



# **Flood Risk & Drainage Strategy Report**

Proposed development at  
Land West of Windmill Lane,  
Cowbridge

Redrow Homes South Wales

Revision -

August 2022

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## Document Details

|                      |                                  |                   |      |
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| Appendix B | Ground Investigations - Report Extracts   |
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# 1 INTRODUCTION

- 1.1 Spring Design Consultancy Ltd. has prepared this Flood Risk and Drainage Strategy Report on behalf of Redrow Homes South Wales in support of a full planning application for the development of a Residential Housing Scheme of 105 dwellings on land off Windmill Close, Cowbridge.
- 1.2 The site lies in Flood Zone A therefore a Flood Consequence Assessment in accordance with TAN15 is not required. Notwithstanding, we have produced this Flood Risk and Drainage Report to provide a summary of the risk of flooding to the site and set out a suitable foul and SuDS strategy that could be implemented to serve the proposed development.

## 2 EXISTING SITE

### Site Description

- 2.1 The site is located approximately 0.5km south of Cowbridge Town Centre and accessed off Windmill Lane, Cowbridge. The location of the site and surrounding area is shown in Figure 2.1 below.
- 2.2 The application site is Greenfield and has an approximate area of 3.9 hectares (ha). The site is bound by rear gardens of existing properties off Bessant Close, Llanquian Close and Lake Hill Drive to the north / north-east, St Athan Road to the east, undeveloped open land to the south / south-west and properties off Windmill Lane to the west.

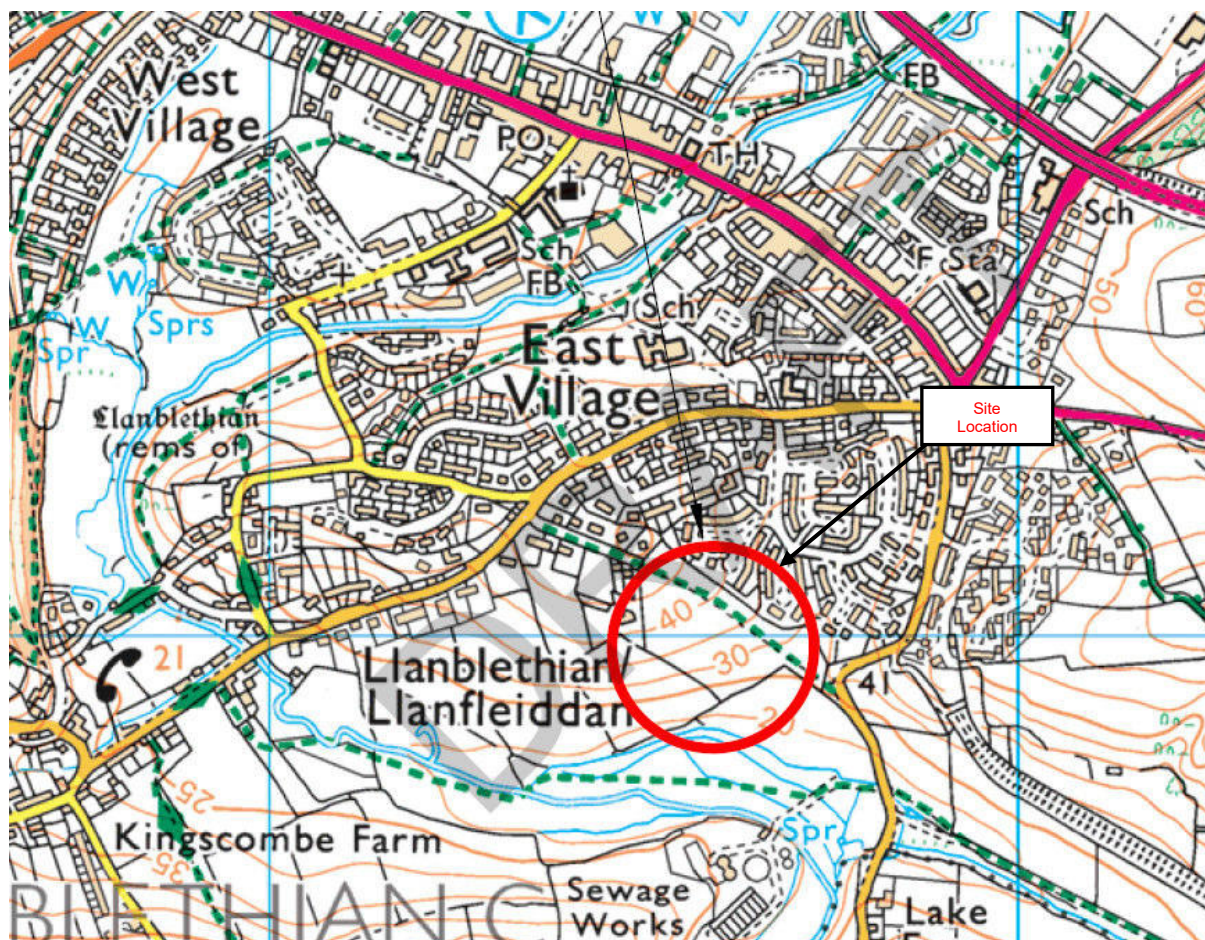


Figure 2.1 – Site Location

### Site Topography

- 2.3 A Topographical Survey has been produced and confirms that the site falls steeply from north-west to south-east and slopes at an average gradient of 1 in 6 (17%).
- 2.4 There is an approximate difference in levels across the site between 50.03m and 20.50m, with the lowest point situated at the south-east corner of the site.

## Existing Surface Water Drainage

### *Public Sewers*

- 2.5 Public Sewer records have been obtained from DCWW and are included at **Appendix A**. The records confirm there is an existing 150mm foul water sewer located within Windmill Lane to the north-west.
- 2.6 The records show there are no surface water sewers in the vicinity.

### *Existing Ground Conditions*

#### *Infiltration Testing*

- 2.7 Ground Investigations were undertaken by Intégral Géotechnique in November 2019 and relevant extracts from their report are included at **Appendix B**. Infiltration testing undertaken on site was varied from unsuccessful to minimal and the use of soakaway drainage systems in the shallow soils beneath the site was not recommended due to the nature of the geology underlying the site where a potential solution feature risk was identified.

### *Greenfield Runoff*

- 2.8 Based on topographical survey and geotechnical data, it is considered runoff from the site discharges via overland flow to the southern site boundary.
- 2.9 Greenfield runoff rates for various return periods have been calculated to determine the existing rate of runoff from the application site.
- 2.10 The calculations are included at **Appendix C** and are summarised in Table 2.1 below.

*Table 2.1 - Greenfield Runoff Rates & Volume*

| Return Period | Runoff Rate (l/s/ha) | Q100 6-hour Vol. (m <sup>3</sup> ) |
|---------------|----------------------|------------------------------------|
| Q1 Year       | 7.6                  |                                    |
| Q2 Year       | 8.0                  |                                    |
| <b>Qbar</b>   | <b>8.6</b>           |                                    |
| Q30 Years     | 15.6                 |                                    |
| Q100 Years    | 18.8                 |                                    |
|               |                      | 471                                |

### 3 EXISTING FLOOD RISK

- 3.1 The nearest surface water feature is located 41m to the south of the site. The OS Water Network Lines map indicate this is an unnamed surface water drainage feature and there are other surface water features located to the south of the site. The nearest named surface water feature is the River Thaw located 139m to the south with the water level at the time of the topographical survey some 1.6m below the lowest site level and 7m below the lowest proposed finished floor level.
- 3.2 As shown on Figure 3.1 below, the National Resources Wales Flood Risk Map indicates the site is not at risk to extreme flooding from rivers or sea without defences. However, the area in between the existing surface water drainage feature and River Thaw is at risk to extreme flooding although no development is proposed within this area.

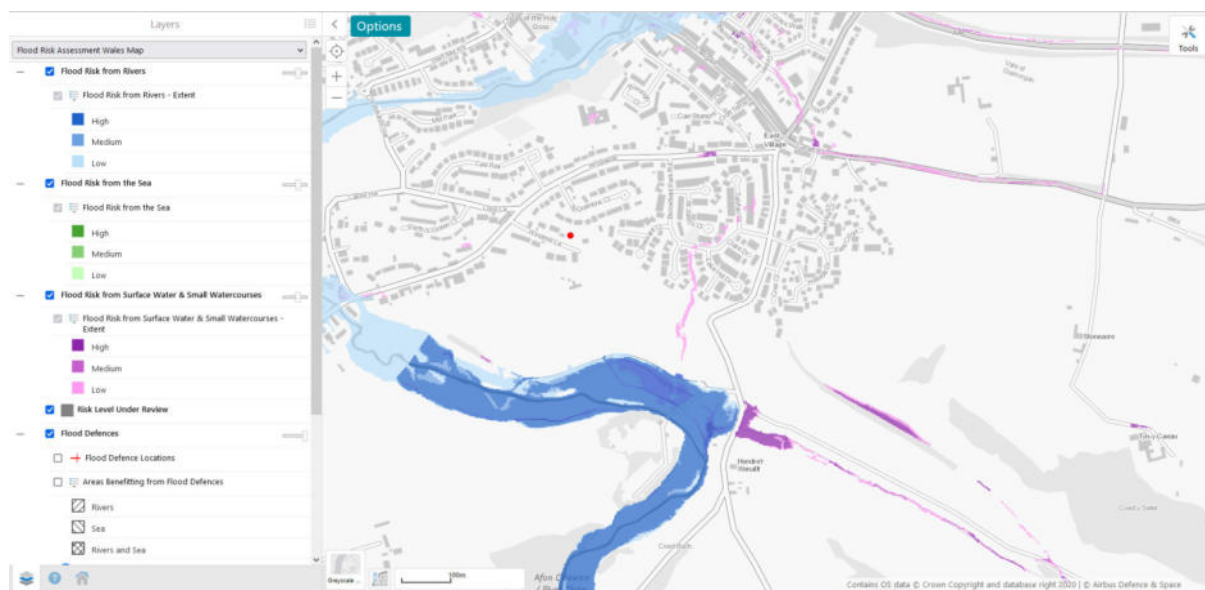


Figure 3.1 – Site Location: NRW Flood Risk Map

- 3.3 It is therefore considered that the site is suitable for development.



## 4 DEVELOPMENT PROPOSALS

- 4.1 The planning application comprises 105 traditional residential dwellings with private gardens and associated infrastructure including access roads, car parking areas, driveways, areas of landscaping, public open space (POS), a foul water pumping station and surface water SUDS features.
- 4.2 The proposed site Layout is shown on the Engineering Layouts included at **Appendix D**.
- 4.3 The post-development impermeable area for the proposed development is approximately 15,000m<sup>2</sup> (1.50ha).

## 5 SURFACE WATER STRATEGY

- 5.1 The proposed surface water drainage strategy is shown on the Engineering Layouts included at **Appendix D**. In accordance with Schedule 3 of the Flood and Water Management Act 2010 (FMWA), the strategy requires approval from the SuDS Approval Body (SAB).
- 5.2 This section summarises the proposed SuDS strategy that can be implemented with reference to the Wales SuDS Standards. A separate application will be submitted to Vale of Glamorgan SAB to agree the SuDS strategy and details for the proposed development.
- 5.3 As set out in Section 2 above, geotechnical investigations have concluded that ground conditions are not suitable for discharging surface water runoff to ground.
- 5.4 It has been assumed that surface water currently discharges via overland flow to the southern boundary where it enters the surface water features ultimately discharging into the River Thaw.
- 5.5 It is therefore proposed to discharge all surface water runoff from the site to the nearest existing surface water feature to the south.
- 5.6 In accordance with relevant guidance, it is proposed to discharge surface water runoff from the site at a similar rate to the existing Greenfield scenario.
- 5.7 The post-development rates and volume from the entire development are summarised in Table 5.1 below, whilst SW design and simulation results are included at **Appendix E**.

*Table 5.1 - Post Development Peak Discharge Rates & Volume*

| Return Period | Discharge Rate (l/s) | Q100 6-hour Vol. (m <sup>3</sup> ) |
|---------------|----------------------|------------------------------------|
| Q1 Years      | 7.4 l/s              | 436                                |
| Q2 Years      | 7.5 l/s              |                                    |
| Q30 Years     | 11.8 l/s             |                                    |
| Q100 Years    | 16.5 l/s             |                                    |

- 5.8 Table 5.2 below demonstrates that the proposed surface water strategy will not increase the risk of flooding from the site and will provide betterment for the more extreme storm events in comparison to the Greenfield scenario.

*Table 5.2 - Comparison of Pre and Post Development Discharge Rates & Volume*

| Return Period | Greenfield Rate (1.50ha catchment) | Post-Development Discharge Rate | Pre & Post development comparison |
|---------------|------------------------------------|---------------------------------|-----------------------------------|
| Q1 Years      | 7.6 l/s                            | 7.4 l/s                         | <b>-0.2 l/s</b>                   |
| Q2 Years      | 8.0 l/s                            | 7.5 l/s                         | <b>-0.5 l/s</b>                   |
| Q30 Years     | 15.6 l/s                           | 11.8 l/s                        | <b>-3.8 l/s</b>                   |
| Q100 Years    | 18.8 l/s                           | 16.5 l/s                        | <b>-2.3 l/s</b>                   |
| Q100 6-hour   | 471m <sup>3</sup>                  | 436m <sup>3</sup>               | <b>-35 m<sup>3</sup></b>          |

- 5.9 As illustrated on the SuDS Strategy Plan, a combination of permeable paving, swales, rain gardens and a detention basin are proposed to be used to control and treat surface water runoff as well as to enhance the biodiversity and amenity value of the site.
- 5.10 The proposed SuDS network and features will be sufficient to ensure no flooding occurs for all storm events up to the 1 in 100yr + 40% Return Period.

**Water Quality**

- 5.11 As shown in Table 5.3 below, guidance set out in SuDS Manual Chapter 26: *Water Quality*, indicates the pollution hazard level for the proposed residential development is considered to be 'low'.

*Table 5.3 – Pollution hazard indices for Residential land use*

| Land Use                     | Pollution Hazard Level | Total Suspended Solids (TSS) | Metals | Hydrocarbons |
|------------------------------|------------------------|------------------------------|--------|--------------|
| Residential roofs            | Very Low               | 0.2                          | 0.2    | 0.05         |
| Driveways, low traffic roads | Low                    | 0.5                          | 0.4    | 0.4          |

- 5.12 As shown in Table 5.4 below, the SuDS mitigation indicates suggest the proposed use of an online detention basin will ensure the surface water runoff is sufficient treated prior to being discharged to the watercourse and areas of vegetation.

*Table 5.4 - SuDS mitigation indices for discharge to surface waters*

| Type of SuDS component | Mitigation Indices |        |              |
|------------------------|--------------------|--------|--------------|
|                        | TSS                | Metals | Hydrocarbons |
| Porous Pavement        | 0.7                | 0.6    | 0.7          |
| Bioretention System    | 0.8                | 0.8    | 0.8          |
| Detention Basin        | 0.5                | 0.5    | 0.6          |

## Maintenance

- 5.13 At this stage it is anticipated that the majority of the SW conveyance pipes and proposed SuDS features (Swales, Bioretention areas and Detention basin) would be adopted and maintained by Vale of Glamorgan Council SAB.
- 5.14 All features shall be maintained in accordance with guidance set out in the SuDS Manual.
- 5.15 The proposed swales are proposed to be maintained by Vale of Glamorgan Council SAB and in accordance with the following:

| Operation and maintenance requirements for swales |  |   |
|---|--|---|
| Maintenance schedule                              | Required action  | Typical frequency   |
| Regular maintenance                               | Remove litter and debris   | Monthly, or as required   |
|   | Cut grass – to retain grass height within specified design range   | Monthly (during growing season), or as required                                     |
|   | Manage other vegetation and remove nuisance plants   | Monthly at start, then as required  |
|   | Inspect inlets, outlets and overflows for blockages, and clear if required   | Monthly   |
|   | Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours           | Monthly, or when required   |
|   | Inspect vegetation coverage  | Monthly for 6 months, quarterly for 2 years, then half yearly                       |
|   | Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies                              | Half yearly   |
| Occasional maintenance                            | Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required                                       | As required or if bare soil is exposed over 10% or more of the swale treatment area |
| Remedial actions                                  | Repair erosion or other damage by re-turfing or reseeding  | As required   |
|   | Relevel uneven surfaces and reinstate design levels  | As required   |
|   | Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface | As required   |
|   | Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip   | As required   |
|   | Remove and dispose of oils or petrol residues using safe standard practices  | As required   |

5.16 The proposed areas of bioretention systems are proposed to be maintained by Vale of Glamorgan Council SAB and in accordance with the following:

| Operation and maintenance requirements for bioretention systems |   |  |
|---|---|--|
| Maintenance schedule  | Required action   | Typical frequency  |
| Regular inspections   | Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary | Quarterly  |
|   | Check operation of underdrains by inspection of flows after rain  | Annually   |
|   | Access plants for disease infection, poor growth, invasive species etc and replace as necessary   | Quarterly  |
|   | Inspect inlets and outlets for blockage   | Quarterly  |
| Regular maintenance   | Remove litter and surface debris and weeds  | Quarterly (or more frequently for tidiness or aesthetic reasons) |
|   | Replace any plants, to maintain planting density  | As required  |
|   | Remove sediment, litter and debris build-up from around inlets or from forebays   | Quarterly to biannually  |
| Occasional maintenance  | Infill any holes or scour in the filter medium, improve erosion protection if required  | As required  |
|   | Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch   | As required  |
| Remedial actions  | Remove and replace filter medium and vegetation above   | As required but likely to be > 20 years                          |

5.17 The proposed online detention basin is proposed to be maintained by Vale of Glamorgan Council SAB and in accordance with the following:

| Operation and maintenance requirements for detention basins |  |   |
|---|--|---|
| Maintenance schedule  | Required action  | Typical frequency   |
| Regular maintenance   | Remove litter and debris   | Monthly   |
|   | Cut grass – for spillways and access routes  | Monthly (during growing season), or as required   |
|   | Cut grass – meadow grass in and around basin   | Half yearly (spring – before nesting season, and autumn)  |
|   | Manage other vegetation and remove nuisance plants   | Monthly (at start, then as required)  |
|   | Inspect inlets, outlets and overflows for blockages, and clear if required.                                | Monthly   |
|   | Inspect banksides, structures, pipework etc for evidence of physical damage                                | Monthly   |
|   | Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies. | Monthly (for first year), then annually or as required  |
|   | Check any penstocks and other mechanical devices   | Annually  |
|   | Tidy all dead growth before start of growing season  | Annually  |
|   | Remove sediment from inlets, outlet and forebay  | Annually (or as required)   |
|   | Manage wetland plants in outlet pool – where provided  | Annually (as set out in Chapter 23)   |
| Occasional maintenance                                      | Reseed areas of poor vegetation growth   | As required   |
|   | Prune and trim any trees and remove cuttings   | Every 2 years, or as required   |
|   | Remove sediment from inlets, outlets, forebay and main basin when required                                 | Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided) |
| Remedial actions  | Repair erosion or other damage by reseeding or re-turfing  | As required   |
|   | Realignment of rip-rap   | As required   |
|   | Repair/rehabilitation of inlets, outlets and overflows   | As required   |
|   | Relevel uneven surfaces and reinstate design levels  | As required   |

5.18 The proposed areas of on plot permeable paving under parking areas and shared driveways are proposed to be maintained by the plot owners. The maintenance regime shall be in accordance with the manufacturers guidance and will be similar to the following:

| Operation and maintenance requirements for pervious pavements |  |  |
|---|--|--|
| Maintenance schedule  | Required action  | Typical frequency  |
| Regular maintenance   | Brushing and vacuuming (standard cosmetic sweep over whole surface)  | Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment |
| Occasional maintenance  | Stabilise and mow contributing and adjacent areas  | As required  |
|   | Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying  | As required – once per year on less frequently used pavements  |
| Remedial Actions  | Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving   | As required  |
|   | Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material | As required  |
|   | Rehabilitation of surface and upper substructure by remedial sweeping  | Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)   |
| Monitoring  | Initial inspection   | Monthly for three months after installation  |
|   | Inspect for evidence of poor operation and/or weed growth – if required, take remedial action  | Three-monthly, 48 h after large storms in first six months   |
|   | Inspect silt accumulation rates and establish appropriate brushing frequencies   | Annually   |
|   | Monitor inspection chambers  | Annually   |

5.19 The proposed areas of on plot bioretention systems (Rain Gardens) are proposed to be maintained by the plot owners and in accordance with the following:

| Operation and maintenance requirements for bioretention systems |   |  |
|---|---|--|
| Maintenance schedule  | Required action   | Typical frequency  |
| Regular inspections   | Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary | Quarterly  |
|   | Check operation of underdrains by inspection of flows after rain  | Annually   |
|   | Assess plants for disease infection, poor growth, invasive species etc and replace as necessary   | Quarterly  |
|   | Inspect inlets and outlets for blockage   | Quarterly  |
| Regular maintenance   | Remove litter and surface debris and weeds  | Quarterly (or more frequently for tidiness or aesthetic reasons) |
|   | Replace any plants, to maintain planting density  | As required  |
|   | Remove sediment, litter and debris build-up from around inlets or from forebays   | Quarterly to biannually  |
| Occasional maintenance  | Infill any holes or scour in the filter medium, improve erosion protection if required  | As required  |
|   | Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch   | As required  |
| Remedial actions  | Remove and replace filter medium and vegetation above   | As required but likely to be > 20 years                          |

## **6 FOUL WATER STRATEGY**

- 6.1 The foul water drainage strategy is shown on the Engineering Layouts included at **Appendix D**.
- 6.2 As shown, it is proposed to discharge all foul flows from the site to the existing DCWW foul sewer in Windmill Lane, to the north-west of the site.
- 6.3 Pre-planning consultation has been undertaken with DCWW and it has been confirmed that there is available capacity in the existing network at to north-west to accommodate the proposed development. It is therefore considered that the proposed foul drainage strategy is acceptable.
- 6.4 These proposals will require the introduction of a new foul pumping station within the development site.

## **7 SUMMARY**

- 7.1 Spring Design Consultancy Ltd. has prepared this Flood Risk and Drainage Strategy Report on behalf of Redrow Homes South Wales in support of a planning application for the development of land at Windmill Lane, Cowbridge for a Residential Housing Estate.
- 7.2 It has been demonstrated that the site is not at risk of flooding.
- 7.3 It is considered that the SuDS strategy for the proposed development would not increase the existing level of flooding risk to the immediate surrounding area and will provide betterment for the more extreme storm events.
- 7.4 A suitable foul water strategy is proposed which will need to be agreed with DCWW.



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