12. Flood Risk and Drainage

Introduction

12.1 This chapter assesses the effects of the proposed development on Water Resources and Flood Risk amenity. In particular it identifies and assesses the anticipated effects of change resulting from the Proposed Development on Hydrology. This considers the potential impacts on surface water quality, flood risk and drainage. Information contained in this chapter includes impacts in relation to the following:

- Flood risk;
- Surface water management;
- Groundwater quality; and
- Surface water quality

12.2 The chapter describes the methods used to assess the likely significant effects, the baseline conditions currently existing at the site and surroundings, the potential direct and indirect effects of the development arising from construction activities required for the residential development and installation of the primary drainage infrastructure. The development has also assessed regarding flood risk and the potential environmental impact caused by flooding. The mitigation measures required to prevent, reduce, or offset the identified significant effects and the residual effects have also been considered. It has been written by Adept Civil and Structural Consulting Engineers Ltd.

12.3 This Chapter is supported by the following figures and appendices.

- Figure12.1: Natural Resource Wales Protected Areas of Land and Sea
- Appendix 12.1 – Flood Consequence Assessment
- Appendix 12.2 – Relevant Correspondence

Assessment Methodology

12.4 The assessment approach has considered the degree (or the "significance") of the likely effects upon the hydrological and hydrogeological characteristics of the site.

12.5 The significance has been defined taking into account the sensitivity of the receiving environment and the potential magnitude of the impact.

12.6 Likely effects are therefore concluded to be of major, moderate, minor or negligible. Major and moderate effects are to be considered significant in terms of the EIA Regulations.

12.7 For the purposes of this assessment, it has been assumed that the development phasing will be continually built out. Temporary drainage will be implemented by the various contractors on site which will be discussed later in this report.

Identification of the Study Area

12.8 The study area for this assessment for the purposes of the surface water (quality and flood risk) considers all the features within the site development based on the boundary shown on masterplan developed by Tetra Tech Ltd. Relevant nearby hydrological features may be affected by the development including a nearby

watercourse, surface water features and dependant habitats; and also, hydrogeological features including underlying geology, aquifers and any nearby groundwater dependant features such as springs and wells.

12.9 A Flood Consequence Assessment has been provided in Appendix 12.1 of this report.

12.10 The assessment covers the construction and operational stage of the proposal and identifies aspects that have the potential to affect the existing baseline situation. The following issues have been considered:

- Effects on groundwater levels, flow and quality;
- Effects on surface water quality;
- Effects on groundwater dependant terrestrial ecosystems;
- Changes to the natural drainage patterns;
- Effects on base flows;
- Effects on runoff rates and volumes;
- Effects on erosion and sedimentation;
- Effects on water resources (both private and public water supplies); and
- Effects on flooding and impediments to flow.

12.11 Where likely significant effects are predicted, their significance has been assessed and measures incorporated into the design to mitigate or reduce the significance of these effects. Significance has been assigned to any residual effects following the implementation of the proposed mitigation measures.

12.12 The potential for cumulative effects has also been assessed.

Flood Modelling

12.13 The proposed drainage networks and infiltration basins have been assessed using InfoDrainage hydraulic modelling software. The result of this hydraulic assessment demonstrates there will be no adverse impact on site with regards flood risk following the build out of the completed development. The hydraulic assessment results can be viewed with the Flood Consequence Assessment appended to this chapter.

Data Sources

12.14 The sources of information used in the development of this desktop study are listed in table 12.1 below.

Table 12.1 – Data Sources Used

Data	Source
Topography	Site topographic survey by Tetra Tech - *784-B024030-TS-01A Cefn Park Topographical Survey*
Geology	BGS Bedrock and Superficial Geological Mapping
Hydrogeology	BGS survey maps
Hydrology	Natural Resource Wales Flood Risk Maps / FRA

Significance Criteria

12.15 Impacts of the proposed development have been assessed from a drainage and flood risk perspective. The magnitude, sensitivity and Impact have been defined below in tables 12.2, 12.3 and 12.4.

Table 12.2 – Determination of Impact Magnitude

Magnitude of Impact	Criteria for Assessing Impact
Major	Total loss or substantial alteration of key elements / features of the baseline. Post development conditions will be fundamentally changed.
Moderate	Loss or alteration to one or more key elements of the baseline conditions. Post development the baseline conditions will be materially changed.
Minor	A slight shift away from baseline conditions. A change which is detectable but not material. Conditions will be comparable to baseline conditions pre-development.
Negligible	Little change from baseline conditions. Change is insignificant or barely distinguishable resulting in a 'no change' situation.

Table 12.3 – Determination of Sensitivity

Sensitivity	Examples of Receptor
High	The receptor has limited ability to absorb change without fundamentally changing its state or is of national importance.
Moderate	The receptor has some capacity to absorb change without significantly changing its state.
Low	The receptor is tolerant of change without detriment to its state or is of low importance.

Table 12.4 – Significance Matrix

Magnitude	High	Moderate	Low
Major	Major Adverse/Beneficial	Major - Moderate Adverse/Beneficial	Moderate - Minor Adverse/Beneficial
Moderate	Major - Moderate Adverse/Beneficial	Moderate - Minor Adverse/Beneficial	Minor Adverse/Beneficial
Minor	Moderate - Minor Adverse/Beneficial	Minor Adverse/Beneficial	Minor - Negligible
Negligible	Negligible	Negligible	Negligible

12.16 Effects which are classified as moderate or above will be deemed significant.

Legislation, Policy and Design Guidance

12.17 The assessment will consider, the following legislation, policies and best practice design guidance.

National policy & Legislation

- Planning Policy Wales
- Land Drainage Act and Water Resources Act 1991
- The Flood and Water Management Act 2010
- The Water Framework Directive

Local policy & Guidance

- Wrexham County Borough Council (WCBC) acting as the Lead Local Flood Authority (LLFA);
    - Local Planning Guidance Note No 30 – Design (A Guide for Developers and Architects when Designing Residential Developments).
    - Local Planning Guidance Note No 32 - Biodiversity & Development

Natural Resources Wales

- Environment Agency Policy on Groundwater Protection (Formerly GP3), an approach adopted by Natural Resources Wales (NRW).
- Statutory National Standards for Sustainable Drainage Systems (SuDS) - Standards for sustainable drainage systems - designing, constructing, operating, and maintaining surface water drainage systems.

Other Guidance

- CIRIA C502 Environmental Good Practice on Site
- CIRIA C532 Control of Water Pollution from Construction Sites
- EA Pollution Prevention Guidelines (PPG) (now withdrawn, but still useful points of reference)

Please note the above list is not an exhaustive list and further relevant guidance may be suggested or use requested by the LLFA, SuDS Approving Body (SAB) or NRW.

Assessment of Climate

12.18 Welsh government guidance on climate change allowances indicates that climate change is likely to have an impact on river flows, sea levels, rainfall intensity, wave height and wind speed. Therefore, the risk of flooding is likely to increase in the future.

Table 12.5 – Government Guidance on Climate Change Allowances

PARAMETER	2015 - 2039	2040 - 2069	2070 - 2115
Peak Rainfall Intensity	10%	20%	40%
Peak River Flow	25%	40%	70%

Consultations

12.19 Various authorities have been consulted during the flood risk assessment and drainage strategy design.

12.20 Wrexham County Borough Council, acting as the Lead Local Flood Authority have been contacted to set out the drainage principles for the drainage strategy and flood risk assessment. The LLFA have confirmed their preference for infiltration basins to be used as the primary point of disposal of the surface water flows and have requested that additional SuDS features be used to create a treatment train, rather than a reliance on two large infiltration basins. The LLFA have also accepted surface water discharges into a nearby watercourse should it be proven that infiltration to ground is not possible.

12.21 The LLFA response did not raise any objections to the design intent for surface water strategy, however, their response for the potential foul drainage stated that they would object to the use of an on-site wastewater treatment works (WwTW) unless sufficient dilution could be achieved throughout the year. The drainage strategy has change to implement four strategically placed infiltration basins rather than the two originally proposed. As this maintains the agreed philosophy, further consultation has not taken place.

12.22 Welsh Water (WW) have been contacted regarding a proposed new treatment works to deal with the foul flows generated by the new development. The WW reply confirmed that the adoption of a new WwTW by Welsh Water would only be considered if a pumped solution was not technically viable.

12.23 Welsh Water have concluded a hydraulic assessment of their network and indicated that the public sewer is at capacity, and further drainage infrastructure will be required to facilitate new foul connections from the development.

12.24 WW have also been contacted regarding the use and adoption of Sustainable Drainage Systems. The WW response has confirmed that as the site will be subject to a SAB application this will be the body which adopts the surface water network.

12.25 A copy of the relevant correspondence can be found in Appendix 12.2 of this report.

Table 12.6 – Consultation Table

Consultation	Date and Time	Comments	Actions
Welsh Water	3rd January 2024	WW preference for a pumped solution.	Drainage strategy update to discount a new WwTW.
Welsh Water	8th January 2024	WW confirming Surface Water drainage will need be adopted by the SAB.	
Wrexham County Borough Council	8th January 2024	Discussion on drainage strategy acceptance of infiltration and notice that the council would object to a WwTW.	Drainage strategy update to discount a new WwTW.
Wrexham County Borough Council (SAB correspondence)	1st May 2024	SAB response to initial Flood Consequence Assessment	Drainage Strategy amended so that no flooding occurs within the 1 in 100 year storm + Climate Change allowance.
Welsh Water	12th July 2024	Adept Query following receipt of Hydraulic Modelling Assessment.	
Welsh Water	23rd August 2024	Welsh Water Confirming further modelling based on correct build out figures and reposition of new infrastructure to be on-plot.	

Baseline Conditions

12.26 A full description of the site can be found in Chapter 3: Site Description of the ES. Features and the study area which are relevant to this chapter are discussed in more detail below.

Site Description and Topography

12.27 The site located off Cefn Road, Erlas Park, Wrexham. The site grid reference is SJ 35608 50760 and the closest postcode is LL13 9TT. The 40.27-hectare site is predominantly greenfield / farmland and is bounded on the east and south by further farmland. There is also a small commercial area located at the centre of the southern boundary which consists of container storage, a canoe company and a playground equipment supplier. The northern boundary is partly bounded by Brynestyrn Road, with residential properties opposite the carriageway. The remaining north boundary is enclosed by Wrexham Rugby Club's clubhouse and sports pitches. The western boundary is bounded by Cefn Road, with existing residential properties opposite the carriageway.

12.28 The site topography generally falls from west to east. There is a high point within the central area of the site approx. 82.000m AOD. From here existing ground generally falls from northwest to southeast to a low level of approx. 56.000m AOD. A 5.5Ha catchment to the northwest of the development falls from west to northeast. This land falls from 81.500m down to 77.500m AOD. The southwest area of the site falls inwards towards the centre of this area. 82.000m AOD at the site central highpoint, 80.000m at the southeast boundary and 78.000m. From these points the existing ground falls into the site to multiple low points in the range of 74.000m to 76.000m AOD.

Hydrology

12.29 There are no known watercourses within the development area. There is an existing pond situated to the west of the proposed development in the middle of the proposed sports pitch area. The proposed development and drainage strategy proposes no change to this area to preserve the existing ecological and biodiverse nature. The closest named watercourses are Redwither Brook located 672m southeast of the development. There are a number of un-named water courses east of the development with the nearest possible un-named watercourse located southeast of the site, outside of the development boundary. The presence of this watercourse is indicated on the NRW surface water flood maps. This watercourse is located approximately 180m from the development southeast boundary, and 415m from the proposed infiltration basins..

Rainfall

12.30 For hydraulic modelling purposes, FSR rainfall data within the software InfoDrainage was used to size the required infiltration basins and confirm flow rates. The ICP SuDS tool within the hydraulic software was used to estimate runoff rates which has confirmed that QBAR for the site is 5.6l/s/Ha. Based on an anticipated development impermeable area of 14 hectares, inclusive of a 10% urban creep allowance, a

greenfield run off rate for the development will be 78.4l/s. However, proposals are to discharge surface water flows fully to ground.

Geology

12.31 Ground investigation work completed in 2020 suggests that the site has a 200mm thick layer of topsoil and clay with medium dense brown sand and gravel from 0.20m – 9.0m below existing ground level. The British Geological Survey's (BGS) online mapping shows the site's bedrock geology is 'Salop Formation - Mudstone, sandstone, and conglomerate. BGS online mapping also shows the superficial geology to be predominantly 'Glaciofluvial Sheet Deposits, Devensian - Sand and gravel'. There is a small section of the site located to the west of the site which is 'Till, Devensian – Diamicton'.

Hydrogeology

12.32 The site is not located within a Groundwater Source Protection Zone area (SPZ). There is an SPZ located 800m east of the site however it is unlikely that the development flows will migrate sufficiently to impact this.

12.33 The entire site is located within flood zone 1 and there are small pockets of the site which show a risk of surface water flooding.

Surface water Quality

12.34 Transitional and coastal water bodies are protected under the Water framework Directive. The WFD has the aim of achieving an overall status of 'good' for these water bodies.

The proposed surface water drainage strategy will be designed to follow the hierarchy for disposal of surface water flows. These being;

- Infiltration – At, or as close to source as possible,
- Discharge to Surface Waters (i.e. watercourse),
- Discharge to a surface water sewer, highway drain or another drainage system,
- Discharge to a combined sewer.

12.35 Following the above hierarchy, the proposed surface water drainage is to discharge surface water flows to ground. With no proposals to discharge into a water body, it can be deemed that the development will be compliant with the WFD and not have a negative impact on the existing water quality. The site located outside a groundwater source protection zone but is fully within the WFD Groundwater bodies Cycle.

Surface Water Abstractions

12.36 Consulting the NRW online maps, it has been deemed that neither groundwater nor surface water abstractions will be affected by the proposed development.

Flood Risk

12.37 A flood consequence assessment has been carried out for the proposal in accordance with the guidance set out within Planning Policy Wales. The FCA identifies and assesses the risk of all forms of flooding. This demonstrates the how flood risks to the development site can be mitigated to safeguard against flooding for the proposed design life. A summary of the flood risk can be viewed in Table 12.7 below.

Table 12.7 – Flood Risk Levels

Source	Risk Level
Fluvial	Very Low
Tidal - Coastal	Very Low
Surface Water / Pluvial	Very Low
Groundwater	Low to Moderate
Surcharged Sewers	Very Low
Other Man-Made Sources	Very Low

Foul Drainage

12.38 Foul flows will discharge into the existing Welsh Water combined sewer which runs through the proposed development. Where possible this will be facilitated by a gravity connection subject to agreement with Welsh Water under Section 106 of the Water Industry Act 1991.

12.39 Welsh Water have confirmed that the existing public sewer is at capacity and further drainage infrastructure upgrades are required in order to provide capacity to allow foul connections for the development.

12.40 The additional storage pipes have been shown as part of the latest drainage strategy and WW will consider this as part of a future hydraulic model.

12.41 It is anticipated that due to the site topography an estimated 256 units will be unable to drain by gravity to the existing combined sewer. Foul drainage from these units will drain to an adoptable pump station located to the east of the site and then be pumped to the WW combined sewer. It is anticipated this pumpstation will service approximately 256 units generating a peak flow rate of 11.85l/s. This is based on 4000 litres per dwelling per day taken from Sewer Sector Guidance – Codes for Adoption. Adoptable foul pump stations require emergency storage provision of 160litres per dwelling per day, a 45.9m^3 storage requirement in this instance. It expected that this will be stored within the wet well and upstream drainage network. This removes the requirement to store foul effluent below ground in a tank.

12.42 This pump station will be constructed so that the compound slab level is above flood events and has been sited so that there is a 15m offset from the wet well to any habitable building

12.43 The site is within the catchment for the River Dee and Bala Lake Special Area of Conservation (SAC). Phosphorous is the leading cause of eutrophication and as such will require a level of treatment prior to discharging into the SAC catchment.

12.44 The ultimate discharge point for the proposed foul drainage will be Five Fords wastewater treatment works. This treatment works will be responsible for treating the foul effluent from the development, particularly a percentage removal of phosphorous.

12.45 There is an element of existing foul drainage to be removed and diverted as part of the proposed works subject to agreement with Welsh Water under Section 185 of the Water Industry Act 1991.

12.46 New foul drainage will be designed to adoptable standards to facilitate the adoption by Welsh Water under a S104 of the Water Industry Act 1991. This will allow the sewer to be regularly monitored and maintained by the water authority thereby minimising the risk of a failure of the foul drainage.

Designated Sites

12.47 Consulting the NRW online maps it can be seen that the proposed development does not sit within a protected area of land and sea. No sites of special scientific interest (SSSI) show within the proposed development The approx. location of the development can be seen in the image below.

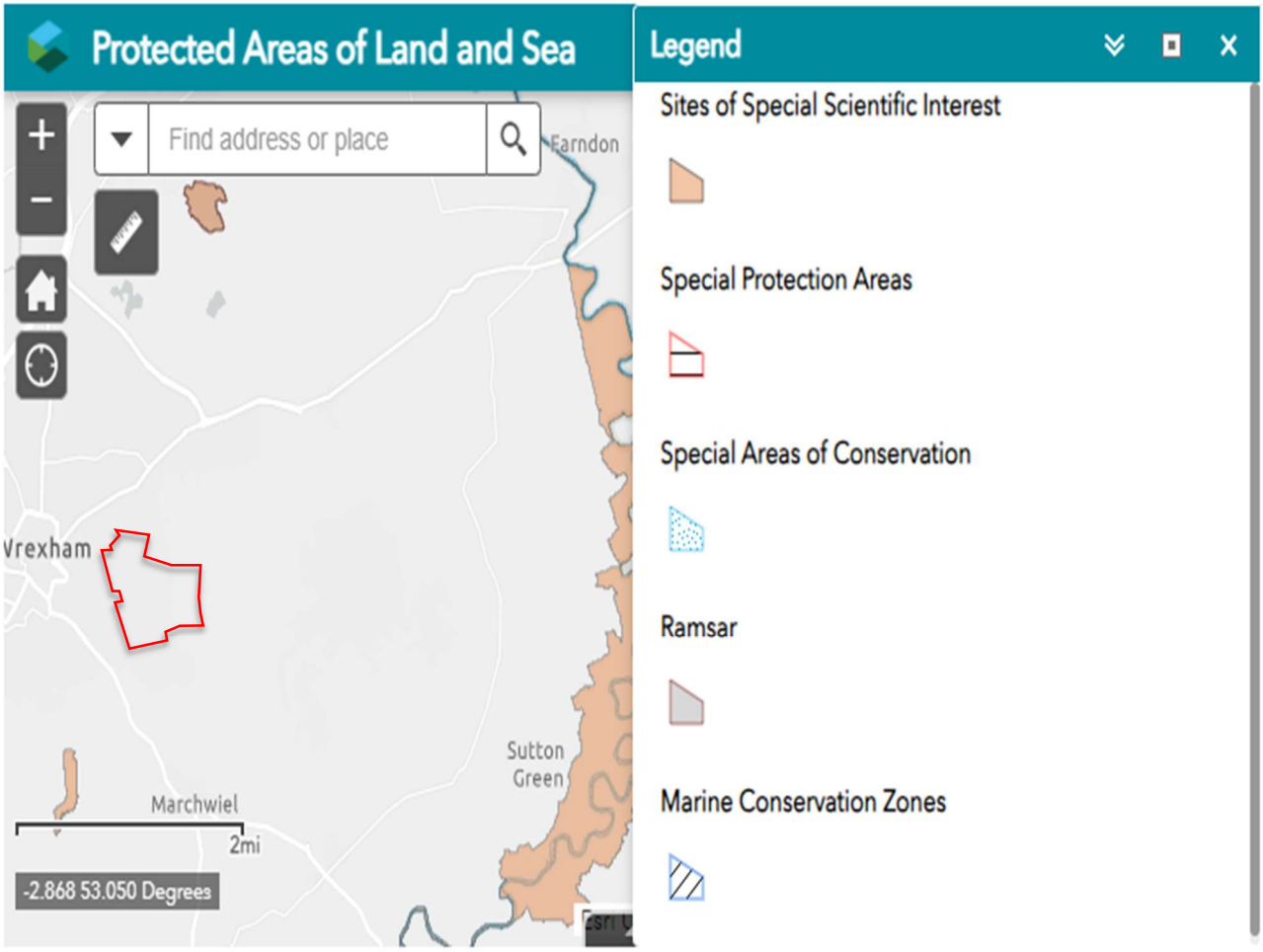


Figure 12.1: Natural Resource Wales Protected Areas of Land and Sea (February 2024)

Nearby Sites of Special Scientific Interest

12.48 A list of SSSI in the surrounding area has been extracted from NRW online map and detailed below;

- The Dee Estuary is located approximately 25km north of the proposed development. (Type - Biological / Marine)
- The River Dee is located 5.8km east of the proposed development.
- Sontley Marsh is located 2.8km southwest of the proposed development.
- Vicarage Moss is located 3.4km north of the proposed development.
- Gatewen Marsh is located 3.5km west of the development.

Sensitivity of Hydrological & Hydrological Receptors

12.49 Construction activities have the potential to contaminate and cause flooding to existing waterbodies. While temporary works drainage will be the responsibility of the contractor, they will also be considered during the final assessment.

Table 12.8 – Sensitivity of Identified Receptors

Receptor	Comment	Sensitivity
SSSI; a) Dee Estuary b) River Dee c) Sontley Marsh d) Vicarage Moss e) Gatewen Marsh	Type; Biological / Marine Marine Biological Mixed Biological	High
Groundwater (superficial deposits)	Secondary undifferentiated aquifer Moderate permeability No source protection zone No private water supplies present	Low
Groundwater (Bedrock geology)	Secondary A aquifer Moderate permeability No source protection zone No private water supplies present No nearby abstractions	High
Unnamed Pond	Aquatic environment	Moderate

Embedded Mitigation

12.50 Identified SSSI

Noted in section 12.48, the nearest site of special scientific interest is approximately 2.8km from the proposed development. Due to the distances of these SSSI from the proposed development, it can be expected that no negative impact will result from the site.

12.51 Surface Water

A surface water drainage and management strategy is proposed to manage and reduce discharges from site. runoff generated by the development will be collected by a traditional piped gravity network prior to discharging into four large SuDS infiltration basins strategically placed across the site. The use of roadside rain gardens or swales and permeable paving offers a level of treatment to surface water flows improving water quality prior to discharging into the large attenuation / infiltration basins. These basins will be designed to be compliant with the Planning Policy Wales, Statutory Standards for Sustainable Drainage Systems – designing, constructing, operating and maintaining surface water drainage systems' and the SuDS Manual (CIRIA 753), SuDS and will offer a further level of treatment prior to discharging to ground. This will improve the quality of the surface water flows prior to discharging into the ground.

The proposed drainage strategy avoids works within the existing unnamed pond located within the development area.

No proposed drainage works are proposed to the existing sports pitches to be retained.

12.52 Surface Water Management

The proposed development will introduce a significant increase of impermeable surface area to land which is predominantly of agricultural use. The increase in impermeable area will be managed by reducing surface water discharges from site. The proposed drainage strategy for the site is to fully infiltrate to surface water flows to ground which offers a full reduction to the offsite flows thus having no negative impact on existing surface water bodies above ground.

The surface water drainage will be subject to, and put forward for adoption under SAB application. This will allow the drainage features to maintained and inspected appropriately by the adopting authority.

Following initial consultation with the SuDS Approval Body the drainage has been amended so no flooding occurs during the 1 in 100 year + climate change storm event. This will reduce overland runoff thus reducing the amount of sediment mobilisation.

12.53 Groundwater

The site is not situated within a groundwater source protections zone, however as described in section 12.51 above, discharges to ground will receive multiple levels of treatment prior to infiltrating to ground. Table G3.1 from the National Standards for Sustainable Drainage Systems indicates that the proposed development will present a pollution hazard level which is 'Low'. Applying the simple index approach from the CIRA SuDS manual which can be seen in the below tables, demonstrates that the proposed SuDS features offer a level of surface water treatment in excess of the anticipated pollution levels.

Table 12.9 - Pollution hazard indices for land use classification taken from CIRA SuDS manual.

Land Use	Pollution Hazard	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Individual property driveways, residential carparks, low traffic roads (e.g. cul de sacs, home zones and general access road) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. <300 traffic movements/day	Low	0.5	0.4	0.4

Table 12.10 - Indicative SuDS mitigation indices for discharges to surface water taken from CIRA SuDS manual.

Type of SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Infiltration / Detention Basin	0.5	0.5	0.6
Swale / Raingarden	0.5	0.6	0.6
Aggregated Surface water Pollution Mitigation index	**0.75**	**0.8**	**0.9**

Flood Risk Management

12.54 Pluvial flood risk will be managed through the provision of a drainage network sized to be compliant with the standards and requirements of Sewer Sector Guidance – Codes for Adoption being:

- No surcharging of pipes for the 1 in 2-year storm return period.
- No flooding of pipes for the 1 in 30-year storm return period.
- Roads, roofs and private hard standing areas have 100% impermeability (run-off coefficient) and fully contribute to flows in the surface water networks.

12.55 The proposed infiltration basins will be sized to provide attenuation for the 1 in 100-year storm with a 40% allowance for climate change. 300mm freeboard above this top water level.

12.56 Finished floor levels for the development could be set 150mm above surrounding ground levels.

Pollution Risk Management

12.57 Post development the site will utilise a number of SuDS features providing a suitable treatment train for the surface water flows with the sediment forebays to the infiltration basins offering a final level of settlement treatment prior to discharging to ground. This is demonstrated above in CIRIA SuDS tables shown in section 12.53.

12.58 During construction the principal contractor will be responsible for implementing pollution prevention measures in line with best practice guidance. It is anticipated that a competent will be employed for the works who will be aware of the environmental parameters and the expectations and requirements they must adhere to. Site runoff is typically collected, treated appropriately and released at a controlled rate or reused on site. The contractor will be required to submit risk assessments and method statements (RAMS) which covers dust suppression and

pollution responses. They will also be required to provide evidence of appropriate qualification to undertake such works while protecting the environment.

12.59 During the construction of the proposed foul drainage diversion, the contractor will divert live foul flows, likely by over pumping while they remove the existing foul and construct the new diversion. The contractor will need to undertake their own risk assessment for the works and provide a method statement for the works to demonstrate how the work will be completed without causing a pollution event.

Assessment of Likely Significant Effects

12.60 The possible impacts on water quality predicted from construction and operational activities are summarised in Table 12.11 and described in greater detail below.

Table 12.11 – Summary of Possible Impacts on the Hydrogeological Environment

Activity	Possible Impacts
Site Preparation	
Site construction	Contaminants from fuel spillage Sediment loading of watercourses. Discharge of poor-quality water to watercourses or to ground. Contamination of ground water.
Site Operation	
Normal site operations	Contaminants from motor oil spillage. Sediment loading of watercourses. Discharge of poor-quality water to watercourses. Contamination of groundwater.

Contaminants from Fuels, Oils and Foul Drainage

12.61 A number of potentially polluting materials may be used during the site construction. These may include but are not to, oils, diesel, fuels and hydraulic fluids. The accidental spillage of these potential contaminants may result in the contamination of surface water and groundwater. Storage and handling of fuels and oils at the site must comply with Natural Resources Wales Pollution Prevention and Control regulations.

Sediment Loading of Watercourses

12.62 Removal of areas of soil and vegetation will modify the area of the local surface water catchments and could potentially result in fine particles of silt and clay washing from excavations or site works during construction. The drainage strategy has been completed to contain the development surface water flows up to and including the 1in 100year storm with an allowance for climate change within new infrastructure. Existing ground falls towards a small watercourse east of the development, the capture of this run off will reduce the natural mobilisation of sediment into the watercaourse.

12.63 Normal construction site and environmental protection measures will prevent the pollution of the local hydrological features which include the above noted watercourse.

12.64 Considering the proposed surface water collection, conveyance, attenuation and infiltration system and each elements potential to improve water quality; in conjunction with correct site operations during construction, no adverse effects are considered to be significant or unmanageable.

12.65 Flood Risk

Changes in the surface water runoff will change the downstream watercourse flow rates and volumes. The development proposals are to discharge flows to ground which will see a reduction of flows into existing above ground water bodies.

12.66 The risk of flooding from a major source, fluvial and/or tidal is considered to be very low.

12.67 The change in land use from agricultural to residential will see a change in vulnerability, from 'less vulnerable' to 'more vulnerable' and is appropriate within Flood Zone 1. An explanation of these classifications can be seen in the appended FCA. This change in this flood risk classification will be managed by designing surface water drainage in accordance with the criteria listed in section 12.54 above. This will allow the development to remain in operation during extreme weather events.

12.68 Flood risk at the site will be further mitigated by the use of the additional SuDS features as part of the surface water drainage and management strategy.

12.69 The sequential test will not be undertaken as part of this assessment as the site is located fully within Flood Zone 1. Planning applications located within FZ1 are not subject to the exception test.

12.70 The site is situated fully within Flood Zone 1 with a low annual probability of flooding from all sources. The likelihood of flooding from all sources, each year is of low significance.

Summary of Impacts

12.71 Operations have the potential to impact upon hydrology, hydrogeology and flood risk both within the site development and downstream. This can potentially impact upon surface water runoff, groundwater levels, flow direction and water quality.

12.72 The principles of the drainage and surface water management strategy noted within this chapter, it has been demonstrated that a scheme can be developed which does not increase risk of flooding, both on and off site.

12.73 The proposal will result in a significant reduction of runoff from site when compared to existing runoff rates.

12.74 The significance of any potential pollution or changes in groundwater levels and flow would be dependent on the nature of the incident, the mitigation measures, timing of the measures, and the effectiveness of the measures and sensitivity of the potential receptors. However, there are no development operations that are deemed to pose any significant risk to the wider environment from pollution. The adoption of a surface water will allow maintenance of the surface water system, is carried out at appropriate times, will protect the site from flood risk.

Cumulative Impacts

12.75 No potential cumulative impacts have been identified in association with drainage and flood risk.

Additional Mitigation / Enhancement Measures

Construction

12.76 The following measures outline the mitigation proposed during site works. It is common practice for the planning authority to impose planning conditions requiring detailed method statements to be submitted for approval prior to any development occurring on the site. These method statements will be incorporated into a composite Water Monitoring and Management Plan which will be prepared for the site.

12.77 Standard pollution prevention procedures are to be implemented during the construction phase based on industry best practice and Environment Agency PPGs, to mitigate potential impacts on the water environment.

12.78 During construction, all site runoff would be intercepted and treated to remove sediment prior to discharge off site. The management of runoff during construction should be documented in a Construction and Environmental Management Plan (CEMP).

12.79 CEMP for control and management of potential risks at the site would be developed and implemented by the Principal Contractor for the preparatory and construction phases of the site. The CEMP would incorporate the mitigation measures recommended above and within other relevant chapters of this ES, to reduce the significance and, where possible, eliminate the identified effects.

12.80 The CEMP would be a live document setting out the management system to be adopted onsite. Detailed risk assessments for all operations from which a safe system of work is required shall be developed. The Principal Contractor would be required to monitor this process and develop assessments and working methods appropriate to changes in work activities.

12.81 The contractor will need to apply for a temporary discharge consent to discharge any foul flows generated within their site compound into the public sewer.

The Completed and Operational Development

12.82 When the site has been completed and is fully developed there will be several embedded mitigation factors which the scheme will benefit from. The drainage strategy follows the drainage hierarchy approach proposing to discharge flows to ground. This not only helps with the flood risk of the proposed development but also on downstream catchments. As noted above in section 12.30 the existing greenfield catchment generated approximately 78l/s of flow which will be removed from the downstream catchments.

12.83 Multiple on-plot SuDS methods are proposed as part of the drainage strategy, this offers a level of treatment to surface water runoff prior to discharging to ground.

12.84 The drainage strategy avoids the use of an on-plot wastewater treatment works for foul drainage. All foul drainage connects into the existing Welsh Water combined sewer either by gravity or by pumping. The ultimate disposal point of this public sewer is the Five Fords treatment works which holds a phosphate consent and will provide treatment of the foul flows generated by the completed development.

Residual Effects Assessment

12.85 Residual impacts refer to those environmental effects predicted to remain after the application of mitigation outlined in this EIA. The predicted residual effects have been considered and outlined below in table 12.12.

Table 12.12 Residual Effects Summary

Impact	Receptors	Sensitivity	Magnitude of Impact before mitigation	Significance of Impact before Mitigation	Magnitude of Impact following Mitigation Measures	Significance of Impact following Mitigation
Site Preparation						
Contaminants from accidental fuel spillages	Groundwater, unnamed pond and existing watercourses	Low	Minor Adverse	Minor Adverse	Negligible	Negligible
Sediment Loading and Flow Impacts	unnamed pond and existing watercourses	Low	Minor Adverse	Minor Adverse	Negligible	Negligible
Discharge of poor-quality water to water bodies	Groundwater, unnamed pond and existing watercourses	Low	Minor Adverse	Minor Adverse	Negligible	Negligible
Damage to SSSI	Dee Estuary River Dee Sontley Marsh Vicarage Moss Gatewen Marsh	High	Negligible	Negligible	Negligible	Negligible
Pollution of groundwater	Groundwater	High	Moderate Adverse	Moderate Adverse	Negligible	Negligible
Erosion of watercourse and river banks	Unnamed Pond and existing watercourses	Low	Negligible	Minor	Negligible	Negligible
Site Operation						
Contaminants from accidental fuel spillages	Groundwater, unnamed pond and existing watercourses	Low	Minor Adverse	Minor Adverse	Negligible	Negligible
Sediment Loading and Flow Impacts	unnamed pond and existing watercourses	Low	Minor Adverse	Minor Adverse	Negligible	Negligible
Discharge of poor-quality water to water bodies	Groundwater, unnamed pond and existing watercourses	Low	Minor Adverse	Minor Adverse	Negligible	Negligible
Damage to SSSI	Dee Estuary River Dee Sontley Marsh Vicarage Moss Gatewen Marsh	High	Negligible	Negligible	Negligible	Negligible
Pollution of groundwater	Groundwater	Low	Minor Adverse	Minor Adverse	Negligible	Negligible

Conclusions

12.86 An assessment has been undertaken of the potential impacts relating to the water environment for the proposed development at the site.

12.87 It has been demonstrated that a scheme can be developed which does not increase risk of flooding, both on and off site.

12.88 The development is sited within the catchment for the River Dee and Bala Lake Special Area of Conservation (SAC) and it has been demonstrated that there will be no adverse effects caused by the development.

12.89 Foul drainage connections into the public sewer will be subject to a S106 agreements with Welsh Water.

12.90 New foul drainage will be subject to S104 technical approval with Welsh Water.

12.91 Foul drainage will discharge into Five Fords wastewater treatment works via the existing 1050mm diameter combined sewer. This WwTW holds a phosphate consent.

12.92 The proposed drainage scheme does not present a risk to the surrounding SSSI areas due to their distance away from the site.

12.93 The proposed scheme implements a SuDS treatment train to improve water quality discharging to ground.

12.94 Four new infiltration basins located at various points around the site boundary are to be the discharge points for surface water flows.

12.95 The site is inside Flood Zone 1, with a low annual probability of flooding from all sources. The chance of flooding from all sources each year is low or not significant.

12.96 Embedded mitigation provided within the development includes; Location of the site, Site is not within a flood zone or a groundwater source protection zone. The site is a significant distance away from any SSSI, the drainage has been designed to limit impact on existing waterbodies and utilises multiple SuDS features to provide a surface water treatment train for surface water flows prior to discharge to ground Utilisation of the existing combined sewer and Five Fords treatment works for phosphate removal.

12.97 Further mitigation can be provided through the implementation and operation of a Construction and Environmental Management Plan by the principal contractor.

12.98 No significant effects are expected to the surface water and groundwater receptors following the mitigation measures noted in this ES chapter.

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