appropriate strategies to manage the surface water and foul water from the site in the post development scenario.
- Section 9: Conclusion – a summary of the development proposals in the context of site vulnerability and the requirements of the NPPF.

2.0 Policy and Sources of Information

Introduction

- 2.1. This chapter provides a review of policy relevant to the assessment and the available information on all sources of flood risk.

National Planning Policy

- 2.2. National Policy in relation to flood risk is set out in Section 14 of the National Planning Policy Framework, Dec 2024 (NPPF) and Planning Practice Guidance ID:7 for Flood Risk and Coastal Change, Aug 2022 (PPG). Flood Risk is discussed at Paragraphs 170 to 182 of the NPPF.
- 2.3. Paragraphs 173 to 176 discuss the sequential approach with respect to individual applications. Paragraph 174 refers to the Strategic Flood Risk Assessment (SFRA) that would form the basis of applying the Sequential Test for local authorities to allocate developments, whilst Paragraphs 177-179 relate to Exception Tests.
- 2.4. Paragraph 181 discusses the determination of planning applications stating:
- ‘When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:*
- *Within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location;*
 - *The development is appropriately flood resistant and resilient, such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;*
 - *It incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*
 - *Any residual risk can be safely managed; and*
 - *Safe access and escape routes are included where appropriate, as part of an agreed emergency plan.’*
- 2.5. The development would be classed as a major development providing more than 10 homes and the site is greater than 0.5 hectares. Paragraph 182 states:

‘Applications which could affect drainage on or around the site should incorporate sustainable drainage systems to control flow rates and reduce volumes of runoff, and which are proportionate to the nature and scale of the proposal. These should provide multifunctional benefits wherever possible, through facilitating improvements in water quality and biodiversity, as well as benefits for amenity. Sustainable drainage systems provided as part of proposals for major development should:



- a) Take account of advice from the Lead Local Flood Authority;
- b) Have appropriate proposed minimum operational standards;
- c) Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and

Local policy

- 2.6. The Wiltshire Council (WC) Core Strategy Core Policy 67 'Flood Risk' sets out how flood risk and surface water drainage should be addressed in planning. The flood risk element of Core Policy 67 states:

'Development proposed in Flood Zones 2 and 3 as identified within the Strategic Flood Risk Assessment will need to refer to the Strategic Housing Land Availability Assessment when providing evidence to the local planning authority in order to apply the sequential test in line with the requirements of national policy and establish best practice.'

Environment Agency

- 2.7. The Flood and Water Management Act (2010) provides the Environment Agency (EA) a strategic overview role for all forms of flooding and coastal erosion. They also have direct responsibility for the prevention, mitigation and remediation of flood damage for main rivers and coastal areas. The EA is a statutory consultee in relation to flood risk and planning dependent upon criteria.
- 2.8. The EA Flood Map for Planning, EA Long Term Flood Risk Mapping and the Catchment Data Explorer websites have been interrogated in respect to flood risk mapping and sources of data.

Local Authorities

- 2.9. The site lies within the administrative area of Wiltshire Council (WC). WC is the Local Planning Authority (LPA) and WC is the Lead Local Flood Authority (LLFA).
- 2.10. Planning guidance published by WC regarding flood risk was referred to in order to assess the methodology best suited to this FRA. The following key documents were reviewed:
- WC Core Strategy, Core Policy 67 'Flood Risk' (adopted January 2015);
 - WC Local Plan (dated January 2015);
 - WC Local Flood Risk Management Strategy (dated November 2014);
 - WC Preliminary Flood Risk Assessment (PFRA) (dated May 2011) and PFRA addendum (dated 2017);
 - WC Level 1 Strategic Flood Risk Assessment (SFRA) (dated November 2024)
- 2.11. WC became the LLFA under the Flood and Water Management Act 2010. WC provide guidance to assess, manage and inform flood risk.
- 2.12. As LLFA, WC provides a guidance note for developers called 'Drainage Betterment Strategy', dated June 2024 to assist developers seeking planning permission for new sites by setting criteria to be met as part of the design of the drainage strategy and a list of documentation to be presented in the associated FRA.



- 2.13. WC has permissive rights over any Ordinary Watercourses including land drainage ditches. If any work is required within the watercourse (improvements or crossings) then approval from the LLFA is required under the Land Drainage Act 1991.

Local Water Authority

- 2.14. Wessex Water is responsible for the supply of clean water in the Malmesbury area. Wessex Water is responsible for the disposal of wastewater for the Malmesbury area.
- 2.15. Information with regards to sewer and water main flooding contained within the SFRA has been reviewed as part of this FRA. All Water Companies have a statutory obligation to maintain a register of properties and areas which are at risk of flooding from the public sewerage system and is shown on the DG5 Flood Register.

Other Sources of Information

- 2.16. A desktop study of the site was carried out using the following websites to ascertain local features, hydrology and soil characteristics:
- DEFRA's Magic Map portal;
 - British Geological Survey (BGS) 'Geology of Britain' online viewer; and
 - Cranfield University 'Soilscapes' portal
- 2.17. A site walkover was carried out on 18/10/2024 which allowed observations of the surface water flow routes, highway ditches, and ditches within the site boundary.
- 2.18. Guidance with respect to Sustainable Drainage Systems (SuDS) is contained within DEFRA document Sustainable Drainage Systems, Non-statutory technical standards for sustainable drainage systems March 2015, CIRIA C753 The SuDS Manual and within the NPPF Planning Practice Guidance (PPG) – 'Flood Risk and Coastal Change'.
- 2.19. Additional guidance on development and flood risk is contained within CIRIA C624 Development and Flood Risk – Guidance for the Construction Industry which identifies several key aims for a development to ensure it is sustainable in flood risk terms.

3.0 Site Setting

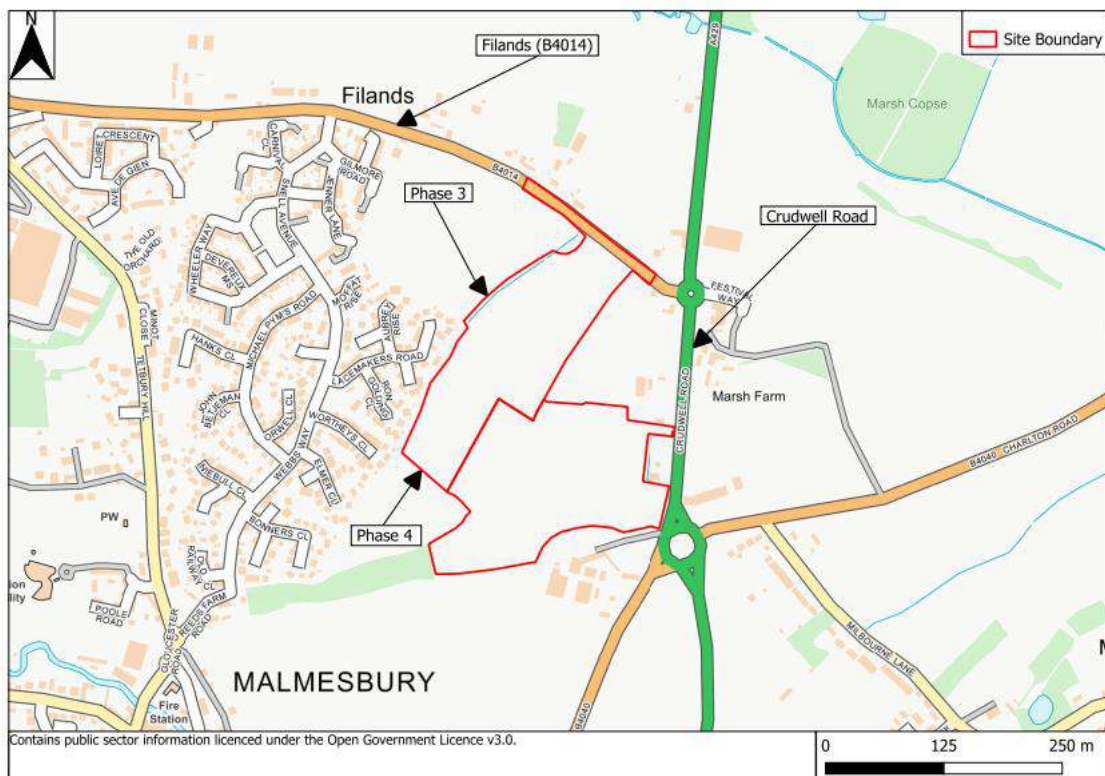
Introduction

- 3.1. This chapter provides a description of the site location, its topography, hydrological context, geology and hydrogeology.

Site Location

- 3.2. The site is located south of Filand's Road and west of Crudwell Road (A429). The nearest postcode is SN16 9XZ. The site centre grid reference is 393516E, 188342N. The site location is shown in **Figure 1**.

Figure 1 – Site Location

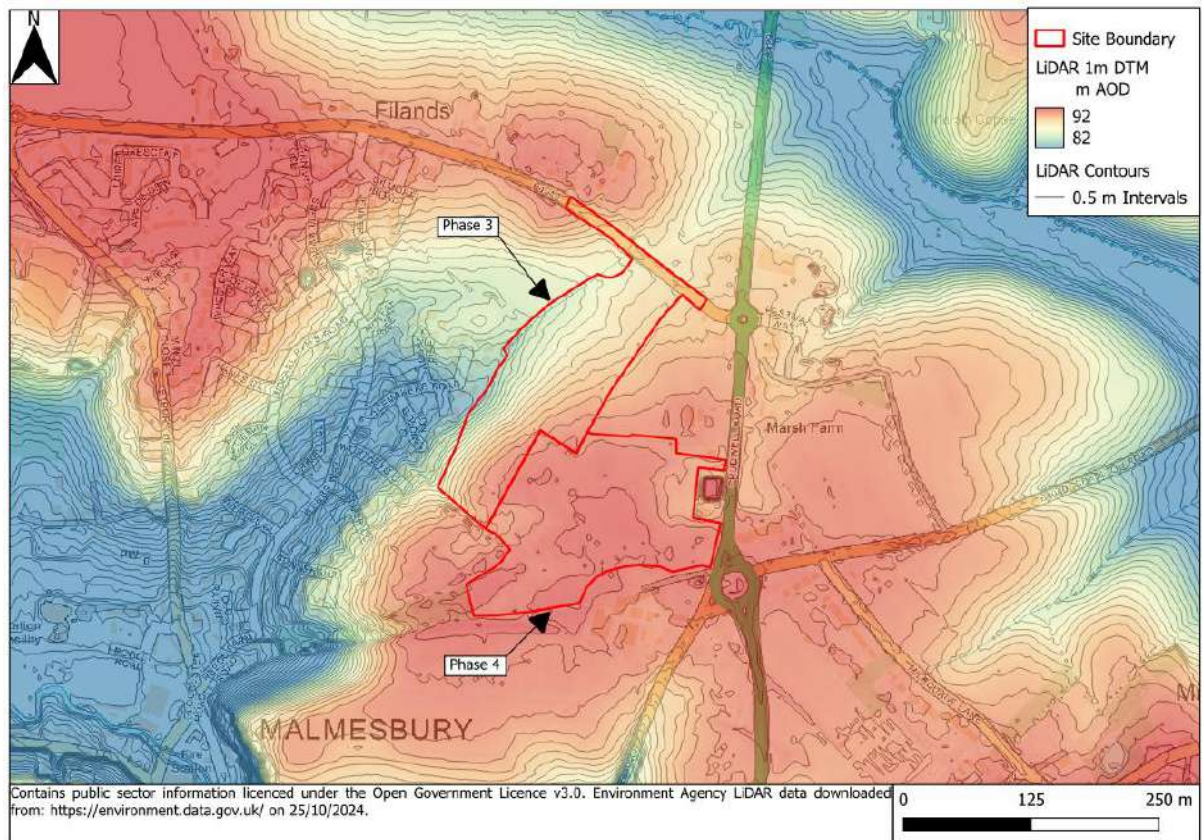


- 3.3. The site is separated into Phase 3 and Phase 4. Both phases are located northeast of Malmesbury and located east of the adjacent development. Phase 3 is located north of Phase 4, as shown in **Figure 1**. Phase 3 is located south of Filand's Road (B4014). The site is bounded by farmland and defined hedges. Phase 4 is located west of Crudwell Road (A429) and is west of Marsh Farm. Phase 4 is also bounded by farmland and defined hedges.
- 3.4. The site covers an area of approximately 12 hectares. Phase 3 covers an area of approximately 6 hectares. Phase 4 covers an area of approximately 6 hectares.

Topography

- 3.5. The ground levels across the site are shown by LiDAR in **Figure 2**.

Figure 2 – Site Topography

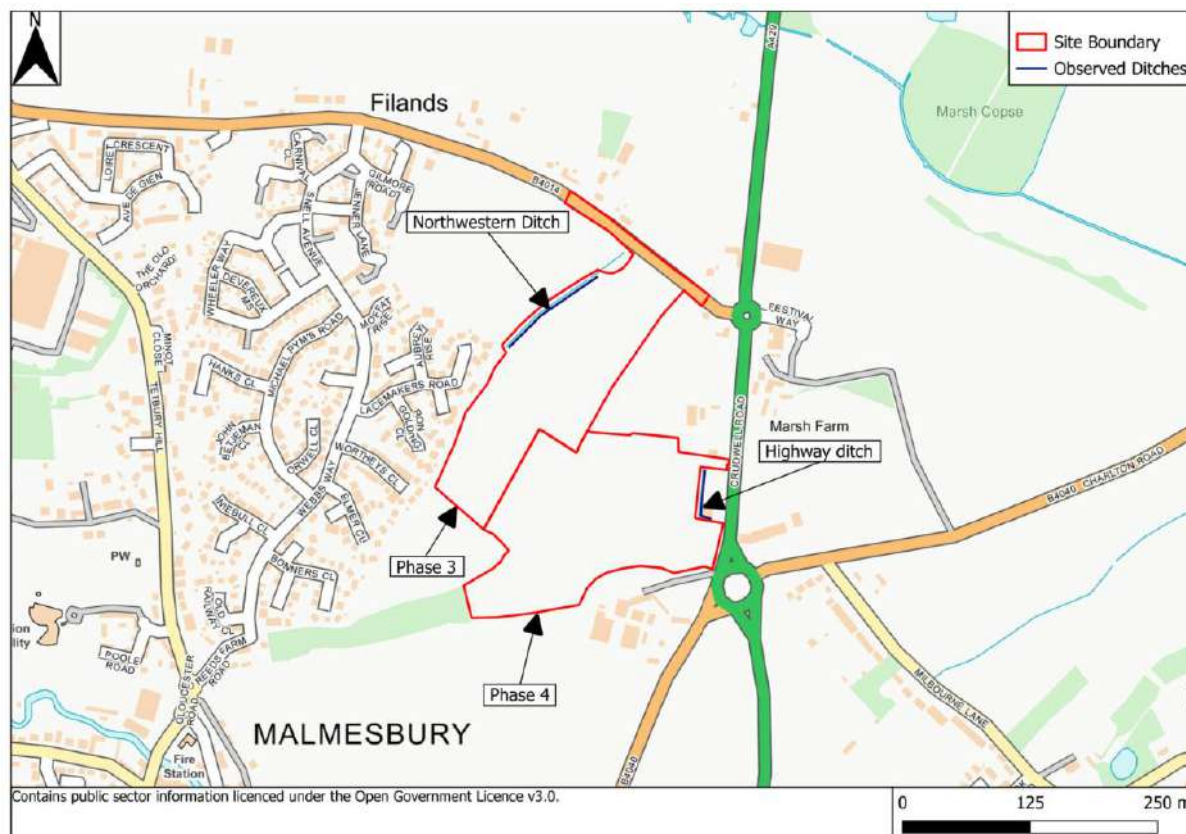


- 3.6. The LiDAR shows the ground levels slope upwards from northwest to southeast. Ground levels across the site are between 83.2m AOD and 91.7m AOD. The highest ground levels are in the central part of Phase 4 with an elevation of 91.7m AOD. The lowest ground levels are along the western boundary of Phase 3 which has an elevation of 83.2m AOD.
- 3.7. A topographical survey of the site has been carried out. A copy of the topographical survey is included in **Appendix A**. The survey data generally agrees with the LiDAR data.

Watercourses and Ditches

- 3.8. The nearest Main River is the Tenbury Avon, which is located 700m to the southwest of phase 4. Ditches were observed within the northwestern part of Phase 3 and outside the site boundary along Crudwell Road (Highway ditch). The locations of the ditches are shown in **Figure 3**.

Figure 3-Ditch locations



- 3.9. **Figure 4 and Figure 5** show photographs of the ditches within and surrounding the site boundary during the site walkover which was carried out on the 18/10/2024.

Figure 4- Photograph of the Northwestern Ditch



- 3.10. **Figure 4** shows a vegetated ditch inside a hedgerow. The ditch is approximately 40cm in width and 1m in depth.

Figure 5– Photograph of the Highway Ditch along Crudwell Road



3.11. **Figure 5** shows a shallow vegetated ditch. The ditch is approximately 0.5m in width and 30cm in depth.



Surface and Foul Water Sewers

- 3.12. Sewer asset records obtained from Wessex Water shows that there is a public foul sewer within the northwestern part of phase 3 from Filand's Road to the adjacent housing estate. There is a water mains distribution within the site coming from the water tower, which is adjacent to the northeastern part of the site in Phase 4. The road network immediately adjoining the Phase 4 side of the site contains foul manholes, public foul sewers, water mains distribution, and highway drains.
- 3.13. A copy of the Wessex Water sewer asset plan is included within **Appendix A**.

Geology and Hydrogeology

- 3.14. The British Geological Survey (BGS) 'Geology of Britain' online viewer indicates that the geology underlying the site within Phase 3 is Kellaways Clay Member-Mudstone. The majority of Phase 4 is underlain by Oxford Clay Formation - Mudstone. The northeastern corner of the site is underlain by Kellaways Clay Member-Mudstone.
- 3.15. The Cranfield University 'Soilscapes' online viewer indicates that the both Phases 3 and 4 is underlain by slowly impermeable seasonally wet slightly acidic but base-rich loamy and clayey soils.
- 3.16. The DEFRA Magic Map online viewer indicates that the site lies within a Groundwater Source Protection Zone (SPZ) and is designated under Zone 1-Subsurface activity.
- 3.17. The majority of the site is not underlain by a bedrock aquifer. The southwestern part of Phase 4 is underlain by Secondary A bedrock aquifer.
- 3.18. A Secondary A aquifer is described by the BGS as 'permeable layers capable of supporting water supplied at a local rather than strategic scale, and in some areas forming an important source of base flow to rivers. They are generally aquifers formerly classed as minor aquifers'

4.0 Overview of Flood Risk

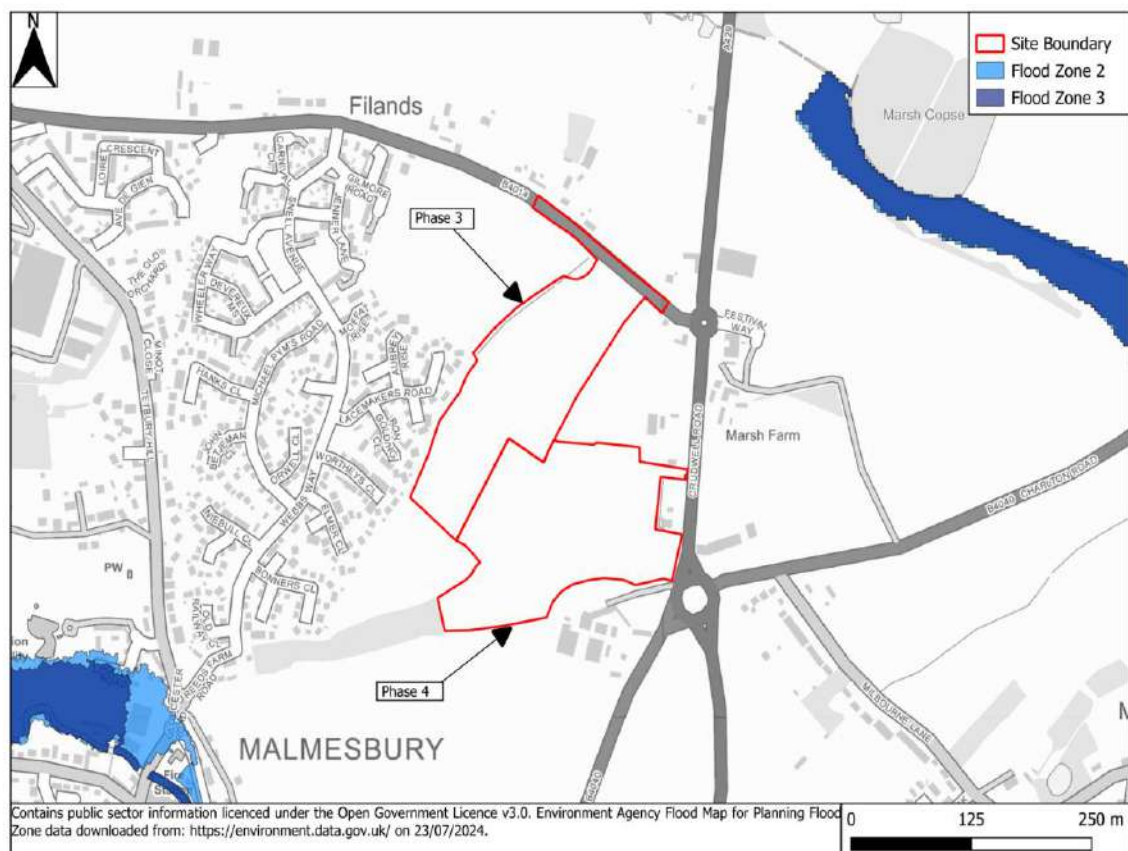
EA Flood Zone Map

4.1. The EA Flood Map for Planning provides an initial indication of the extent of Flood Zones. In the NPPF, Flood Zones are defined as follows:

- Flood Zone 1 'Low Probability' – Land less than 1 in 1,000 (0.1%) annual probability of river or sea flooding.
- Flood Zone 2 'Medium Probability' – Land between 1 in 100 (1%) and 1 in 1000 (0.1%) annual probability of river flooding, or between 1 in 200 (0.5%) and 1 in 1,000 (0.1%) annual probability of sea flooding.
- Flood Zone 3 'High Probability' – Land at 1 in 100 (1%) or greater annual probability of river flooding, or 1 in 200 (0.5%) or greater annual probability of sea flooding.

4.2. Figure 6 shows the EA Flood Zone mapping.

Figure 6 – EA Flood Zone Map



4.3. **Figure 6** confirms that the site lies entirely within Flood Zone 1.

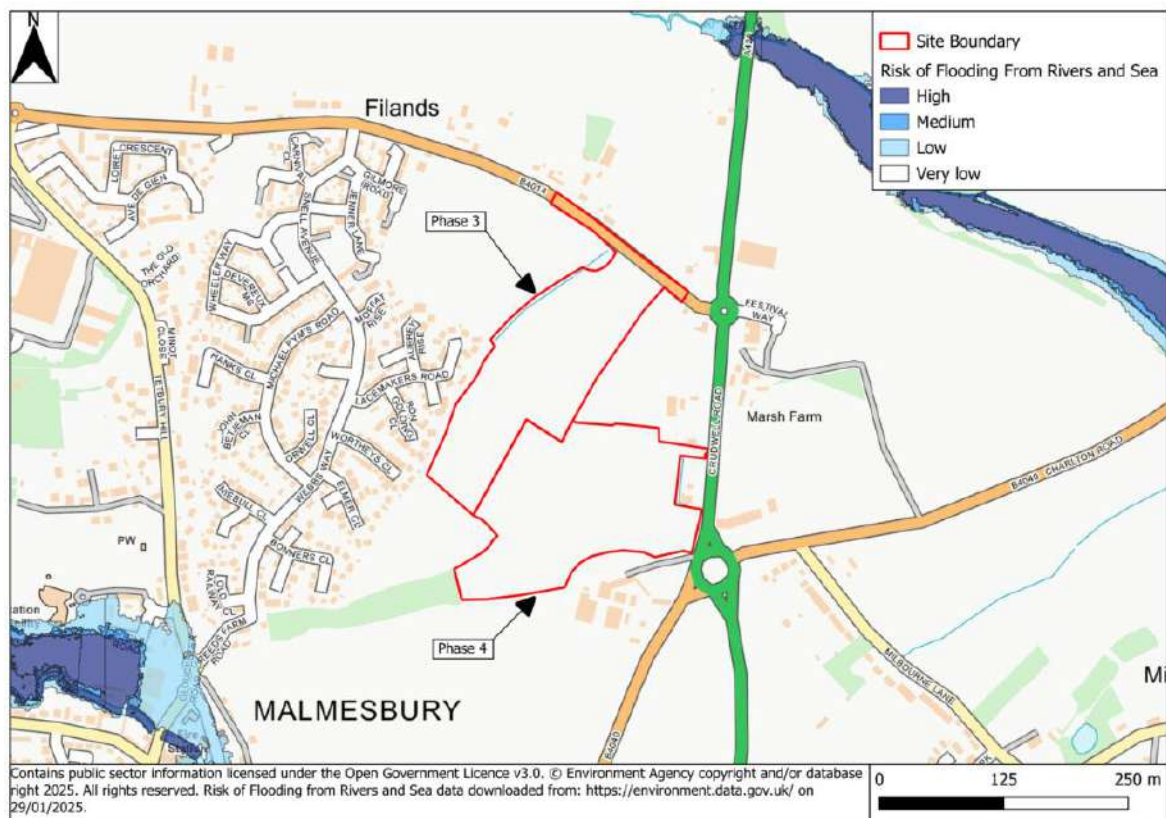
EA Long Term Flood Risk Mapping: Flooding from Rivers and Sea

4.4. The EA's Risk of flooding from Rivers and Sea mapping, updated in January 2025 shows areas at risk of flooding from rivers and sea taking into account the presence and condition of flood defences. The EA rivers and sea mapping defines flooding from rivers and sea based on the following:

- High Risk: 1 in 30 or more (3.3% or greater) annual probability
- Medium Risk: 1 in 100 to 1 in 30 (1% to 3.3%) annual probability
- Low Risk: 1 in 1,000 to 1 in 100 (0.1% to 1%) annual probability
- Very Low Risk: Less than 1 in 1,000 (0.1%) annual probability

4.5. Figure 7 shows the potential for flood risk from Rivers and Sea based on this mapping.

Figure 7: EA Long Term Flood Risk Mapping: Rivers and Sea



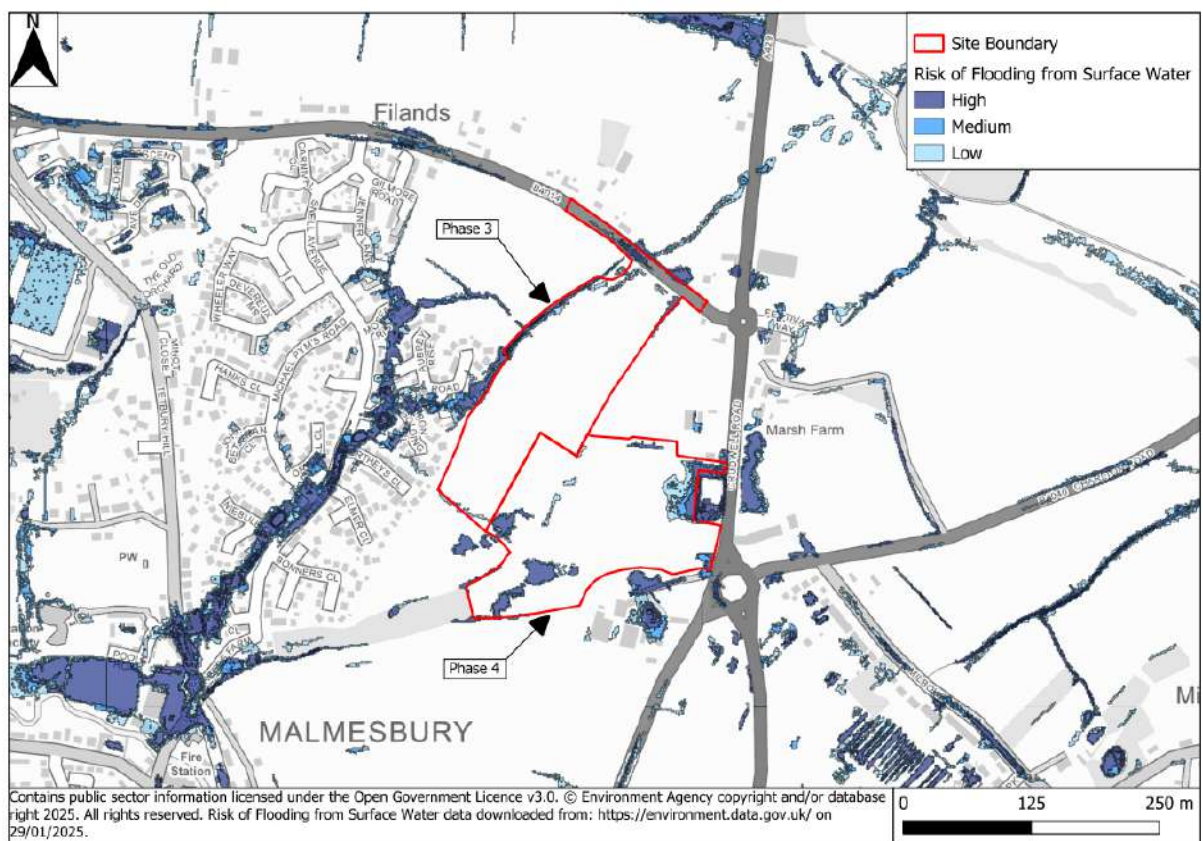
4.6. **Figure 7** shows that the entire site is at Very Low risk of flooding from rivers and sea.

4.7. Therefore, the site is deemed to be at low risk of flooding from rivers and sea.

Flood Risk from Surface Water

- 4.8. The EA's Long Term Flood Risk of Flooding mapping for Flooding from Surface Water indicates areas that could be susceptible to surface water flooding during extreme rainfall events. The EA surface water flood mapping defines rainfall events based on the following:
- High Risk: 1 in 30 or more (3.3% or greater) annual probability
 - Medium Risk: 1 in 100 to 1 in 30 (1% to 3.3%) annual probability
 - Low Risk: Less than 1 in 100 (1%) annual probability
- 4.9. The NPPF PPG – 'Flood Risk and Coastal Change' includes the 1 in 100 annual probability of surface water flood (including climate change) within the definition of the design flood event to be used to inform a FRA.
- 4.10. **Figure 8** shows the potential flood risk from surface water.

Figure 8 - EA Long Term Flood Risk Mapping: Surface Water



- 4.11. The EA Flood Risk from Surface Water mapping shows that the majority of phase 3 is not at risk of surface water flooding. There is a flow route along the western boundary of Phase 3 of Low, Medium and High risk of surface water flooding outside the proposed development.



- 4.12. There is a parcel of isolated surface water ponding in the northeastern part of Phase 4 with Low, Medium and High potential for surface water flooding. Observations from the site visit confirms that this is associated with the highway ditch system. There are also a few isolated parcels of surface water ponding within the western part of Phase 3 with Low, Medium and High potential for surface water flooding. However, the majority of areas within isolated parcels of surface water flooding are located in areas outside the proposed development.
- 4.13. Therefore, the entire site is deemed to be at Low risk of surface water flooding as the majority of the surface water flooding is located outside the proposed development.

Flood Risk from Groundwater

- 4.14. Groundwater flooding has the potential to occur after prolonged periods of unusually high rainfall. During such periods, more water than usual infiltrates through the ground, raising the water table above its normal depth below the surface. Where the water table is at a shallow depth in any case, the water table can reach the surface. This can cause groundwater to merge with rainfall and cause localised flooding.
- 4.15. The EA Long Term Flood Risk for groundwater states that 'Flooding from reservoirs is unlikely in this area'.
- 4.16. The WC Level 1 SFRA assesses the area for susceptibility to groundwater flooding, which has been undertaken using Appendix G (BGS Groundwater Emergence Map) and Appendix R (Groundwater Flood Zone for application of a Sequential Test map). The relevant mapping is included within **Appendix A** of this FRA and is described below.
- 4.17. The BGS Groundwater Emergence Map shows that the entire site is 'deemed as having negligible risk from groundwater flooding due to the nature of the local geological deposits'.
- 4.18. The Groundwater Flood Zone for application of a Sequential Test Map shows that the site lies outside the groundwater flood zone.
- 4.19. Therefore, the site is deemed to be at low risk of groundwater flooding and groundwater flooding is no basis of the Sequential Test.

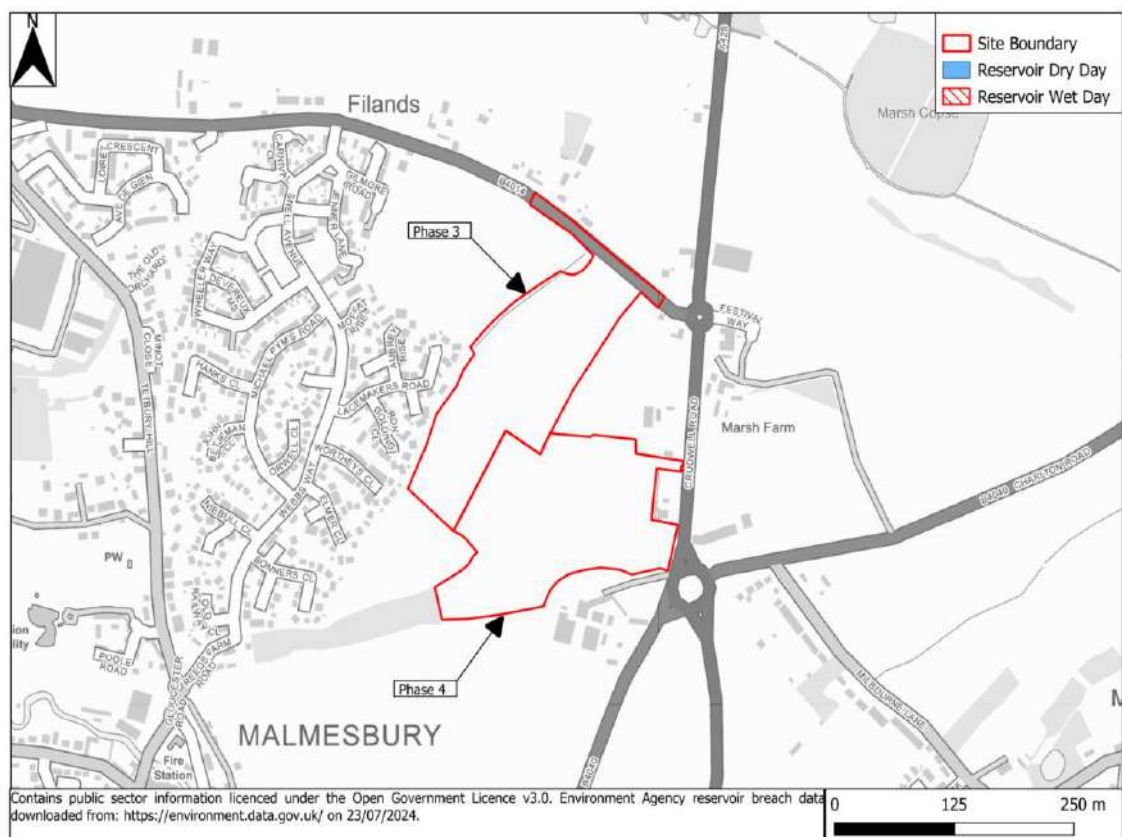
Flood Risk from Sewers

- 4.20. When exceeded, surcharged sewer networks can lead to flooding from backed up manholes and gully connections.
- 4.21. Wessex Water Asset Location Plans (downloaded on the 08/11/2024) show that there is a public foul sewer within the site boundary. A copy of the Wessex Water Asset Plans is included within **Appendix A**.
- 4.22. The Level 1 WC SFRA includes a record of sewer flooding for Wiltshire covering a period between 2015 to 2019. The sewer record from the nearest postal code shows that there have been 6 recorded incidents of sewer flooding. However, there is no specific indication that the site itself has been affected.
- 4.23. Overall, the site is deemed to be at low risk of sewer flooding.

Flood Risk from Reservoirs

- 4.24. The EA flood risk from reservoirs mapping indicates areas that would be at risk of flooding in the event of a reservoir breach.
- 4.25. **Figure 9** shows the flood risk from reservoirs.

Figure 9 – EA Flood Risk from Reservoirs



- 4.26. The mapping indicates that the site is not at risk of flooding in the event of a reservoir breach. The site is therefore at low risk of flooding from reservoir flooding.

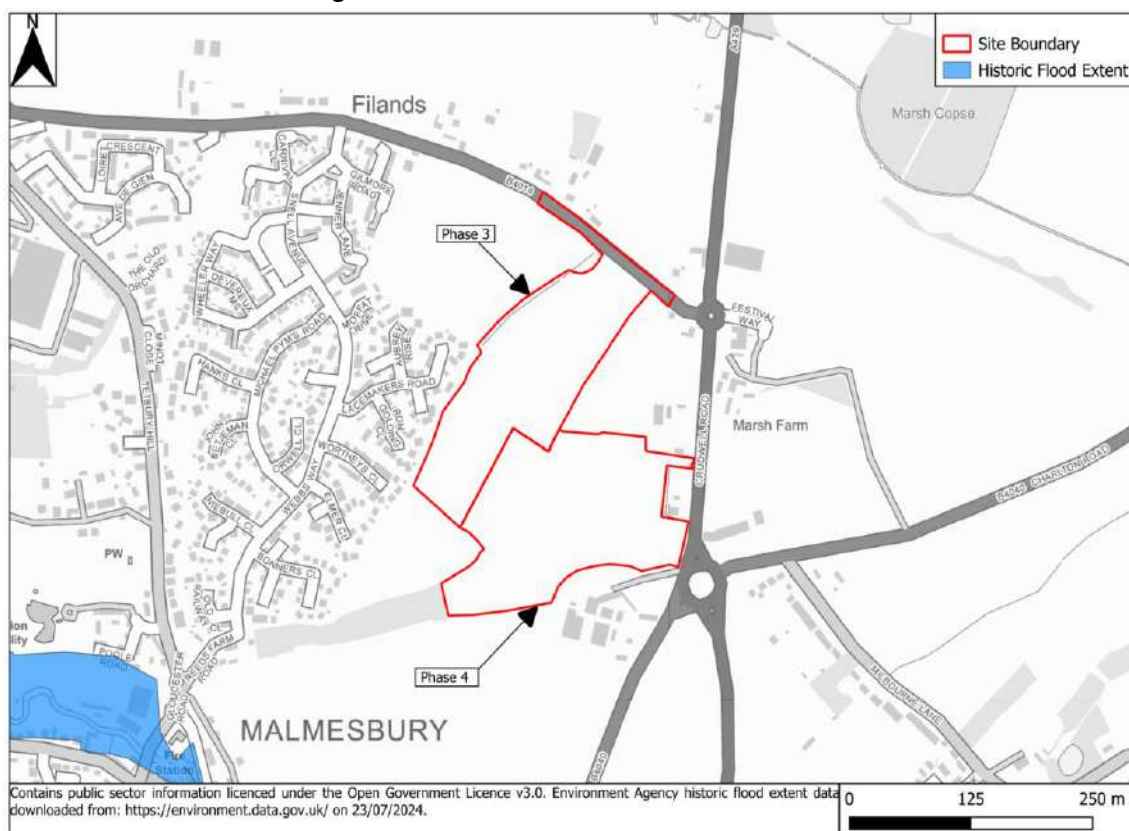
Flood Risk from Other Sources

- 4.27. The EA flood risk maps, and the 2019 and 2024 Level 1 SFRAs shows that the site is not at risk of flooding from canals or other artificial sources.

Historic Flooding

- 4.28. **Figure 10** shows the historic flood extent records held by the EA. The EA Historic Flood Map shows the maximum extent of recorded flood events.

Figure 10– Historic Flood Extents



- 4.29. The EA historic flood outline dataset shows that the site and surrounding area has no record of historic flooding. The site is therefore at low risk of historic flooding.

Flood Risk Summary

- 4.30. A summary of flooding from all sources is provided in **Table 1**.

Table 1 – Summary of Flood Risk

Source of Flooding	High	Medium	Low	Comments
Fluvial			✓	The entire site is located within Flood Zone 1. The WC Level 1 SFRA Flood Map confirm the EA Flood Zones.
Pluvial			✓	The EA Flood Risk from Surface Water mapping indicates that the majority of the site is not at risk of surface water flooding. There is a flow route along the western boundary of Phase 3 of 'Low' potential for surface water flooding. There are also isolated parcels of surface water ponding within Phase 4 with 'Low', 'Medium' and 'High' potential for surface water flooding. However, the majority of areas within isolated parcels of surface water flooding are located in areas outside the proposed development. Therefore, the entire site is deemed to be at Low risk of surface water flooding as the majority of the surface water flooding is located outside the proposed development.
Groundwater			✓	The WC Level 1 SFRA BGS Groundwater Emergence mapping shown shows that the entire site is 'deemed as having negligible risk from groundwater flooding due to the nature of the local geological deposits'. The WC Level 1 SFRA Groundwater Flood Zone for application of a Sequential Test Map shows that the site lies outside the groundwater flood zone. Therefore, the site is deemed to be at low risk of groundwater flooding.
Sewers			✓	The Wessex Water asset maps show that there is a public sewer within the phase 3 site boundary. The Level 1 WC SFRA includes a record of sewer flooding. The sewer record from the nearest postal code shows that there has been 6 recorded incidents of sewer flooding.
Reservoirs, canals and other artificial sources			✓	EA and WC Level 1 SFRA mapping do not indicate the site to be at risk of flooding from reservoirs or other sources.



5.0 Sequential Test and Exception Test

NPPF Sequential Test

- 5.1. NPPF states that Local Planning Authorities allocating land for development should apply the Sequential Test to demonstrate that there are no reasonably available sites in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed.
- 5.2. The entire site is located within Flood Zone 1.
- 5.3. The majority of the site is located within an area with 'Very Low' risk of surface water flooding.
- 5.4. The entire site lies outside the Groundwater Flood Zone for application of a Sequential Test.
- 5.5. The site is deemed to be at low risk of sewer flooding.
- 5.6. The flood risk from other sources is low.
- 5.7. The proposed development is for residential use. It is classed within the NPPF as 'More Vulnerable' development.
- 5.8. The WC Level 1 SFRA states '*Developers are required to apply the Sequential Test to all development sites, unless a development is within fluvial flood zone 1 and other flooding issues in the area of the development (i.e. surface water, groundwater, sewer flooding) are at low risk*'.
- 5.9. The WC Level 1 SFRA states '*If a Sequential Test is not required. The Exception Test is therefore not required*'.
- 5.10. Therefore, the Sequential Test and Exception Test are not required.

6.0 Flood Mitigation Strategy

Sequential Approach

- 6.1. The NPPF encourages a 'sequential approach' in master planning for new development: locating the more vulnerable uses of the development in the areas of lowest flood risk from all sources.
- 6.2. The masterplan reflects this sequential approach with all residential development located in Flood Zone 1 and areas of low flood risk from other sources.

Ground Floor Levels

- 6.3. Ground floor levels should be set a minimum of 150mm above the surrounding ground level to mitigate the residual flood risk from surface water runoff events. It is recommended that surrounding ground levels are appropriately contoured to direct surface water away from the development.

Floodplain Storage and Flow Routing

- 6.4. The proposed built residential development areas are located outside of the fluvial flood extents for the design event. There is therefore no impact on fluvial floodplain storage or conveyance as a result of the proposed built residential development.
- 6.5. Some parts of the site are located within areas of 'High', 'Medium' and 'Low' risk of surface water flooding. Rainfall and runoff in these areas will be managed within the surface water drainage strategy and therefore not negatively impact the surface water flow routes, or conveyance once the drainage strategy is implemented.

Safe Access

- 6.6. The residential development areas are located outside of the potential flood risk areas. Continuous safe access for the development is available via the B4014.

Residual Risk

- 6.7. The NPPF PPG – 'Flood Risk and Coastal Change' defined residual risk as coming from 'flood risk management infrastructure' and the 'residual risk to a development once any site-specific flood mitigation measures are taken into account'.
- 6.8. Residual risk to the site includes a breach in the raised flood defences, the failure of a reservoir and a flood event greater than the designed standards.
- 6.9. The residual risk to the site is low. The EA AIMS dataset which contains information of flood defences indicates that the site does not benefit from raised flood defences. The EA mapping for reservoir breaches indicates that the site is not located within an area at risk of flooding in the event of a reservoir breach. The 'Less Vulnerable' residential development is located outside of the 1 in 1000 annual probability flood extent.

7.0 Surface Water Drainage

Introduction

- 7.1. This chapter provides details on the surface drainage strategy and includes measures to drain the proposed development site.

Overall Strategy

- 7.2. The proposed drainage strategy has been designed to the requirements of the NPPF by providing a comprehensive drainage system which embraces the SuDS philosophy and key principals. The utilisation of Sustainable Drainage Systems (SuDS) not only provides the benefit of controlling waters at source and online treatment of collected surface water but also allows enhanced aesthetics through improved landscaping, biodiversity, and ecological opportunities.
- 7.3. These features offer a holistic treatment train and management system to the benefit of new residents, members of the wider community, downstream receptors and the environment.
- 7.4. The alteration of natural surface water flow patterns through developments can lead to problems elsewhere in the catchment, particularly flooding downstream. Changes of land uses can have significant downstream impacts where existing drainage systems may not have sufficient capacity for any additional surface water flow.
- 7.5. A surface water management strategy is therefore required to manage and reduce the flood risk posed by the surface water runoff from the site. The surface water drainage arrangements for any development site should be such that the volumes and peak flow rates of surface water leaving a developed site are no greater than the rates to the pre-development scenario, unless specific off-site arrangements are made and result in the same net effect.
- 7.6. Sustainable water management measures (SuDS) should be introduced to control the surface water runoff from the proposed development site therefore, managing the flood risk to the site and surrounding areas from the surface water runoff.
- 7.7. The Construction Industry Research and Information Association, CIRIA's C690 states the following:
- **Prevention** – the use of good site design and housekeeping measures on individual sites to prevent runoff and pollution (e.g. minimise areas of hard standing surfaces)
 - **Source Control** – control of runoff at or very near its source (such as the use of rainwater harvesting)
 - **Site Control** – management of water from several sub-catchments (including routing water from roofs and car parks to one or several soakaways for the entire site)
 - **Regional Control** – management of runoff from several sites, typically in a detention basin or wetland.



- 7.8. The SuDS Manual 2015 (C753) provides best practice guidance on the planning, design, construction, operation and maintenance of SuDS. This document provides guidance to ensure that SuDS are planned and designed to maximise the opportunities and benefits of surface water management.
- 7.9. The four main categories of benefits that can be achieved by SuDS, referred to as the four pillars of SuDS design, are:
- **Water quantity** – control the quantity of runoff to support the management of flood risk, and maintain and protect the natural water cycle;
 - **Water quality** – manage the quality of the runoff to prevent pollution
 - **Amenity** – create and sustain better places for people
 - **Biodiversity** – create and sustain better places for nature.
- 7.10. Supplemental to CIRIA guidance, Document H of the Building Regulations 2015 sets out three possible options to discharge surface water runoff. Rainwater shall discharge to one of the following, listed in order of priority:
- An adequate soakaway or some other adequate infiltration system; or where that is not reasonably practicable,
 - A watercourse; or where that is not reasonably practicable
 - A sewer.
- 7.11. As the underlying geology is not conducive to the use of infiltration type techniques, due to the existence of Mudstone and Clay Formation (Ref: Para 3.14 above), the surface water drainage proposals will be designed to attenuate runoff with controlled discharge to the existing local watercourses i.e. the existing open field ditch on site which would be feasible point of discharge.
- 7.12. Implementation of SuDS will ensure that flood risk downstream is not increased due to the proposed development. These features will also provide positive improvements to the quality of surface water runoff.
- 7.13. The following SuDS components are deemed applicable to the site:
- Conveyance systems – components that convey flows to downstream storage systems, e.g. swales and filter drains.
 - Storage systems – components that control flow, and possibly volumes, by storing water and releasing it slowly, e.g. geocellular units, attenuation basins and wetlands.
 - Treatment systems – components that remove or facilitate the degradation of contaminants present in runoff, e.g. filter strips and proprietary treatment systems.

Pre and Post Development Areas/Rates

- 7.14. The overall site is approximately 12.477ha. It is classified as a greenfield site and it is considered 100% permeable.

- 7.15. Given the underlying geology, it is assumed part of the rainfall infiltrates to the ground and the rest occurs as overland flow at source towards the lower parts of the site.
- 7.16. In order to quantify any potential increase in surface water runoff, the existing Greenfield runoff rate from the site must initially be determined. The rates of runoff have been determined using the current 'industry best practice' guidelines as outlined in the Interim Code of Practice for SuDS. The recommended methodology for sites up to 200 hectares in area is the IH124 method.
- 7.17. An assessment of existing surface water runoff has been undertaken, to determine the potential surface water options and attenuation requirements for the site utilising the following parameters.
- Average Annual Rainfall (SAAR): 763mm/year
 - Soil: 0.37
 - Region No.: 8

Pre-Development Discharge Areas & Rates

- 7.18. With an overall site area of 12.477ha, the calculated Greenfield runoff discharge rates and volumes are as presented in **Table 2**. The corresponding runoff outputs created with the use of HR Wallingford and FLOW software can be found within **Appendix B**.

Table 2 – Pre-Development Runoff Rates/Volumes per Hectare

Annual Probability	Greenfield/Pre-Development Runoff Rate per hectare (l/s)	Greenfield/Pre-Development Runoff Rate for 12.477ha (l/s)	Greenfield/Pre-Development Volume 360 minute storm (m3)
1 in 1 year event(100% AEP)	2.5	31.2	-
1 in 2 year event(50% AEP)	-	-	1,007
QBar(44% AEP)	3.2	39.9	-
1 in 30 year event(3.3% AEP)	6.2	77.4	2,147
1 in 100 year event(1% AEP)	7.7	96.1	2,879

- 7.19. Based on the Illustrative Masterplan, it has been conservatively estimated that the impermeable surfaces will be approximately 65% of the developable area. The use of 65% therefore provides for a robust assessment which allows for fluctuations in residential density, and future urban creep of up to 10% on private curtilage areas, which typically results in approximately 5% of the total area, in accordance with The SuDS Manual (CIRIA 753).



- 7.20. The post development impermeable area of the dwellings has been calculated to approximately 3.987ha and the future urban creep of 10% in accordance with The SuDS Manual (CIRIA 753) has been calculate to 0.398ha. Therefore, the total impermeable area of the residential buildings is 4.385ha and the total impermeable area of the proposed development including the dwellings, the roads, the basins and general infrastructure is 5.347ha.
- 7.21. In order to comply with best practice as stipulated in EA Report SC030219 'Rainfall Runoff Management for Developments', proposed discharge rates should be restricted to one of two methods for all storms up to and including the 1 in a 100 year storm event plus a 45% allowance for climate change.

Post-Development Discharge Areas & Rates

- 7.22. All discharge flows could be restricted to 20% betterment of the existing greenfield runoff rates QBar. This negates the requirement for Long Term Storage and again flows would be attenuated on site and discharged utilising an onsite control device, such as a vortex control device. This normally requires a greater volume of attenuation.
- 7.23. The site naturally splits towards two different directions; to the west and to the east. Refer to drawing HD009-006 in **Appendix B** for the catchments and the proposed drainage strategy.
- 7.24. Catchment A and B naturally slope to the west and their topography will be maintained. Part of Catchment C naturally slopes towards the west, which is also the outfall of Catchment B and the rest of Catchment C towards the east. The eastern portion of Catchment C does not have an outfall, such as a ditch, watercourse or a public sewer and therefore, it is proposed to transfer flows of that area towards the west and discharge to the outfall that Catchment B utilizes.
- 7.25. The part of Catchment C that slopes towards the east is relatively flat and causes localised flooding on the site, mostly towards the boundary, due to the lack of an outfall.
- 7.26. All the flows from the part of Catchment C that is relatively flat will be restricted to 20% betterment of the greenfield runoff QBar of the natural Catchment C that slopes towards the west and utilizes the same outfall as Catchment B.
- 7.27. The proposed development's discharge rates are designed to be restricted to 16.4 l/s for all storm events. This represents a 20% reduction compared to the existing greenfield runoff rate (QBAR). The calculated runoff discharge rates are presented in Table 3. Catchment B and C share the same outfall and therefore their combined discharge rate, which considers 20% betterment, should not exceed 11.6l/s.

Table 3 – Post-Development Runoff Rates

Catchment	Catchment Area (ha)	Impermeable Area (ha)	QBAR (l/s)	20%betterment on QBAR(l/s)	Proposed Discharge Rates (l/s)	Attenuation Volume Provided (m3)
A	1.897	1.290	6.0	4.8	4.8	1,424
B	1.651	1.129	5.3	4.2	6.0	1,063
C	2.917*	2.928	9.3	7.4	5.6	6,116
Total	-	5.347	20.6	16.4	16.4	8,603

*The 2.917ha is the area of Catchment C that positively drains towards the west.

Surface Water Proposals

- 7.28. It is proposed to provide a network of trapped gullies, pipes and Sustainable Drainage (SuDS) features to collect the surface water runoff from impermeable areas such as roads, roofs and driveways. The traditional system could work in combination with such features such as permeable pavement, roadside swales and filter drains, to filtrate, store and transport water to attenuation basins to provide attenuation storage and high-quality water benefits.
- 7.29. The final attenuation basins will drain, with a controlled discharge into the existing ordinary watercourse to the west. Due to the topography in Catchment C a dual pumping station is proposed to pump surface water to the outfall that Catchment B and part of Catchment C utilises and to pump foul to the Wessex Water foul sewer on Crudwell Road.
- 7.30. In Catchment C the end point attenuation basin will not provide the full storage requirements on its own to attenuate the flows at the proposed discharge rate. It will therefore be necessary to provide an attenuation basin close to the proposed surface water pumping station, in order to provide emergency storage and a constant rate to the pumping station.
- 7.31. Drawing HD009-006, a copy of which is included within **Appendix B**, provides a high level overview of the drainage proposals together with the estimated requirements for the required storage and SuDS features for the parcels within the various catchments of the proposed development.
- 7.32. The banks of the SuDS basins will be designed in accordance with the SuDS Manual C753 guidance and a side slope gradient between 1 in 3 and 1 in 4. An appropriate freeboard of 300mm above the maximum water level is also proposed. This allows landscaping of both wetland and wildflower mixes to provide an appropriate landscape context in the vicinity of the features through the provision of permanent water pools in parts of the proposed basins.
- 7.33. Open SuDS features will be designed so as not to compromise the safety of residents, visitors and their property. Generally open boundaries are provided, and perimeter planting could be utilised to define the extents of the features.
- 7.34. Proposed discharge rates will be restricted to a rate that is 20% reduced than the QBAR (refer to Para.7.27 and **Table 3**) for all storm events up to and including the 1 in 100 year storm event plus 45% allowance for climate change. This would negate the requirement for Long Term Storage and flows would be attenuated on site and discharged utilising an on-site flow control device such as a Hydrobrake.
- 7.35. All conveyance systems will be designed to cater for the 1:30 year storm event, in accordance with industry standard, with all attenuation features designed to allow for the 1 in 100 year storm event plus 45% climate change allowance. All the drainage modelling calculations can be found in **Appendix B**.
- 7.36. The proposals draw reference to the DEFRA document Sustainable Drainage Systems, Non-statutory technical standards for sustainable drainage systems March 2015, as well as CIRIA C753 The SuDS Manual.



- 7.37. Current uncontrolled pluvial runoff exhibited onsite during high rainfall events will be mitigated as a result of the Development and flooding near the Wessex Water water tower and relevant equipment close to the eastern boundary of Catchment C will be significantly reduced. This will occur by virtue of the change in surface from greenfield to positively drained impermeable areas, which will serve to capture, attenuate and delay surface water runoff. This will be a benefit to downstream receptors, especially towards Crudwell Road.
- 7.38. This proposal identifies the principal components of the surface water strategy and is subject to further detailed localised investigations as part of the subsequent Reserved Matters applications. These assumptions are subject to evolution as the design develops and the individual parcels are further realised.
- 7.39. There is scope to utilise source control techniques (such as swales, granular strips and permeable paving) which will assist with the reduction of larger attenuation storage features. This should be embraced and investigated as the project progresses.
- 7.40. Subject to the provision of additional geotechnical information, the attenuation basins may require partial lining to protect against the ingress of natural groundwater. Such lining provides the ability to create localised, small permanent bodies of water which adds landscaping and biodiversity opportunities to the scheme.

Exceedance Flood Routing

- 7.41. Flows in excess of the above design storms, which may flood from the network for storms in excess of the 1 in 100 year storm plus 45% climate change, will be kept within the internal road network, until such time as they can be directed into adjacent landscaping areas or existing vegetation/woodland. This ensures that no onsite or offsite residential units are afforded an increased level of protection from flood waters until such time as the rain events become significant. Refer to drawing HD009-006, in **Appendix B** for exceedance flow routes.
- 7.42. The attenuation basins of the Development are designed to provide 300mm freeboard and therefore can accept additional flood water from manholes upstream.

Water Quality Improvements

- 7.43. CIRIA report C753 The SuDS Manual outlines the methodology for assessing water quality risks associated with new development. This is a simple index approach which provides a high level scoping analysis of the land usage and gives guidelines for appropriate treatment stages.
- 7.44. This process identifies features necessary to provide adequate substance removal in line with Environment Agency requirements. This is a three step process of Allocation, Mitigation and Review.
- 7.45. Surfaces generating runoff are 'graded' on their potential to contribute to various harmful pollutants and gives each surface a risk of pollution from each element. An extract of Table 26.2 within the SuDS Manual is set out overleaf.

Table 4 – Extract from Table 26.2 SuDS Manual

Land Use	Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Other Roofs	Low	0.3	0.2-0.8	0.05
Low traffic residential roads and non-residential parking with infrequent change.	Low	0.5	0.4	0.4
Commercial yard, parking with frequent change, other roads,	medium	0.7	0.6	0.7
Sites with heavy pollution	High	0.8	0.8	0.9

- 7.46. Historically, PPG3 documentation would recommend that pollutants were removed utilising oil separators, but since its superseding, more recent guidance has shifted to the use of SuDS features to remove pollutants; thereby providing significant improvements in treatment.
- 7.47. The use of non-mechanical features decreases the requirements for maintenance and increase natural biodiversity. That said, the SuDS Manual does not remove the possibility of utilising separators, so long as they are considered in partnership with a comprehensive overall SuDS regime.
- 7.48. Without adequate treatment, the pollutants would cause damage if they were to enter the watercourse or water table in large volumes. The use of SuDS features to slow down and degrade these pollutants is critical to the provision of an acceptable discharge.
- 7.49. The respective cleansing abilities of common SuDS features are given by corresponding mitigation indices within the SuDS Manual. An extract of Table 26.3 is set out below.

Table 5 – Extract from Table 26.3 SuDS Manual

Type of SuDS component	Total Suspended Solids	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable Paving	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8

- 7.50. The individual pollution indices are totalled, with the first SuDS component utilising its full value and subsequent downstream SuDS features acting with 50% efficiency. This provides a realistic strategy which mimics the reduced cleansing effectiveness as the concentration of a pollutant decreases along the SuDS train.
- 7.51. The proposed detention basins provide adequate pollution mitigation to the pollution hazard levels that the proposed development will create, in accordance with **Table 4 and 5**.
- 7.52. In line with Environment Agency guidance, before the design phase is concluded, the proposals are reviewed and analysed in order to identify potential shortcomings and to ensure that adequate volume of SuDS features are provided to mitigate the risk of pollution from each source.

SuDS Maintenance Strategy

- 7.53. For the water treatment effects of SuDS features to remain effective, a comprehensive maintenance strategy should be implemented.
- 7.54. During construction, maintenance of SuDS features should be undertaken by the Contractor. Upon completion, the assets should be passed over to the Management Company, statutory authority, or community group commissioned to maintain the features in perpetuity.
- 7.55. As part of the strategy, a regular maintenance regime will be created, which consists of several primary measures required to ensure the longevity of the system. These should be undertaken on a regular basis to ensure consistent performance. Typical maintenance activities consist of:
- Inspecting and reporting; relatively regular review of the condition identifying issues and providing resolutions. Periodic review from the maintenance contractor;
 - Litter and debris removal;
 - Grass trimming, overall cutting and localised strimming preventing blockages;
 - Weed and evasive plant control;
 - Shrub management;
 - Aquatic and shoreline vegetation management;
 - Sweeping pervious surfaces; and
 - Oil removal from proprietary systems.
- 7.56. A remedial maintenance schedule would be recommended as part of the handover of the SuDS features, remedial maintenance is required to provide repairs to the system and monitor long term damage ensuring the system remains consistently productive. The schedule could consist of;
- Structure rehabilitation and repair;
 - Infiltration surface rehabilitation;
 - Scarifying to remove “Thatch”;
 - Spiking or Tining the soil;
 - Air pressure treatment.
- 7.57. The maintenance schedule contents and timing will depend upon multiple factors including usage, contents of water utilising the system, location and biology. To this end, it is suggested that the schedule be finalised as part of detailed design; ensuring the most comprehensive maintenance schedule is incorporated for the phase in hand.
- 7.58. Community outreach can be undertaken as part of the development, which will raise awareness on the importance of SuDS to both flood risk and water quality in the local area. Imparting the new residents with knowledge on the risks associated with pollution to the surface water drainage system is key, as is the direct effect their actions may have on water quality and biodiversity in the area.



Adoption and Ownership

- 7.59. The drainage system is designed to the appropriate standards including the new Sewerage Sector Guidance (SSG), the Building Regulations and the requirement of the National Planning Policy Framework.
- 7.60. The intention of adoption and ownership of drainage and SuDS is as follows:
- Surface water sewers within development parcels and the pumping station to be offered for adoption to Wessex Water under the Section 104 process of the Water Industry Act.
 - Surface water highway drains, gullies and leads within adopted roads to be maintained by the Highway Authority.
 - Above ground attenuation (i.e. swales and basins) to be maintained by a private maintenance company funded by residential properties or subject to agreement with the Local Authority.
 - SuDS features serving single properties, for example, permeable paved driveways to single dwellings, will be owned and maintained by the owner of that property.
- 7.61. Suitable adoption and maintenance regimes for SuDS should be submitted in support of the Reserved Matters application.



8.0 Foul Water Drainage

Introduction

- 8.1. This chapter provides details on the proposed foul water drainage strategy and measures to convey effluent.

Overall Strategy

- 8.2. A Wessex Water public foul sewer is crossing Catchment A and B and therefore it is proposed each of these two catchments to connect to the existing foul sewer. Refer to Drawing HD009-006 in **Appendix B** for the proposed foul drainage strategy.
- 8.3. Due to the topography of the site and location of the existing foul sewer point of connection for Catchment C, wastewater from Catchment C will require pumping to the receiving public sewer.
- 8.4. There is currently a public sewer located within Crudwell Road that borders the site. The foul sewer records from Wessex Water can be seen in **Appendix B**.
- 8.5. Discussions are currently ongoing with Wessex Water, but Wessex Water has confirmed that they would accept a connection from a 150mm diameter sewer from Catchment C to the foul public sewer within Crudwell Road.
- 8.6. The topography of the Site and the location and invert of the existing foul sewers will require wastewater from Catchment C only to be pumped as it cannot drain by gravity.
- 8.7. Discussions are ongoing with Wessex Water regarding the exact location(s) and specifications of the pump station that will be required to provide sufficient capacity to service the development.
- 8.8. Notwithstanding this, the delivery of the proposed on-site foul water sewers will be designed in collaboration with Wessex Water as approving body in accordance with the new Sewerage Sector Guidance (SSG) and will be offered to Wessex Water for adoption under S104 Agreement of the Water Industry Act. The connection to the existing public sewer system will be made via a S106 Agreement of the Water Industry Act with Wessex Water as part of the overall adoption process.

Adoption and Ownership

- 8.9. The drainage system is designed to the appropriate standards including the new Sewerage Sector Guidance (SSG), the Building Regulations and British Standards.
- 8.10. Foul water sewers within development parcels and offsite to the point of connection are to be offered for adoption to Wessex Water under the Section 104 process of the Water Industry Act.

9.0 Conclusion

Flood Risk

- 9.1. The EA Flood Risk mapping has been reviewed alongside the Wiltshire Council (WC) Preliminary Flood Risk Assessment (PFRA) and Level 1 Strategic Flood Risk Assessment (SFRA).
- 9.2. This Flood Risk Assessment (FRA) concludes that:
- The entire site is located in Flood Zone 1 according to the EA Flood Map for Planning and WC Level 1 SFRA mapping.
 - The EA's Risk of flooding from Rivers and Sea mapping shows the entire site is at Very Low risk of flooding from rivers and sea.
 - The EA Flood Risk from Surface Water mapping shows that the majority of phase 3 is not at risk of surface water flooding. There is a flow route along the western boundary of Phase 3 of High, Medium and Low potential for surface water flooding. There are also isolated parcels of surface water ponding within Phase 4 with Low, Medium and High potential for surface water flooding. However, these isolated parcels of surface water flooding are located in areas outside the proposed development. Therefore, the proposed development area is deemed to be at Low risk of surface water flooding.
 - The WC Level 1 SFRA BGS Groundwater Emergence Map shows that the entire site is 'deemed as having negligible risk from groundwater flooding due to the nature of the local geological deposits'. The WC Level 1 SFRA Groundwater Flood Zone for application of a Sequential Test Map shows that the site outlies the groundwater flood zone. Therefore, the site is at low risk of groundwater flooding.
 - Wessex Water asset maps show Sewer Asset Records obtained from Wessex Water show that there is a public foul sewer within the site boundary. The Level 1 WC SFRA includes a record of sewer flooding for Wiltshire covering a period between 2015 to 2019. The sewer record from the nearest postal code shows that there have been 6 recorded incidents of sewer flooding. Overall, the site is deemed to be at low risk of sewer flooding.
 - The site is not at risk of flooding in the event of a reservoir breach.
- 9.3. In summary, the proposed development area is at a low risk of flooding from all sources.

Sequential Test and Exception Test

- 9.4. The site is located within Flood Zone 1.
- 9.5. The entire site lies outside the Groundwater Flood Zone for application of a Sequential Test.
- 9.6. The WC Level 1 SFRA states '*Developers are required to apply the Sequential Test to all development sites, unless a development is within fluvial flood zone 1 and other flooding issues within the area of development (i.e. surface water, groundwater, sewer flooding) are at low risk.*'



- 9.7. The residential development is classes as 'More Vulnerable'. The WC Level 1 SFRA states *'If a Sequential Test is not required. The Exception Test is not required'*.
- 9.8. Therefore, the Sequential Test and Exception Test is not required.

Mitigation Strategy

- 9.9. Finished ground floor levels should be set a minimum of 150mm above the surrounding ground level to mitigate the residual flood risk from surface water runoff events. Surrounding ground levels should also be appropriately contoured to direct surface water away from houses.
- 9.10. The proposed surface water drainage strategy will manage the flood risk posed by uncontrolled surface water runoff from the Site. Any increase in surface water run-off can be managed using SuDS source control techniques as well as attenuation features to provide storage in extreme storm events. All surface water drainage systems will be designed to provide 20% betterment to the existing QBAR runoff rate and store the balance of water for all events up to and including the 1 in 100 year event including an allowance for a 45% increase in rainfall intensities as a result of climate change and urban creep.

Summary

- 9.11. This FRA demonstrates that the proposed development complies with national and local planning policy with respect to flood risk and drainage. The risk of flooding is adequately managed, and, with the implementation of a suitable surface water drainage strategy, the offsite flood risk is not increased.



Appendices



Appendix A – Plans

Illustrative Masterplan

Topographical Survey

Wessex Water Sewer Asset Plan

WC Groundwater Emergence Map

WC Groundwater Flood Zone for application of the Sequential Test



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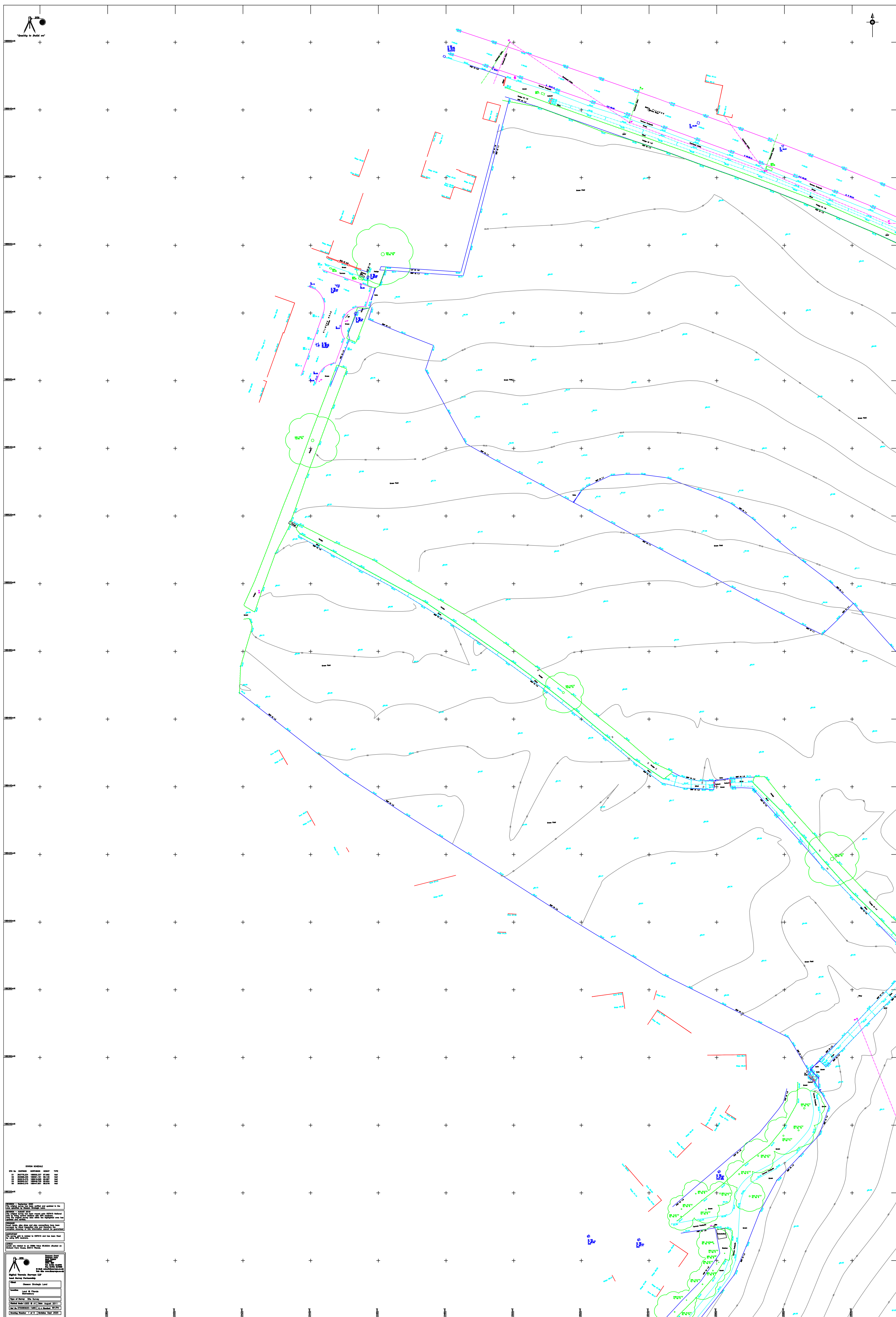
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P2	Revised following client review

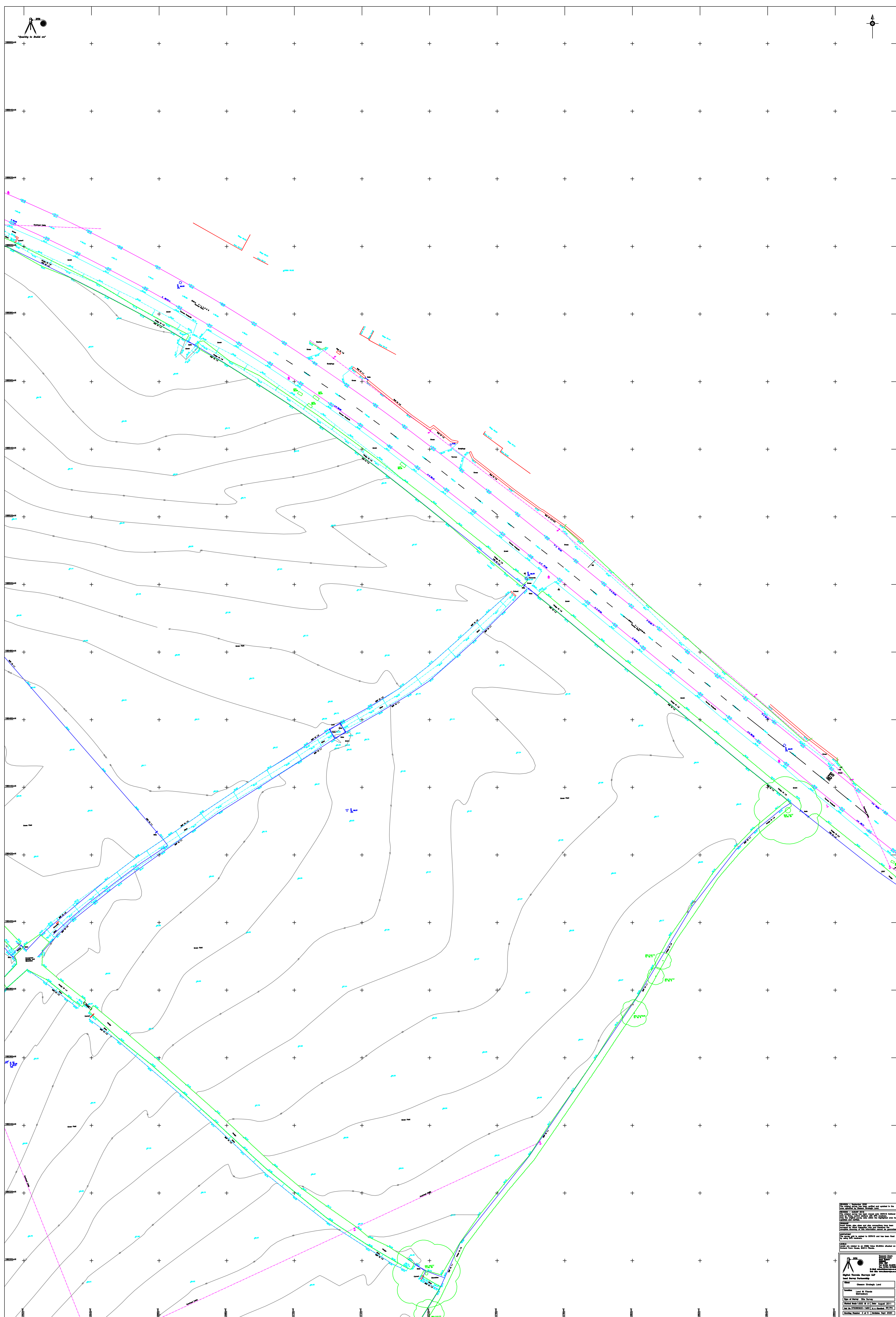
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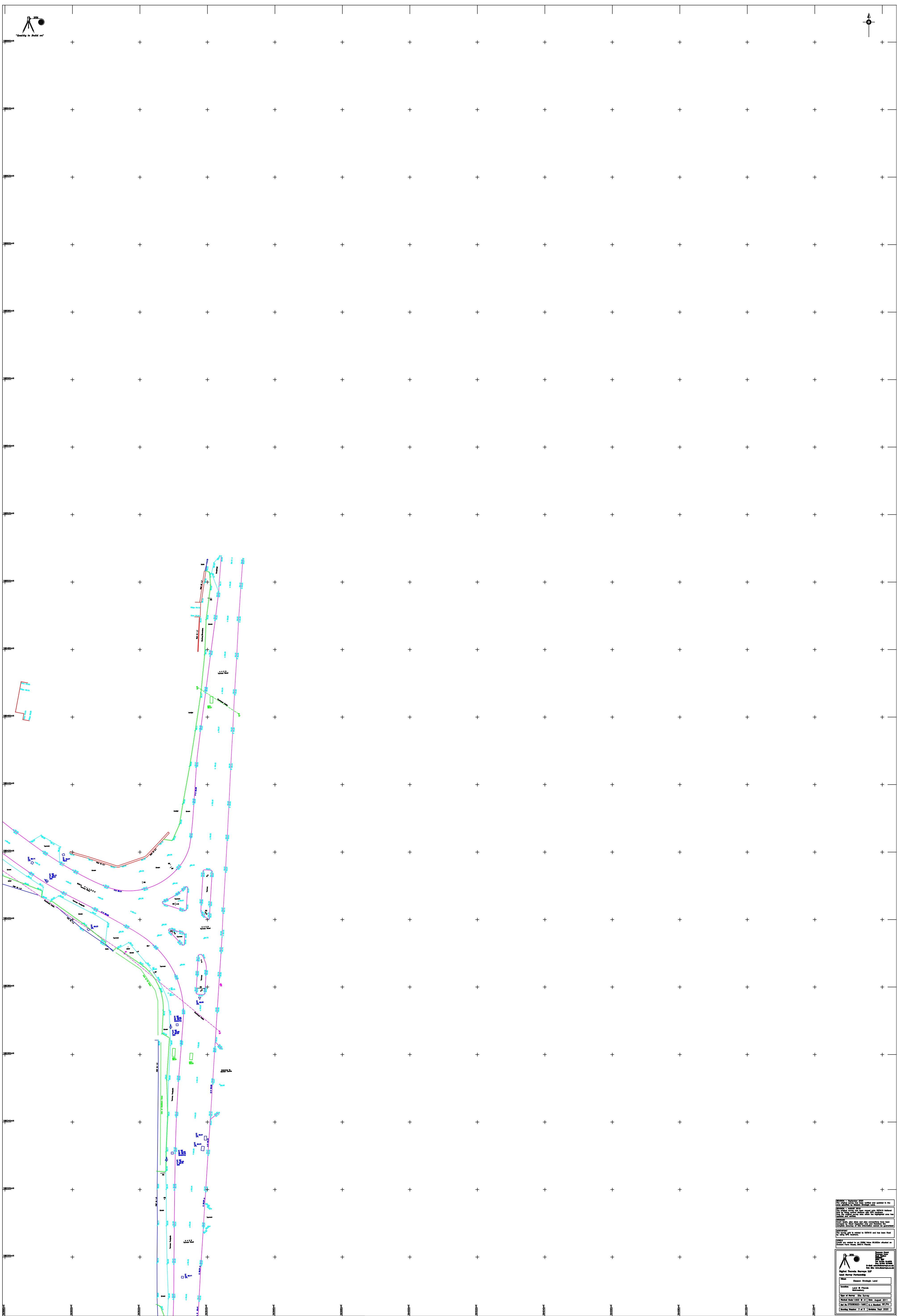
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Drawing	Illustrative Masterplan

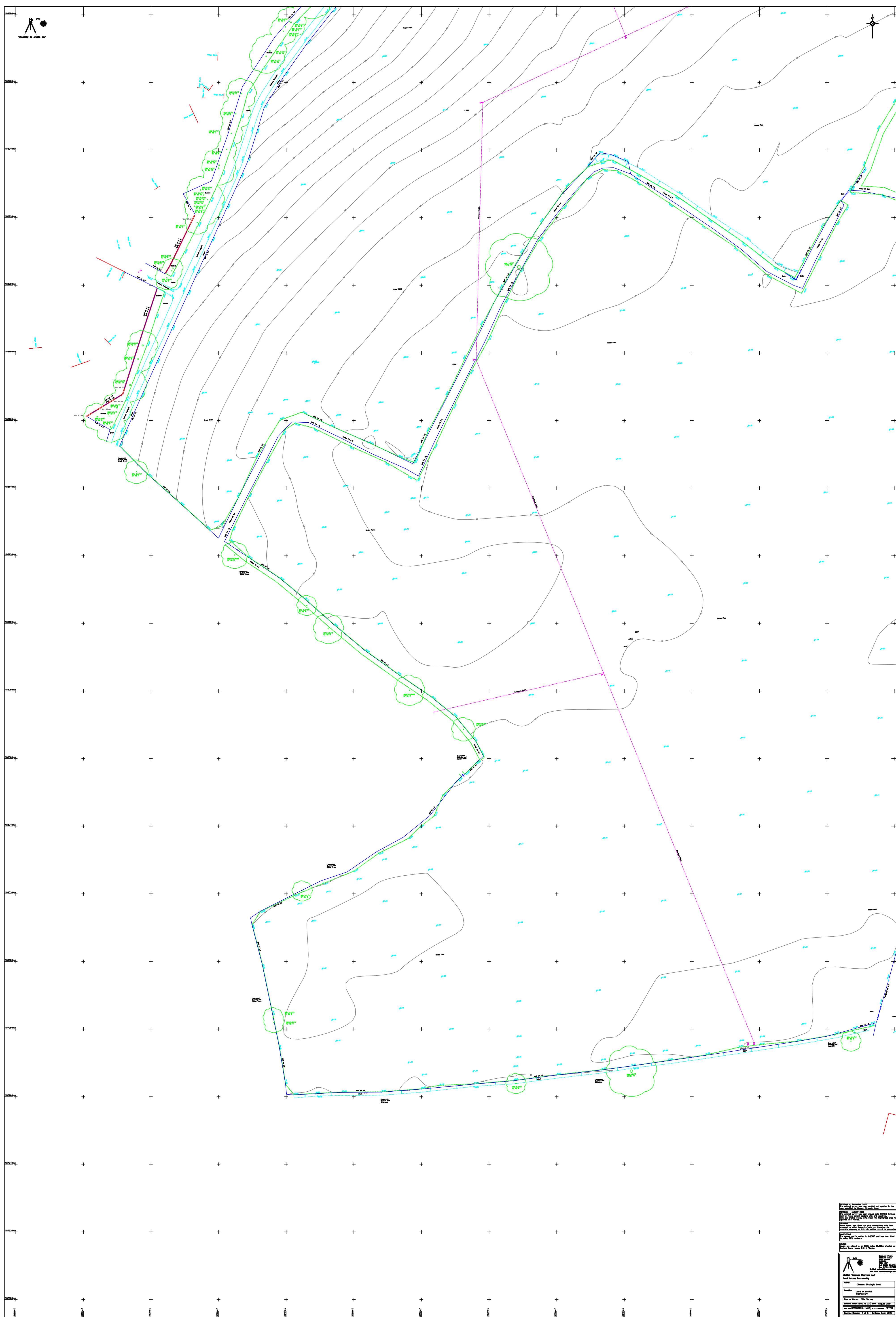
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Client ref.	-		

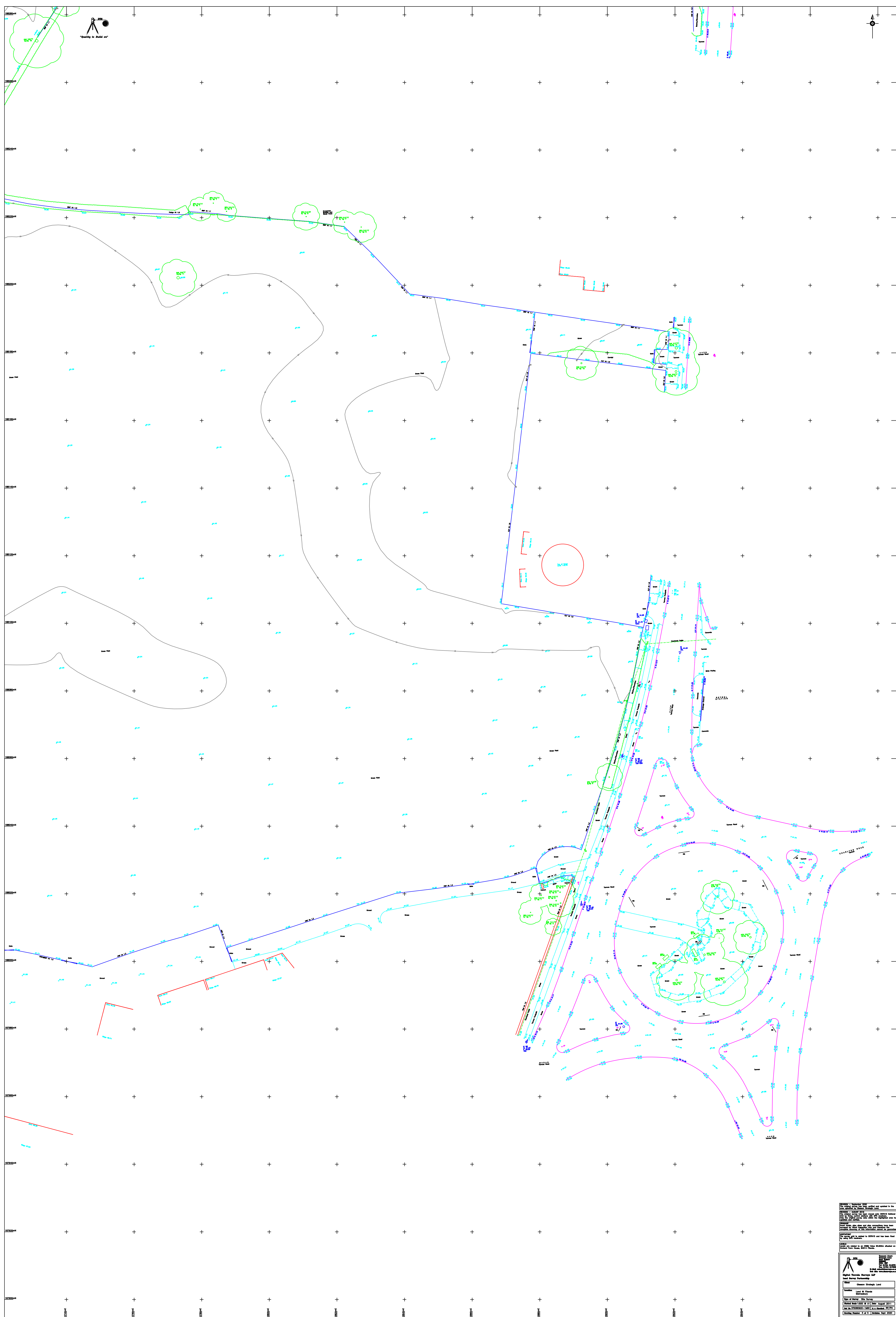




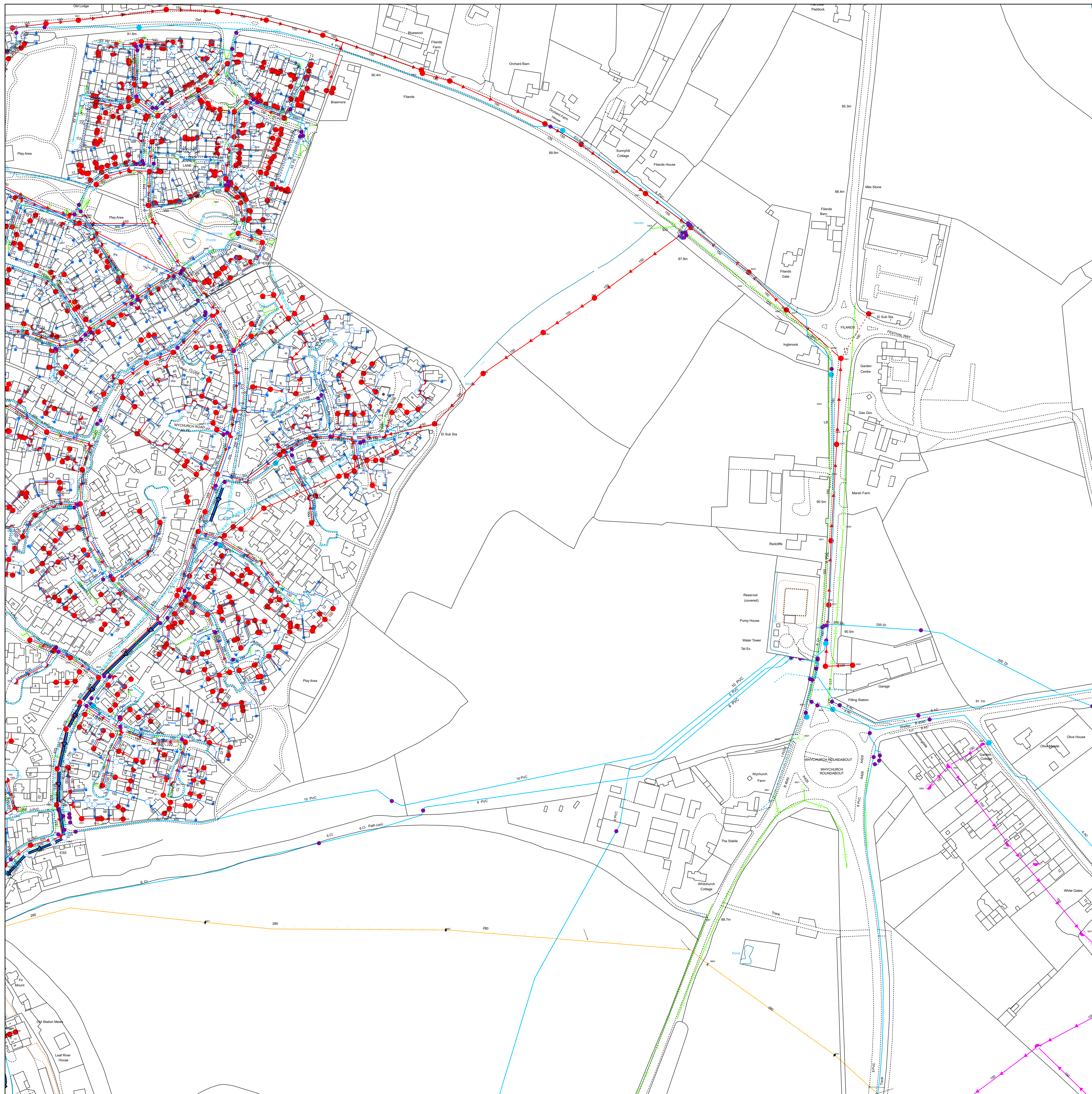








Wessex Water Web Map



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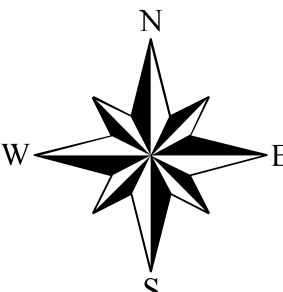
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	Distribution		Foul										Rising Mains		Private Rising Mains
	Washout		Surface										Standby Rising Mains		Culverted Watercourse
	Raw Water		Combined										Effluent Disposal		Highway Drain
	Abandoned		Abandoned										Overflow		Use Unknown
	Private												Syphon		Status Unknown
FITTINGS		STRUCTURES													
	Hydrant		Manhole - Foul		Pumping Station - Surface										
	Other		Manhole - Surface		Pumping Stn - Foul/Combined										
			Manhole - Combined		Gully										
	Inlet		Outfall		Vent Column										
	Lamphole		Bifurcation - Foul		Rodding Eye										
	Bifurcation - Surface		Flushing Chamber		Catchpit										
	Bifurcation - Combined		Soakaway		Non Return Valve										
	Combined Sewage Overflow		Air Valve		Hatch Box										

OTHER STRUCTURES

	Attenuation Tank		Chamber
	Storage Tank		Tunnel
			Interceptor

Information in this map is provided for identification purposes only. No warranty as to accuracy is given or implied. The precise route of pipe work may not exactly match that shown. Wessex Water does not accept liability for inaccuracies. Sewers and lateral drains adopted by Wessex Water under the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011 are to be plotted over time and may not yet be shown. In carrying out any works, you accept liability for the cost of any repairs to Wessex Water apparatus damaged as a result of your works. You are advised to commence excavations using hand tools only. Mechanical digging equipment should not be used until pipe work has been precisely located. If you are considering any form of building works and pipe work is shown within the boundary of your property or a property to be purchased (or very close by) a surveyor should plot its exact position prior to commencing works or purchase. If you are proposing to build over or near Wessex Water's apparatus you should contact the Developer Services Team, tel: 01225 526333 or e-mail: developer.enquiries@wessexwater.co.uk to discuss your proposals. Details of assets within Wessex Water's land ownership are unavailable through this service.

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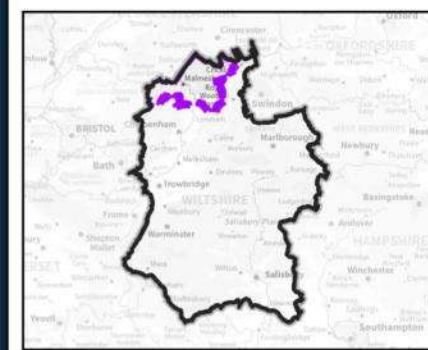




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Wiltshire Council



Groundwater Emergence: Malmesbury

Legend

- Wiltshire boundary
- Community Partnership Area

Groundwater Emergence

- This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
- Flooding from groundwater is not likely.
- There is a risk of flooding to subsurface assets but surface manifestation of groundwater is unlikely.
- Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
- Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.

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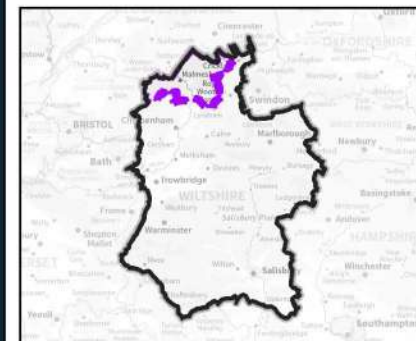




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Wiltshire Council



Groundwater Flood Zone for application of the Sequential Test: Malmesbury

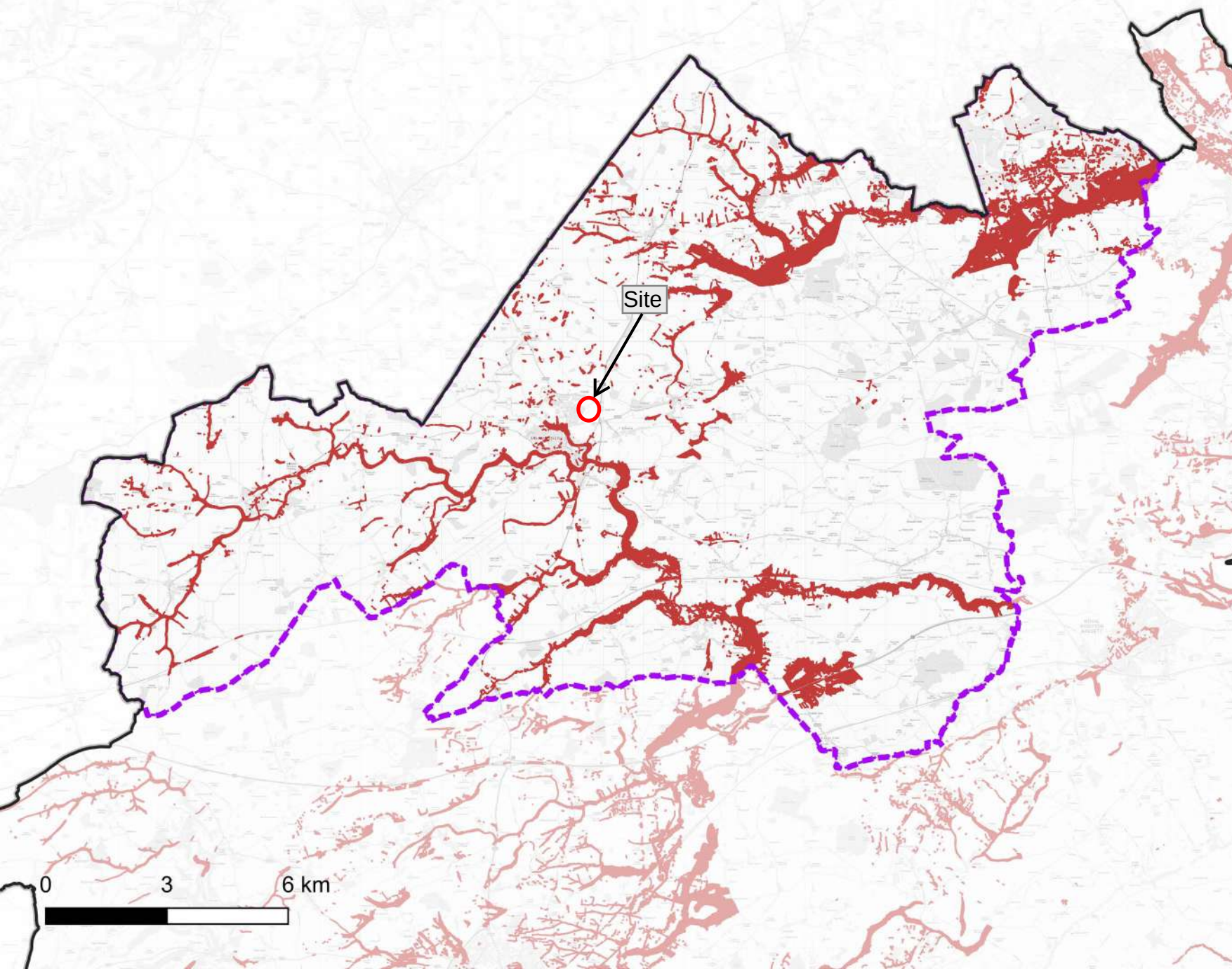
Legend

-  Wiltshire boundary
-  Community Partnership Area
-  Groundwater Sequential Test area

The analyses performed to prepare the mapping are all for a 1 in 100-year (1% AEP) event and so provide a risk of groundwater flooding to the surface as they are based on predicted difference between groundwater level and the ground surface.

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Appendix B – Drainage Strategy

Greenfield Runoff Rates

Greenfield Volumes

Proposed Drainage Modelling Calculations

Proposed Drainage Strategy Layout

Calculated by:	GEORGIOS ROINAS
Site name:	HD009 Filands Road, Malmesbury
Site location:	Filands Road, Malmesbury

Site Details

Latitude:	51.59386° N
Longitude:	2.09262° W
Reference:	1641170261
Date:	Sep 27 2023 16:59

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach **IH124**

Site characteristics

Total site area (ha): **1**

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

Soil characteristics

	Default	Edited
SOIL type:	3	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.37	0.37

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

Hydrological characteristics

	Default	Edited
SAAR (mm):	763	763
Hydrological region:	8	8
Growth curve factor 1 year:	0.78	0.78
Growth curve factor 30 years:	1.95	1.95
Growth curve factor 100 years:	2.43	2.43
Growth curve factor 200 years:	2.78	2.78

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	3.18	3.18
1 in 1 year (l/s):	2.48	2.48
1 in 30 years (l/s):	6.2	6.2
1 in 100 year (l/s):	7.72	7.72
1 in 200 years (l/s):	8.83	8.83

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

50% AEP Greenfield Volume

Pre-development discharge

Site Makeup	Greenfield
Greenfield Method	FSR/FEH
Positively Drained Area (ha)	12.477
Soil Index	3
SPR	0.37
Catchment Wetness Index	113.387
Return Period (years)	2
Climate Change (%)	0
Storm Duration (mins)	360
Betterment (%)	0
	Calc
PR	0.341
Runoff Volume (m ³)	1007

3.3% AEP Greenfield Volume

Pre-development discharge

Site Makeup	Greenfield
Greenfield Method	FSR/FEH
Positively Drained Area (ha)	12.477
Soil Index	3
SPR	0.37
Catchment Wetness Index	113.387
Return Period (years)	30
Climate Change (%)	0
Storm Duration (mins)	360
Betterment (%)	0
	Calc
PR	0.360
Runoff Volume (m ³)	2147

1% AEP Greenfield Volume

Pre-development discharge

Site Makeup	Greenfield
Greenfield Method	FSR/FEH
Positively Drained Area (ha)	12.477
Soil Index	3
SPR	0.37
Catchment Wetness Index	113.387
Return Period (years)	100
Climate Change (%)	0
Storm Duration (mins)	360
Betterment (%)	0
	Calc
PR	0.379
Runoff Volume (m³)	2879



Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	5	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	550.0		

Nodes

Name	Area (ha)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
Catch. A	1.290	100.000	-14.438	76.404	1.500
Catch. B	1.129	100.000	-79.149	5.055	1.500

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	0.0		

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 %)
2	0	0	0
30	0	0	0
100	45	0	0

Node Catch. A Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	98.500	Product Number	CTL-SHE-0101-4800-1200-4800
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	4.8	Min Node Diameter (mm)	1200

Node Catch. B Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node		Sump Available	✓
Invert Level (m)	98.500	Product Number	CTL-SHE-0112-6000-1200-6000
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	6.0	Min Node Diameter (mm)	1200

Node Catch. A Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	98.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	816.2	0.0	1.500	1621.8	0.0

Node Catch. B Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	98.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	447.4	0.0	1.500	1598.8	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
960 minute summer	Catch. A	675	98.794	0.294	27.3	263.0399	0.0000	OK
600 minute summer	Catch. B	420	98.835	0.335	32.1	193.0008	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
960 minute summer	Catch. A	Hydro-Brake®	4.8	242.9
600 minute summer	Catch. B	Hydro-Brake®	6.0	226.2

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
960 minute winter	Catch. A	930	99.125	0.625	35.6	614.6564	0.0000	OK
720 minute winter	Catch. B	690	99.165	0.665	38.3	467.0204	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
960 minute winter	Catch. A	Hydro-Brake®	4.8	268.7
720 minute winter	Catch. B	Hydro-Brake®	6.0	275.3

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
1440 minute winter	Catch. A	1410	99.697	1.197	49.3	1361.4680	0.0000	OK
1440 minute winter	Catch. B	1380	99.678	1.178	43.2	1060.2560	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m ³)
1440 minute winter	Catch. A	Hydro-Brake®	4.8	406.2
1440 minute winter	Catch. B	Hydro-Brake®	6.0	516.6



Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.600
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	550.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
EASTERN BASIN	1.952	5.00	90.240	1800	393707.155	188035.660	1.500
PUMP			90.240	1800	393628.146	188004.680	1.524
WESTERN BASIN			91.000	1200	393589.923	188114.424	1.500
HYDRO	0.976	5.00	90.240	1800	393695.703	188031.170	1.512

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	EASTERN BASIN	HYDRO	5.000	0.600	88.740	88.728	0.012	410.0	750	5.06	49.3
1.001	HYDRO	PUMP	5.000	0.600	88.728	88.716	0.012	416.7	750	5.12	49.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.375	607.7	347.5	0.750	0.762	1.952	0.0	407	1.419
1.001	1.364	602.7	518.7	0.762	0.774	2.928	0.0	539	1.524

Pipeline Schedule

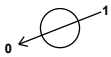
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	5.000	410.0	750	ADOPTABLE	90.240	88.740	0.750	90.240	88.728	0.762
1.001	5.000	416.7	750	ADOPTABLE	90.240	88.728	0.762	90.240	88.716	0.774

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	EASTERN BASIN	1800	Manhole	Adoptable	HYDRO	1800	Manhole	Adoptable
1.001	HYDRO	1800	Manhole	Adoptable	PUMP	1800	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
EASTERN BASIN	393707.155	188035.660	90.240	1.500	1800				
PUMP	393628.146	188004.680	90.240	1.524	1800				
						0	1.000	88.740	750
						1	1.001	88.716	750

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
WESTERN BASIN	393589.923	188114.424	91.000	1.500	1200					
HYDRO	393695.703	188031.170	90.240	1.512	1800		1	1.000	88.728	750
							0	1.001	88.728	750

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	10080	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	0.0		

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 %)
2	0	0	0
30	0	0	0
100	45	0	0

Node PUMP Offline Pump Control

Flap Valve	✓	Design Depth (m)	2.024	Switch off depth (m)	0.100
Loop to Node	WESTERN BASIN	Design Flow (l/s)	11.5		
Invert Level (m)	88.516	Switch on depth (m)	0.200		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.099	0.000	0.500	8.500	1.500	8.500	2.024	8.500
0.100	8.500	1.000	8.500	2.000	8.500		

Node WESTERN BASIN Offline ACO Q-Brake Control

Flap Valve	x	Design Depth (m)	1.200	Min Node Diameter (mm)	1050
Loop to Node		Design Flow (l/s)	5.6	Orifice Diameter (m)	0.101
Invert Level (m)	89.500	Min Outlet Diameter (m)	0.145		

Node HYDRO Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	88.728	Product Number	CTL-SHE-0234-3000-1200-3000
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.300
Design Flow (l/s)	30.0	Min Node Diameter (mm)	1800



Node PUMP Online Weir Control

Flap Valve	x	Design Depth (m)	2.500	Discharge Coefficient	0.590
Replaces Downstream Link	x	Design Flow (l/s)			
Invert Level (m)	90.239	Width (m)	2.000		

Node WESTERN BASIN Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	89.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	4620

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	1643.7	0.0	1.500	2481.5	0.0

Node EASTERN BASIN Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	88.740
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	3120

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	2152.5	0.0	1.500	3914.4	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.90%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	EASTERN BASIN	1020	89.028	0.288	36.6	670.5630	0.0000	OK
15 minute summer	PUMP	9	89.095	0.379	15.2	0.9666	0.0000	OK
10080 minute summer	WESTERN BASIN	6840	89.824	0.324	8.5	561.5306	0.0000	OK
15 minute summer	HYDRO	9	89.220	0.492	156.0	1.2533	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	EASTERN BASIN	1.000	HYDRO	8.5	-0.227	0.014	0.8016	
15 minute summer	PUMP	Weir		0.0				0.0
15 minute summer	PUMP	Pump	WESTERN BASIN	8.5				196.2
10080 minute summer	WESTERN BASIN	ACO Q-Brake		5.6				2108.9
15 minute summer	HYDRO	1.001	PUMP	15.2	0.583	0.025	1.0938	



Results for 30 year Critical Storm Duration. Lowest mass balance: 99.90%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
1440 minute winter	EASTERN BASIN	1380	89.345	0.605	51.0	1518.0680	0.0000	OK
1440 minute winter	PUMP	1380	89.240	0.524	8.7	1.3337	0.0000	OK
10080 minute winter	WESTERN BASIN	9300	90.176	0.676	8.5	1239.9180	0.0000	OK
1440 minute winter	HYDRO	1380	89.345	0.617	19.9	1.5696	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
1440 minute winter	EASTERN BASIN	1.000	HYDRO	-11.2	-0.322	-0.018	1.9197	
1440 minute winter	PUMP	Weir		0.0				0.0
1440 minute winter	PUMP	Pump	WESTERN BASIN	8.5				2044.6
10080 minute winter	WESTERN BASIN	ACO Q-Brake		5.6				3495.2
1440 minute winter	HYDRO	1.001	PUMP	8.7	0.551	0.014	1.6205	



Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.90%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
2160 minute winter	EASTERN BASIN	2100	89.895	1.155	72.0	3272.3180	0.0000	SURCHARGED
2160 minute winter	PUMP	2100	89.790	1.074	8.7	2.7339	0.0000	OK
10080 minute winter	WESTERN BASIN	13140	90.665	1.165	8.5	2294.9230	0.0000	OK
2160 minute winter	HYDRO	2100	89.895	1.167	26.9	2.9698	0.0000	SURCHARGED
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
2160 minute winter	EASTERN BASIN	1.000	HYDRO	-18.2	-0.339	-0.030	2.2006	
2160 minute winter	PUMP	Weir		0.0				0.0
2160 minute winter	PUMP	Pump	WESTERN BASIN	8.5				4159.1
10080 minute winter	WESTERN BASIN	ACO Q-Brake		5.6				5407.4
2160 minute winter	HYDRO	1.001	PUMP	8.7	0.560	0.014	2.2006	

Catchments	Total Area (ha)	Total Impermeable Area (ha)	Discharge Rates Based on 20% Betterment on QBAR (l/s)	Volume Provided (m ³)	Depth (m)	Basin Side Slopes
A	1.897	1.290	4.8	1,424	1.5	1 in 3 - 1 in 4
B	1.651	1.129	5.8	1,063	1.5	1 in 3 - 1 in 4
C	4.160*	2.928	5.8	6,116	1.5	1 in 3

*The 4.160ha is the total area of this Catchment. Not all of Catchment C naturally slopes towards the west. Thus, the discharge rate for this catchment is restricted to the area(2.917ha) that naturally slopes towards the Western outfall that also Catchment B utilizes.

N/11/04126/OUT
Consented development

Catchment A
Total Developable Area: 1.897ha

Foul from the dwellings of Catchment A to connect to the existing Wessex Water foul sewer that crosses the site. A new manhole chamber to be provided.

Attenuation Basin A
Approximate Volume = 1,232m³
Side Slopes = 1:3 & 1:4
Depth = 1.5m
Top of the Bank: 86.50m
IL: 85.00m

Hydrobrake to restrict flows and offer 20% betterment on the Qbar
Flow discharge rate: 4.8l/s

Foul from the dwellings of Catchment B to connect to the existing Wessex Water foul sewer that crosses the site. A new manhole chamber to be provided.

Hydrobrake to restrict flows and offer 20% betterment on the Qbar
Flow discharge rate: 5.8l/s

Catchment B
Total Developable Area: 1.651ha

Attenuation Basin B
Approximate Volume = 1,063m³
Side Slopes = 1:3 & 1:4
Depth = 1.5m
Top of the Bank: 85.26m
IL: 83.76m

Conveyance Vegetated Swale

Hydrobrake to restrict flows to 20% betterment of the natural catchment that flows towards the outfall of Catchment B
Flow discharge rate: 5.8l/s

Attenuation Basin C1 (Western Basin)
Approximate Volume = 2,164m³
Side Slopes = 1:3
Depth = 1.5m
Top of the Bank: 91.00m
IL: 89.50m

Proposed Dual Pumping Station

Attenuation Basin C2 (Eastern Basin)
Approximate Volume = 3,652m³
Side Slopes = 1:3
Depth = 1.5m
Top of the Bank: 90.24m
IL: 88.74m

Catchment C
Total Developable Area: 4.160ha
Catchment C is restricted to the natural catchment area(2.917ha) that naturally slopes towards the outfall of Catchment B

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NOTES:

- 1) The basins have been designed to drain 65% impermeable area of the total area of each catchment and 100% impermeable area from the basins.

KEY:

- Red Line Boundary
- Catchment A (Total Area: 1.897ha)
- Catchment B (Total Area: 1.651ha)
- Catchment C (Total Area: 4.160ha)
- Part of Catchment C that naturally slopes towards the outfall of Catchment B (Total Area: 2.917ha)
- Proposed Foul Rising Main
- Proposed Surface Water Rising Main
- Proposed Surface Water Sewer
- Proposed Foul Sewer and Manhole
- Exceedance Flow Routes
- Flow Control (Hydrobrake or similar)
- Proposed Headwall

P4	02.25	Layout amended	GR	SL
P3	01.25	Down revised to avoid the P10W	GR	SL
P2	12.24	Addressed the client's comments	GR	KW
P1	11.24	First Issue	GR	KW

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Client: GLEESON LAND LTD

Address: FILANDS ROAD
MALMESBURY

Project: DRAINAGE STRATEGY
LAYOUT

Status: PRELIMINARY

Date:	1:500 @ A0	Date:	FEB 2025	Drawn:	GR	Checked:	KW
Project:	HD009-006	Drawn:		Checked:		Project:	P4

Rev	Description
01	Issue for comment

Date	AU	Ch
01/01/2025	GR	KW

Project: Land off Whychurch Farm, Malmesbury

Transport
Development Planning
Sustainable
Deliver
Trusted
Enable
Site Appraisal
Hydrology
Highways
Civil Engineering
Successful
Travel Planning
Support
Drainage
Dynamic
Masterplanning
Flood Risk Assessment
Infrastructure Design

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