



**Queensberry**  
**DESIGN LIMITED**  
RESIDENTIAL AND COMMERCIAL DESIGN CONSULTANTS

**Strata Homes**

**Westgate, Cleckheaton**

**FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY**

February 2023

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## 1. Introduction

- 1.1 Queensberry Design Ltd has been commissioned by Strata Homes to undertake a Flood Risk Assessment (FRA) for a proposed residential development at Westgate, Cleckheaton.
- 1.2 This FRA has been produced to demonstrate how flood risk from all sources of flooding, and flood risk to others from the development will be managed, to satisfy the requirements, set out in '*National Planning Policy Framework, and Technical Guidance to the National Planning Policy Framework*'. A full assessment of the flood risk to the site and consideration of the surface water management as a result of the development is to be considered in this investigation.
- 1.3 Consultation has been undertaken with Yorkshire Water (YW), Environment Agency (EA) and Kirklees Lead Local Flood Authority (LLFA) including inspection of their Strategic Flood Risk Assessment (SFRA). Data has also been gathered from several other sources including aerial photographs, Ordnance Survey (OS), the British Geological Society (BGS), National Soil Resources Institute (NSRI), Sewerage Sector Guidance (SSG), SuDS Manual (C753) and anecdotal evidence from the internet.

## 2. Site Description

- 2.1 The site is circa 6.45ha in size and is located south of Westgate, Cleckheaton. The irregular shaped site is brownfield and consists of multiple occupancies some still operating. The site has had a heavy industrial past, consisting of Chemical Works, Rolling Mill, scrap yard, brickworks and quarry.
- 2.2 The site is bounded by Quarry Road and residential properties to the east, Westgate Road and further residential properties to the north. Western and southern boundaries are occupied by industrial properties, a watercourse named Blacup Beck forms part of the southern boundary.
- 2.3 The location of the development is shown in Figure 1a, and Figure 1b.

### Site Levels

- 2.4 A topographical survey was carried out during May 2020 and can be viewed in Appendix 1. Levels generally fall to the south, flat areas are shown on the survey which will represent previous buildings, numerous sharp drops in level and mounding are recorded which are assumed to be demolition material.

### Hydrogeology

- 2.5 The bedrock consists of Solid Clifton Road (stone stone) Formation which is classified as a Secondary A Aquifer (solid). The site is not located in a source protection zone.

### Hydrology

- 2.6 Blacup beck forms the southern boundary of the development and is a mixture of open channel and culvert within the Strata Homes boundary. Blacup Beck is a tributary of the river Spen falling within the river Calder catchment.
- 2.7 Blacup beck receives both rural and urbanised run-off and is identified with the Strategic Flood Risk Assessment and Environment Agency flood mapping.
- 2.8 Blacup beck is heavily modified in places specifically downstream of the development boundary where there are numerous structures maintained by third parties and the Environment Agency including flood protection infrastructure.
- 2.9 Given the sensitivity of the downstream watercourse network modification to Blacup Beck should be limited.

### Existing Drainage Infrastructure

- 2.10 Existing public sewerage infrastructure which is present within the site's vicinity is described below. The existing sewer records provided by Yorkshire Water can be found in Appendix 5.
- 2.11 Sewer records show combined sewers crossing the site from north to south then connecting to an existing combined sewer south of Blacup. The recorded sewers will have to be abandoned or diverted to allow the new development, upon agreement with Yorkshire Water under Section 185 of the Water Industry Act.



2.12 *Figure 1a – Site Location, Ordnance Survey*



2.13 *Figure 1b - Detailed Site Location*

### 3. Strategic Flood Risk Documentation

#### Calder Catchment Strategic Flood Risk Assessment Volume 1 (2016)

- 3.1 The Level 1 Strategic Flood Risk Assessment (SFRA) has been produced for Kirklees Council in April 2016 by JBA Consulting. The report considers the risk of flooding within the river Calder catchment as well as overview of risk from, groundwater and surface water runoff.

#### Calder Catchment Strategic Flood Risk Assessment Volume 2 (2016)

- 3.2 The Level 2 Strategic Flood Risk Assessment (SFRA) produced in July 2016 by JBA Consulting involves a more detailed (local) investigation. Volume 2 covers National Planning Policy and flood risk policy while assessing actual flood risk, flood risk within key communities and conclusions and recommended for further work.
- 3.3 The volume 2 assessment also assists with emerging development area to ensure that the requirements of a Sequential Test and Exception Test can be met, by providing a framework for assessment of risk to future development.
- 3.4 Volume 2 of the SFRA discusses flood zone 3ai and confirms the 3ai zone has been implemented by the local authority and the zone can be defined as developed land within Flood Zone 3b where water would flow or be stored in times of flooding if not already constrained by development.
- 3.5 The SFRA confirmed Flood Zone 3ai has been defined using the same 1 in 20 and 1 in 25 AEP event outlines produced from the flood risk mapping studies that were used to create functional floodplain. Additionally confirming these outlines were assessed and refined by the Local Planning Authority and Environment Agency, based on their local knowledge.

### 4. Planning Policy

- 4.1 Kirklees Local Plan was adopted 27<sup>th</sup> February 2019 with the aim to set out policy necessary to achieve new development up to the year 2031.
- 4.2 Policy LP27 relates to flood risk and climate change, this policy states:

*Proposals within flood zone 3ai will be assessed in accordance with National Policies relating to flood zone 3a but with all off the following additional restrictions:*

- a) No new highly vulnerable or more vulnerable users will be permitted*
- b) Less vulnerable uses may only be permitted provided that the sequential test has been passed*
- c) All proposals will be expected to include flood mitigation measures such as compensatory storage which should be identified and considered through a site specific Flood Risk Assessment*
- d) Development will not be permitted on any part of the site identified through a site specific Flood Risk Assessment as performing a functional floodplain role*

- 4.3 Further policy justification for the placement of development and flood risk mitigation under points 12.21 and 12.22:

#### Policy Justification – 12.21

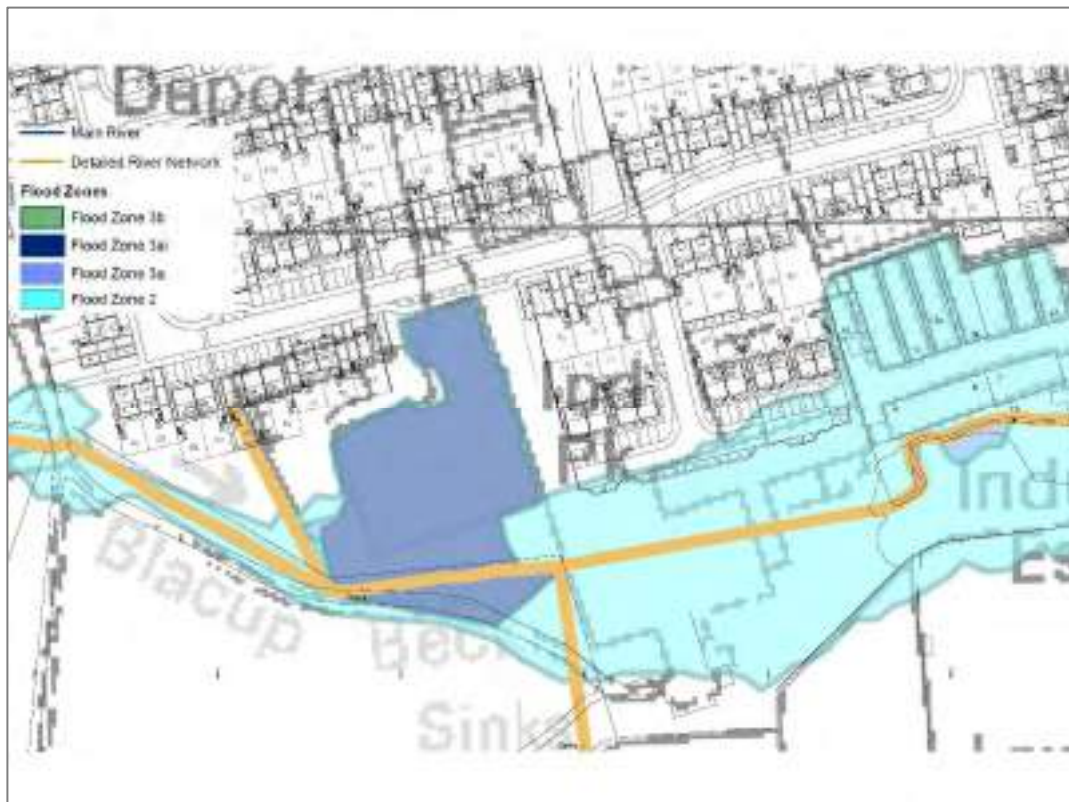
*Using the recommended 5% probability of flooding as a starting point for determining the functional floodplain does not reflect the fact that some land within these areas will already contain buildings and therefore cannot perform a functional floodplain role. Such areas have therefore been excluded from the functional floodplain but have been identified in the Calder Catchment SFRA as flood zone 3ai to highlight the higher risk than flood zone 3a.*

Policy Justification – 12.21

*Proposals within flood zone 3ai will be assessed using criteria in national policy for flood zone 3a but with additional restrictions to reflect the higher risk. The probability of flooding in flood zone 3ai remains the same as the functional flood plain (flood zone 3b) therefore highly vulnerable or more vulnerable development proposals would not be appropriate within this zone.*

**5. Sequential Test**

- 5.1 The Flood Risk and Coastal Change Planning Guidance (PPG) provides the basis for a Sequential Approach. This approach is integral into all states of the development planning process, which provides the opportunities to reduce flood risk to people, their property and the environment to acceptable levels.
- 5.2 The council must provide a list of proposed development site as part of their Local Plan, these sites should be assessed against the flood risk information provided within the SFRA Maps to screen against the level of flood risk to the sites.
- 5.3 The proposed development is listed on the Local Plan as allocation MXS9.
- 5.4 The development proposals detailed in appendix 3 and 4 clearly demonstrate a sequential approach and policy complaint scheme has been produced by Strata Home by ensuring only open space is located within flood zone 3ai.



5.5 *Figure 3a – SFRA overlay*

## 6. Flood Risk Assessment

- 6.1 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.
- 6.2 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.
- 6.3 The Planning Practice Guidance was published in March 2014. The new Guidance is intended to reflect and support (but not replace) the National Planning Policy Framework (the NPPF) published in February 2019. On 25<sup>th</sup> August 2022, the Ministry of Housing, Communities & Local Government, released an updated version of the National Planning Policy Framework (NPPF).
- 6.4 In respect of flood risk, the NPPF was amended to clarify that all plans should apply a sequential, risk-based approach to the location of development, taking into account 'all sources of flood risk' and the current and future impacts of climate change.
- 6.5 If it is not possible for development to be located in zones with a lower risk of flooding, an application for the development should be considered having regard to the vulnerability of the site and development proposed. A new 'Floor Risk Vulnerability Classification' has been added to the NPPF that categorises those types of development particularly vulnerable to flood risk.

### Sources of Flooding

6.6 In accordance with NPPF all forms of flood risk need to be considered in relation to any development. Flood risk has been assessed from the following sources: tidal and fluvial, surface water and flooding from the land, groundwater, sewer flooding and artificial sources (i.e., canals, reservoirs etc.)

### Tidal and Fluvial Flooding

6.7 The Environment Agency 'Flood Map for Planning' map in Figure 6.1, indicates the site is located within Flood Zone 1, 2 and 3 and so having a variable probability of flooding.

6.8 The EA flood map for planning provides the same outline as the SFRA meaning the extent of flood zone 3 is the same extent of flood zone 3ai, thus having a probability of flooding from 1 in 25 to 1 in 100 chance.

6.9 This is further reinforced by the EA 'long term flood risk' mapping which shows the areas of flood zone 3 within the redline boundary having a 'medium' risk between 1 in 30 and 1 in 100 chance of flooding.

6.10 The area of flood zone 3 is being generated by the existing culvert which due to either incapacity issues or condition / blockage is throttling run-off under surcharge condition. The exceedance generated by this run-off is then being held within the low point, possibly by a former buildings.

6.11 As it can be seen on the mapping flood zone 2 (1 in 100 to 1 in 1000 probability) is downstream for the culvert.

6.12 As discuss in section 5 of this assessment the development outline is outside of flood zones 3 and 2 therefore no new properties are at risk of flooding based on both the EA Flood maps for planning and the SFRA.



6.13 Figure 6.1 – Environment Agency Flooding from Rivers and Sea Flood Map



6.14 Figure 6.2 – 2016 Calder Catchment SFRA Flood Zone Map



6.15 Figure 6.3 – Environment Agency 'long term flood risk' Flooding from Rivers and Sea Flood Map

### River Levels

- 6.16 The principal source of flooding is Blacup Beck, water levels are available from the River Spen Flood Warning Improvements – 2009, JBA, Environment Agency.
- 6.17 The model node points are located along the southern extent of the site, upstream (BLAC01\_1330 and BLAC01\_1287) and downstream (BLAC01\_1155 and BLAC01\_1098) of the culvert – shown in appendix 3.

**Table 6.1 – Blacup Beck – River Spen Flood Warning Improvements**

| Reference Node | Return Period |             |             |                   |              |
|----------------|---------------|-------------|-------------|-------------------|--------------|
|                | 1 in 25 yr    | 1 in 50 yr  | 1 in 100 yr | 1 in 100 + 20% yr | 1 in 1000 yr |
| BLAC01_1330    | 94.772m AOD   | 94.802m AOD | 94.831m AOD | 94.886m AOD       | 95.123m AOD  |
| BLAC01_1287    | 94.579m AOD   | 94.605m AOD | 94.631m AOD | 94.680m AOD       | 94.937m AOD  |
| BLAC01_1155    | 91.320m AOD   | 91.369m AOD | 91.414m AOD | 91.487m AOD       | 91.747m AOD  |
| BLAC01_1098    | 90.540m AOD   | 90.561m AOD | 90.586m AOD | 90.738m AOD       | 91.304m AOD  |

- 6.18 As it can be seen water levels dramatically drop downstream of the culverted watercourse which reinforces the evidence within the flood mapping that the culverted watercourse is throttling run-off.
- 6.19 As river levels are available this assessment aims to review the levels and the implications these levels have on the proposed development and the downstream catchment.

### Site History

- 6.20 In the time since the River Spen model and the production of the SFRA the development has been modified due to the removal of existing building including the alteration of levels.
- 6.21 This assessment will show the extent of flood zone 3 (1 in 100 year water level) being larger what which is identified within the SFRA and the EA Flood Maps for Planning.
- 6.22 As discussed in section 4 and 5 of this assessment this development has been allocated and developed following the SFRA and EA Flood Maps for Planning.

### De-culverting

- 6.23 Kirklees Planning Policy is where feasible development proposals should incorporate re-opening of culverts.
- 6.24 Given the evidence that the culvert is likely holding back flows while under surcharge condition the opening up of Blacup beck by de-culverting will allow an influx of flow downstream.
- 6.25 As the downstream watercourse network is prone to flooding which has occurred during 2007 and 2020 storms as well as having existing flood defences. The removal of the culvert and opening back up the water to channel should be avoided to ensure the flood risk is not moved downstream then posing a risk to people or property.
- 6.26 This assessment will be undertaken on the understanding the culvert will not be removed and Strata Homes will not make any modifications unless structural issues for found post planning determination.

### Impacts of Climate Change

- 6.27 Climate change allowances have been updated in July 2021 and the most appropriate allowance for this area is 23%. During a recent meeting with the Environment Agency the use of the 20% water level to determine impact from climate change has been agreed.
- 6.28 This method is robust as the difference between the 1% AEP and 1% AEP +20% is 55mm, it is therefore reasonable to assume the difference between the 1% AEP + 20% and the 1% AEP +23% will be negligible.
- 6.29 To assess the impacts on climate change to the development the model node BLAC01\_1287 is proposed to be used, this model node is upstream is at the head of the culvert where flows are being throttled by the surcharged culvert then backing up into the surrounding land.
- 6.30 Generally, an upstream node point should be used to determine the impact of climate change point BLAC01\_1330 in this case.
- 6.31 However after reviewing the watercourse top of embankment level is circa 94.95m AOD at BLAC01\_13303 which is higher than the 1% AEP + 20% water level (94.886m AOD) meaning flows will not be exiting the watercourse in the location of BLAC01\_1330. Additionally, the surrounding ground level levels are lower circa 94.60m AOD matching the downstream 1% AEP +20% level of 94.680m AOD.
- 6.32 Using the BLAC01\_1287 climate change water level assessment shall be undertaken to ensure that development and surrounding catchment is protected from the impacts of climate change and that the development does not remove any flood storage from the catchment.
- 6.33 Refer to drawing QD1776-50-01 for node point locations and sections.

### Flood Risk Mitigation

- 6.34 To ensure the proposed dwellings are not susceptible to flooding from effects of climate change finished floor levels must be set at least 600mm above the water level.
- 6.35 Meaning the minimum finished floor level must be 95.280m AOD.
- 6.36 Due to the earthworks required to manage contaminated material, site levels are proposed to be raised, the lowest finished floor level proposed is 96.150m AOD providing circa 1450mm freeboard from the 100 year climate change water level.
- 6.37 The layout does specify ground floor sleeping accommodation within bungalow properties (within Flood Zone 1), given the level difference from the proposed development to climate change levels no further mitigation is proposed.

### Flood Compensation Storage

- 6.38 The development must ensure that no loss of flood storage for the 100 year + climate change event, as discussed within this report the dwellings are outside of the extent of both flood zones 2 and 3 based on the SFRA and Flood Maps for Planning.
- 6.39 Drawing QD1776-50-02 has been produced by transposing the 1% AEP +20% water level on the topographical survey (excluding the existing mounding and buildings). This has then been used on calculate the amount of standing water within the development boundary – the total volume of water being 1624m<sup>3</sup>
- 6.40 On assessment of water levels, the 1% AEP +20% is encroaching into dwellings additionally drainage infrastructure (discussed in section 11). As shown on drawing QD1776-50-03 the development and drainage infrastructure are displacing 525m<sup>3</sup> of flood volume.
- 6.41 The development must provide 525m<sup>3</sup> flood compensation on a level for level basis.

- 6.42 This compensation shall be provided in a way which ensures drain down is through the culvert, therefore, not to change any watercourse characteristics downstream.
- 6.43 Drawing QD1776-50-04 within appendix 6 provides existing depth / volume based on current site levels, the area outside the developed boundary is then to be re-profiled to provide the same volumes as the pre-development scenario.
- 6.44 This area forms part of the landscape strategy thus ensuring maintenance for the development life time as well as mitigating changes in land profile which could change the flood risk.

#### **Culvert Blockage**

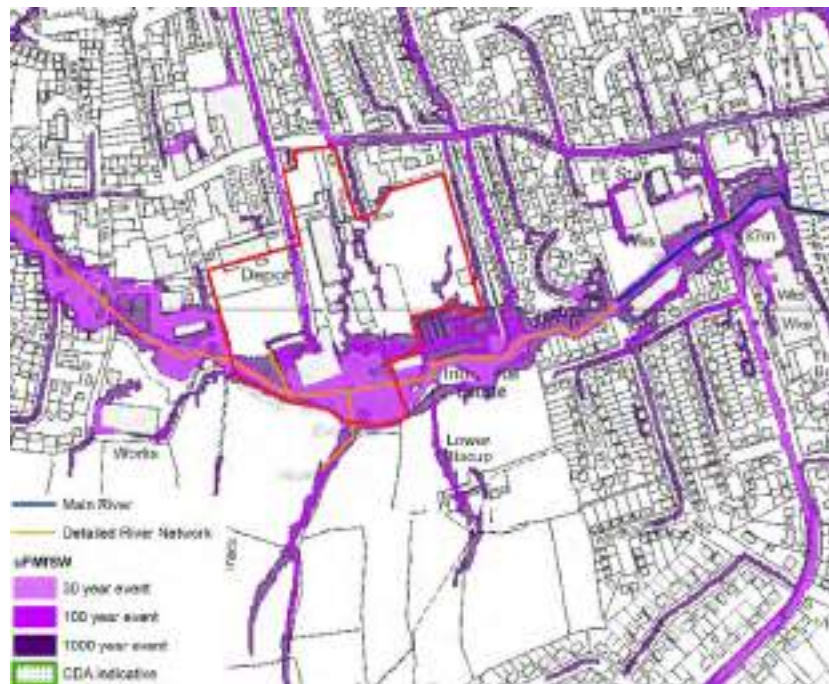
- 6.45 Levels will not be raised over the culvert compared to pre-development therefore under a blockage scenario flow will fall in an easterly direction – as shown on the surface water flood maps.
- 6.46 Due to the development being raised considerably above existing ground levels dwellings will not be impacted by a culvert blockage as the exceedance level on the eastern boundary is 94.740m AOD (1.41m below the site minimum FFL).
- 6.47 Due to the eastern boundary level not being changed flow created by a blockage will not be any different compared to the non-developed situation – refer to Appendix 6 for diagram.

### Surface Water Flooding

- 6.46 Flooding from overland flow can become a risk to any development if flooding occurs at a higher level than the development site.
- 6.47 The Environment Agency surface water flood map shows the majority of the site is at a very low risk, with low to high risk concentrated in the south.
- 6.48 Very low risk refers to land having less than a 1 in 1000 annual exceedance probability of flooding. Low risk refers to land having between a 1 in 1000 and 1 in 100 annual exceedance probability of flooding (0.1% - 1% AEP). Medium risk refers to land having 1 in 100 and 1 in 30 annual probabilities (1% - 3.33% AEP). High risk refers to land having a greater than 1 in 30 annual exceedance probability of flooding (>3.33% AEP).
- 6.49 Two surface water flow routes extend from the north of the site to Blacup Beck, one route originates from south parade and flows through Iron Street, while the second originates from Stone Street.
- 6.50 The site levels design must ensure these flow routes are maintained for the lifetime of the development, by ensuring the flow route is collected by adopted road network or privately managed shared access ways.
- 6.51 All new dwellings shall have 300mm freeboard from the flow route to ensure exceedance does not raise above a finished floor level – level design can be view in appendix 7.
- 6.52 The collection of surface water flooding to the south of the development is a result of the flooded Blacup Beck
- 6.53 Environment Agency surface water flood maps show the medium risk areas are at a water depth between 300 and 900mm.
- 6.54 High risk areas on the southern boundary are a depth greater than 900mm. This correlates and coincides with the existing low points and surcharging of culverted part of Blacup Beck.
- 6.55 To ensure surface water flows paths can be maintained any works within the area outside the dwelling boundary including any flood compensation works must ensure ground levels do not block the path of run-off.
- 6.56 Based on the available information flood risk from this source is considered HIGH.



6.57 Figure 6.3 – Environmental Agency Surface Water Flood Risk Map



6.58 *Figure 6.4 – 2016 Calder Catchment SFRA Surface Water Flood Map*

#### Groundwater

6.59 Groundwater flooding is caused by water originating from beneath the ground surface from permeable strata through a natural process, usually after periods of higher-than-average rainfall.

6.60 The SRRAs identifies the site having a 25% risk of groundwater emergence.

6.61 Based on the available information significant flood risk from this source is considered LOW.

#### Sewer Flooding

6.62 No known sewer flood events are known, given the scheme with divert existing drawing to modern standards and the new surface water network will be design in accordance with this document and current best practice possible future sewer flooding is limited.

6.63 Based on the available information flood risk from this source is considered LOW.

#### Land Drainage

6.64 In the event of any land drainage being discovered during excavations on site, it is recommended that the drain is repaired or diverted. Should this not be possible due to layout constraints, then it is recommended that the land drain is further investigated by the development engineer, to determine if the drain is still required post development.

6.65 Based on the available information flood risk from this source is considered LOW.

#### Artificial Sources

6.66 Environment Agency data and mapping indicates the site is not at risk of reservoir flooding.

6.67 Based on the available information flood risk from this source is considered LOW.

## 7. Summary of Existing Flood Risk

7.1 The table below summarises the sources of possible flooding which have been investigated.

| Flood Risk Source                   | Current Risk Level | Mitigation Requirement   |
|-------------------------------------|--------------------|--|
| <b>Tidal &amp; Fluvial Flooding</b> | HIGH               | FFL's must provide at least 600mm freeboard from 1% +20% AEP<br><br>Existing culvert not to be opened as channel<br><br>Flood compensation to be provided on level for level basis |
| <b>Groundwater</b>                  | LOW                | Not required   |
| <b>Sewer Flooding</b>               | LOW                | Not required   |
| <b>Overland Flow</b>                | HIGH               | Dwellings to be set 300mm higher than existing flow routes<br><br>Existing flow routes to be maintained through the southern open space and flood compensation                     |
| <b>Land Drainage</b>                | LOW                | Not required   |
| <b>Artificial Sources</b>           | LOW                | Not required   |

## 8. Existing Drainage Regime

8.1 The site is a mixture of permeable and impermeable surfaces discharge is split between the existing public sewers and Blacup Beck.

8.2 Given the mixture of discharge regime and the removal of buildings and recent alterations in land usage the calculation of a brownfield discharge rate has been discounted.

## 9. Proposed Development

- 9.1 Strata Homes proposes to develop the site for residential use comprising of 165 plots with associated landscaping, access and infrastructure works.
- 9.2 A copy of the proposed site layout can be viewed in Appendix 2.

### Planning Context

- 9.3 The EA flood maps for the region show that the development sits within Flood Zone 1, which has a low probability of flooding 1 in 1000 in any one year (0.1%). This is illustrated in Table 1.
- 9.4 The proposed development will comprise residential dwellings. Therefore, in accordance with NPPF Table 2, the development is classified as 'more vulnerable'.
- 9.5 Thus, given that site is situated in Flood Zone 1 and the vulnerability classification in accordance with the NPPF compatibility matrix in Table 3, the scheme is classified as appropriate for development.

| Table 1 Flood Risk Probability |                       |  |
|--------------------------------|-----------------------|--|
| Flood Zone                     | Probability           | Explanation  |
| <b>Flood Zone 1</b>            | Low Probability       | This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).  |
| <b>Flood Zone 2</b>            | Medium Probability    | This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year. |
| <b>Flood Zone 3a</b>           | High Probability      | This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.                            |
| <b>Flood Zone 3b</b>           | Functional Floodplain | This zone comprises land where water has to flow or be stored in times of flood  |

| Table 2 Flood Risk Vulnerability    |  |
|-------------------------------------|--|
| Category                            | Explanation  |
| <b>Essential Infrastructure</b>     | <ul style="list-style-type: none"> <li>• Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.</li> <li>• Essential utility infrastructure which has to be located in a flood risk area for operational reasons.</li> <li>• Wind turbines and Solar farms.</li> </ul>   |
| <b>Highly Vulnerable</b>            | <ul style="list-style-type: none"> <li>• Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations required to be operational during flooding.</li> <li>• Emergency dispersal points.</li> <li>• Basement dwellings.</li> <li>• Caravans, mobile homes and park homes intended for permanent residential use.</li> <li>• Installations requiring hazardous substances consent.</li> </ul>   |
| <b>More Vulnerable</b>              | <ul style="list-style-type: none"> <li>• Hospitals.</li> <li>• Residential institutions such as residential care homes, children’s homes, social services homes, prisons and hostels.</li> <li>• Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels.</li> <li>• Non-residential uses for health services, nurseries and educational establishments.</li> <li>• Landfill and sites used for waste management facilities for hazardous waste.</li> <li>• Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.</li> </ul>   |
| <b>Less Vulnerable</b>              | <ul style="list-style-type: none"> <li>• Police, ambulance and fire stations which are not required to be operational during flooding.</li> <li>• Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non-residential institutions not included in ‘more vulnerable’; and assembly and leisure.</li> <li>• Land and buildings used for agriculture and forestry.</li> <li>• Waste treatment (except landfill and hazardous waste facilities).</li> <li>• Minerals working and processing (except for sand and gravel working).</li> <li>• Water treatment plants.</li> <li>• Sewage treatment plants (if adequate pollution control measures are in place).</li> <li>• Car Parks</li> </ul>   |
| <b>Water-compatible development</b> | <ul style="list-style-type: none"> <li>• Flood control infrastructure</li> <li>• Water transmission infrastructure and pumping stations.</li> <li>• Sewage transmission infrastructure and pumping stations.</li> <li>• Sand and gravel workings.</li> <li>• Docks, marinas and wharves.</li> <li>• Navigation facilities.</li> <li>• MOD defence installations.</li> <li>• Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.</li> <li>• Water-based recreation (excluding sleeping accommodation).</li> <li>• Lifeguard and coastguard stations.</li> <li>• Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.</li> <li>• Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.</li> </ul> |

| Table 3 Flood Risk Vulnerability Classification |                          |                         |                         |                 |                  |
|---|--------------------------|-------------------------|-------------------------|-----------------|------------------|
| Flood Zone                                      | Essential Infrastructure | Highly Vulnerable       | More Vulnerable         | Less Vulnerable | Water Compatible |
| <b>Zone 1</b>                                   | Appropriate              | Appropriate             | Appropriate             | Appropriate     | Appropriate      |
| <b>Zone 2</b>                                   | Appropriate              | Exception Test required | Appropriate             | Appropriate     | Appropriate      |
| <b>Zone 3a</b>                                  | Exception Test required  | Not Permitted           | Exception Test required | Appropriate     | Appropriate      |
| <b>Zone 3b</b>                                  | Exception Test required  | Not Permitted           | Not Permitted           | Not Permitted   | Appropriate      |

## 10. Management of Surface Water

### Possible Drainage Solutions

10.1 An assessment of possible drainage options has been undertaken in accordance with Building Regulations H3 Section 3 and NPPF. The disposal of surface water has been considered in the following order of priority.

-An adequate soakaway or some other infiltration system; or, where not reasonably practicable,

-A watercourse, or where not reasonably practicable,

-A sewer

### Infiltration

10.2 It is anticipated that due to the clay soils and contamination underlying the site that infiltration will not be possible for the disposal of surface water from the development site.

### Discharge to a Watercourse

10.3 Discharge to a watercourse will be the preferred method of surface water disposal.

10.4 As a brownfield discharge rate has been discounted a greenfield discharge rate to Blacup Beck is proposed. Based on developed boundary of 5.15ha which excludes all green space across the southern periphery of the development.

10.5 Using MicroDrainage Rural Run-off calculator has been used to establish the existing greenfield discharge rate of 26.5 l/s.

10.6 The greenfield discharge rate will be applied to all storm events including climate change exceedance.

| Return Period/Year | Region            | GEAR (%) | Q (1 hr) (l/s) | Q (1 yr) (l/s) | Q (10 yr) (l/s) | Q (100 yr) (l/s) |
|--------------------|-------------------|----------|----------------|----------------|-----------------|------------------|
| ICP SLEDS          | Region 1          | 26.5     | 22.5           | 21.5           | 50.8            | 65.8             |
|                    | Region 2          | 26.5     | 23.8           | 21.0           | 50.3            | 60.8             |
|                    | Region 3          | 26.5     | 22.7           | 22.7           | 48.8            | 55.8             |
|                    | Region 4          | 26.5     | 23.8           | 22.0           | 51.8            | 60.8             |
|                    | Region 5          | 26.5     | 23.8           | 21.0           | 43.5            | 54.2             |
|                    | Region 6/Region 7 | 26.5     | 22.5           | 21.5           | 58.8            | 64.4             |
|                    | Region 8          | 26.5     | 20.8           | 20.8           | 50.4            | 54.0             |
|                    | Region 9          | 26.5     | 23.3           | 25.3           | 48.8            | 57.7             |
|                    | Region 10         | 26.5     | 23.8           | 21.0           | 44.8            | 55.8             |

### Discharge to Public Sewers

10.7 The existing sewerage within the development will not be utilized for new surface water discharge.

## 11. Preferred Drainage Solution

### Storm Drainage

11.1 The preferred drainage solution will involve the discharge of site surface water flows to the watercourse south of the site. The proposed drainage strategy and calculations can be viewed in Appendix 8.

### Storm Drainage

11.2 It is proposed to restrict surface water flows to the equivalent green rate for the proposed developable boundary. Therefore, of the total 6.45ha site 5.15ha is denoted as developable boundary excluding any areas of POS. MicroDrainage Rural Run-off calculator, a restricted discharge rate of 26.5 l/sec is proposed across all storm events.

11.3 Surface water modelling has been undertaken following the West Yorkshire Combined Authority Sustainable Drainage Guidance Table 8. By ensuring modelling assesses 30% climate with no inclusion of urban creep.

11.4 Attenuation will be provided by the means of a pre-cast attenuation tank located within the green space south of the development.

11.5 The attenuation must be designed to ensure no flood waters can enter the system, then providing adequate storage for the development,

11.6 To mitigate the cover level of the attenuation is proposed to be a minimum of 95.200m AOD (above the flood zone 2 water level).

11.7 Due to cover level raising compensation is required as discussed in section 6.

11.8 The surface water outfall is proposed downstream of the culverted watercourse where water levels significantly drop. Therefore, a submerged outfall is not expected, as a check the modelling includes a surcharged outfall (30mm below outfall invert) to ensure storage capacity is maintained.

11.9 All new adoptable standard surface water drainage is to be designed in accordance with 'SSG' and to ensure that no flooding occurs during the critical 1 in 30-year storm event.

### Foul Drainage

11.10 Foul drainage will connect into diverted sewers under Section 185 of the Water Industry Act or new foul drains under Section 104 of the Water Industry Act.

11.11 Flows will ultimately connect into the existing 450mm dia combined sewer at the south of the development.

11.12 All new adoptable foul sewerage is to be designed in accordance with 'SSG'.

## 12. Conclusion

### Flood Risk

- 12.1 The flood risk assessment and drainage strategy has been prepared in accordance with the NPPF, Flood Risk and Coastal Change Planning Practice Guidance. The management of the surface water flows have also been considered in accordance with Building Regulations H3 Section 3.
- 12.2 There is risk of flooding from fluvial sources. The proposed development is classified as 'more vulnerable' and is located within Flood Zone 1 according the SFRA and Flood Maps for Planning, therefore the development is suitable within this flood zone in accordance with NPPF.
- 12.3 Employment of the mitigation measures stated in this report will ensure that the development will be safe and is suitable in this location.
- 12.4 Flood risk from all sources have been considered and with mitigation where necessary it has been established that these sources do not pose a residual risk to the development.

### Storm Drainage

- 12.5 Surface water runoff will discharge to the existing watercourse south of the site. The development will restrict surface water flow to 26.5 l/sec across all storm events which is the equivalent greenfield runoff rate for the proposed developable boundary.
- 12.6 Applying a restricted discharge rate in this way results in a reduction from predevelopment rates during extreme rainfall events which result in flooding / flood risk. Therefore, development of the site results in a reduction in flood risk in the area.
- 12.7 Exceedance flows above the restricted rate of 25.0 l/sec will be attenuated on site via SuDS detention basin located in the south eastern corner of the site.
- 12.8 All new adoptable standard surface water drainage is to be designed in accordance with 'SSG' and to ensure that no flooding occurs during the critical 1 in 30-year storm event. A 30% increase in rainfall due to climate change has been considered.
- 12.9 The surface water storage design shall mitigate against in flow of flood waters by ensuring the cover level is above the flood zone 2 water level (i.e. theoretically flood zone 1).

### Foul Drainage

- 12.10 It is proposed to discharge foul flows into either diverted or new sewers.
- 12.11 All new adoptable foul sewerage is to be designed in accordance with 'SSG'.

## Appendix 1 - Topographical Survey



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| ZP04    | 418448.437 | 425195.267 | 102.822 | ZP15    | 418261.462 | 424951.508 | 95.176  |
| ZP05    | 418385.402 | 425195.036 | 104.829 | ZP16    | 418264.496 | 424933.909 | 94.651  |
| ZP06    | 418344.321 | 425195.250 | 106.728 | ZP17    | 418269.155 | 424929.304 | 94.745  |
| ZP07    | 418282.810 | 425172.465 | 109.607 | ZP18    | 418261.707 | 424891.216 | 96.884  |
| ZP08    | 418219.093 | 425114.646 | 107.851 | ZP19    | 418262.252 | 425016.381 | 92.089  |
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| ZP11    | 418124.189 | 425091.279 | 102.466 | ZP22    | 418262.252 | 425032.152 | 97.954  |

LEGEND

|  |                           |
|--|---------------------------|
|  | Grid (25m Intervals)      |
|  | Contours (200m Intervals) |
|  | Contours (1m Intervals)   |
|  | Building                  |
|  | Wall                      |
|  | Channel                   |
|  | Kerb Top                  |
|  | Road Edge                 |
|  | Ramp                      |
|  | Change Of Surface         |
|  | Concrete                  |
|  | Drain                     |
|  | Water Line                |
|  | Overhead Cable            |
|  | Overhead Electric Cable   |
|  | Bottom Of Bank            |
|  | Top Of Bank               |
|  | Trees Canopy              |
|  | Vegetation                |
|  | Hedge                     |
|  | Fence Open Board          |
|  | Fence Closed Board        |
|  | Fence Iron Rail           |
|  | Fence Chain Link          |
|  | Fence Post Rail           |
|  | Fence Wire Mesh           |
|  | Down Pipe                 |
|  | Rodding Eye               |
|  | Post                      |
|  | Bollard                   |
|  | Traffic Light             |
|  | Telegraph Pole            |
|  | Lamp Post                 |
|  | Earth Rod                 |
|  | IC Cover (Circle)         |
|  | Flag Pole                 |
|  | Road Sign                 |
|  | Sign Post (1 of 2)        |
|  | Bus Stop                  |
|  | Gate                      |
|  | Gully                     |
|  | Kerb Outlet               |
|  | Fire Hydrant              |
|  | Stop Tap                  |
|  | Stop Valve                |
|  | British Telecom           |
|  | Cable TV                  |
|  | Junction Box              |
|  | IC Cover (Square)         |
|  | Flood Light               |
|  | Marker Post               |
|  | Tree (MT - multitrunk)    |
|  | Spot Levels               |
|  | Ridge Level               |
|  | Station                   |



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**LEGEND**

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|  | Building                   |
|  | Wall                       |
|  | Channel                    |
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|  | Drain                      |
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|  | Overhead Electric Cable    |
|  | Bottom Of Bank             |
|  | Top Of Bank                |
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|  | Vegetation                 |
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|  | Fence Iron Rail            |
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|  | Fence Post Rail            |
|  | Fence Wire Mesh            |
|  | Down Pipe                  |
|  | Rodding Eye                |
|  | Post                       |
|  | Bollard                    |
|  | Traffic Light              |
|  | Telegraph Pole             |
|  | Lamp Post                  |
|  | Earth Rod                  |
|  | IC Cover (Circle)          |
|  | Flag Pole                  |
|  | Road Sign                  |
|  | Sign Post (1 of 2)         |
|  | Bus Stop                   |
|  | Gate                       |
|  | Gully                      |
|  | Kerb Outlet                |
|  | Fire Hydrant               |
|  | Stop Tap                   |
|  | Stop Valve                 |
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LEGEND

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|  | Down Pipe                 |
|  | Rodding Eye               |
|  | Kerb Outlet               |
|  | Post                      |
|  | Bollard                   |
|  | Traffic Light             |
|  | Telegraph Pole            |
|  | Lamp Post                 |
|  | Earth Rod                 |
|  | IC Cover (Circle)         |
|  | Flag Pole                 |
|  | Road Sign                 |
|  | Sign Post (1 of 2)        |
|  | Bus Stop                  |
|  | Gate                      |
|  | Gully                     |
|  | Fire Hydrant              |
|  | Stop Tap                  |
|  | Stop Valve                |
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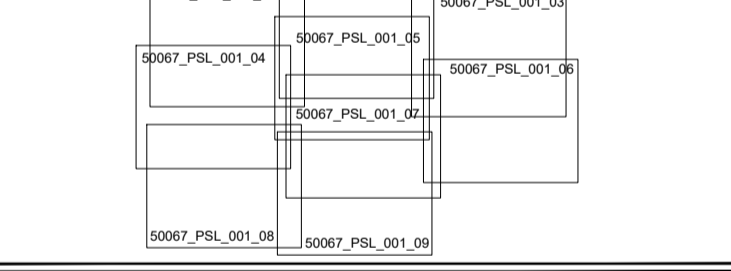
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| ZP10    | 418234.189 | 425001.279 | 102.466 | ZP21    | 418252.322 | 425016.381 | 97.954  |
| ZP11    | 418232.978 | 425002.101 | 100.602 | ZP22    | 418212.713 | 425153.026 | 99.102  |



**LEGEND**

- Grid (25m Intervals)
- Contours (200m Intervals)
- Contours (1m Intervals)
- Building
- Wall
- Channel
- Kerb Top
- Road Edge
- Ramp
- Change Of Surface
- Concrete
- Drain
- Water Line
- Overhead Cable
- Overhead Electric Cable
- Bottom Of Bank
- Top Of Bank
- Trees Canopy
- Vegetation
- Hedge
- Fence Open Board
- Fence Closed Board
- Fence Iron Rail
- Fence Chain Link
- Fence Post Rail
- Fence Wire Mesh
- Down Pipe
- Rodding Eye
- Post
- Bollard
- Traffic Light
- Telegraph Pole
- Lamp Post
- Earth Rod
- IC Cover (Circle)
- Flag Pole
- Road Sign
- Sign Post (1 of 2)
- Bus Stop
- Gate
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| B   |             |    |      |
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| D   |             |    |      |
| E   |             |    |      |
| F   |             |    |      |

**NOTES**

| Station | Easting    | Northing   | Level   | Station | Easting    | Northing   | Level   |
|---------|------------|------------|---------|---------|------------|------------|---------|
| ZP01    | 418443.810 | 425024.260 | 63.513  | ZP12    | 418252.883 | 425035.697 | 100.770 |
| ZP02    | 418253.020 | 425100.020 | 99.303  | ZP13    | 418253.128 | 425016.486 | 99.014  |
| ZP03    | 418497.895 | 425188.535 | 101.038 | ZP14    | 418267.701 | 424931.089 | 96.945  |
| ZP04    | 418444.321 | 425195.267 | 102.222 | ZP15    | 418261.462 | 424951.508 | 95.176  |
| ZP05    | 418386.402 | 425195.036 | 104.829 | ZP16    | 418384.496 | 424933.909 | 94.651  |
| ZP06    | 418400.121 | 425195.260 | 106.728 | ZP17    | 418393.582 | 424936.304 | 94.742  |
| ZP07    | 418202.810 | 425172.465 | 109.607 | ZP18    | 418461.707 | 424931.216 | 96.884  |
| ZP08    | 418211.020 | 425174.646 | 107.851 | ZP19    | 418393.582 | 425016.381 | 92.989  |
| ZP09    | 418211.020 | 425174.646 | 104.846 | ZP20    | 418393.582 | 425016.381 | 100.332 |
| ZP10    | 418324.189 | 425093.278 | 102.466 | ZP21    | 418393.582 | 425032.152 | 97.954  |
| ZP11    | 418325.978 | 425092.101 | 100.602 | ZP22    | 418912.713 | 425033.026 | 99.102  |

**LEGEND**

|  |                         |  |                           |
|--|-------------------------|--|---------------------------|
|  | Grid (25m Intervals)    |  | Contours (200m Intervals) |
|  | Contours (1m Intervals) |  | Building                  |
|  | Wall                    |  | Channel                   |
|  | Kerb Top                |  | Road Edge                 |
|  | Ramp                    |  | Change Of Surface         |
|  | Concrete                |  | Drain                     |
|  | Water Line              |  | Overhead Cable            |
|  | Overhead Electric Cable |  | Bottom Of Bank            |
|  | Top Of Bank             |  | Trees Canopy              |
|  | Vegetation              |  | Hedge                     |
|  | Fence Open Board        |  | Fence Closed Board        |
|  | Fence Iron Rail         |  | Fence Chain Link          |
|  | Fence Post Rail         |  | Fence Wire Mesh           |
|  | Down Pipe               |  | Gully                     |
|  | Rodding Eye             |  | Kerb Outlet               |
|  | Post                    |  | Fire Hydrant              |
|  | Bollard                 |  | Stop Tap                  |
|  | Traffic Light           |  | Stop Valve                |
|  | Telegraph Pole          |  | British Telecom           |
|  | Lamp Post               |  | Cable TV                  |
|  | Earth Rod               |  | Junction Box              |
|  | IC Cover (Circle)       |  | IC Cover (Square)         |
|  | Flag Pole               |  | Flood Light               |
|  | Road Sign               |  | Marker Post               |
|  | Sign Post (1 of 2)      |  | Tree (MT - multitrunk)    |
|  | Bus Stop                |  | Spot Levels               |
|  | Gate                    |  | Ridge Level               |
|  |                         |  | Station                   |



# Celete Industrial Park

**Yorkshire & Midlands**      **North West**  
**4250 Park Approach**      **Unit 9 Rising Bridge Business & Enterprise Village**  
**Thorpe Park**      **Blackburn Road**  
**Leeds**      **Haslingdon**  
**West Yorkshire**      **LS15 8GB**  
**LS15 8GB**      **B85 2AL**  
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| F   |             |    |      |

**NOTES**

| Station | Easting    | Northing  | Level   | Station | Easting    | Northing  | Level   |
|---------|------------|-----------|---------|---------|------------|-----------|---------|
| ZP01    | 418443.810 | 42504.260 | 63.513  | ZP12    | 418202.883 | 42503.687 | 100.770 |
| ZP02    | 418204.620 | 42518.205 | 66.923  | ZP13    | 418203.128 | 42516.486 | 99.014  |
| ZP03    | 418497.895 | 42518.535 | 101.038 | ZP14    | 418207.701 | 42493.589 | 96.945  |
| ZP04    | 418443.321 | 42518.207 | 102.222 | ZP15    | 418201.462 | 42493.584 | 95.176  |
| ZP05    | 418386.402 | 42518.036 | 104.829 | ZP16    | 418204.496 | 42493.909 | 94.951  |
| ZP06    | 418404.121 | 42518.200 | 106.228 | ZP17    | 418203.582 | 42493.904 | 94.742  |
| ZP07    | 418202.810 | 42517.465 | 109.607 | ZP18    | 418201.707 | 42493.216 | 96.884  |
| ZP08    | 418201.025 | 42517.446 | 107.851 | ZP19    | 418203.252 | 42503.381 | 92.586  |
| ZP09    | 418201.881 | 42517.342 | 104.846 | ZP20    | 418203.252 | 42503.152 | 97.954  |
| ZP10    | 418324.189 | 42500.278 | 102.466 | ZP21    | 418212.713 | 42513.926 | 99.102  |
| ZP11    | 418324.978 | 42502.191 | 100.602 |         |            |           |         |

**LEGEND**

|  |                           |
|--|---------------------------|
|  | Grid (25m Intervals)      |
|  | Contours (200m Intervals) |
|  | Contours (1m Intervals)   |
|  | Building                  |
|  | Wall                      |
|  | Channel                   |
|  | Kerb Top                  |
|  | Road Edge                 |
|  | Ramp                      |
|  | Change Of Surface         |
|  | Concrete                  |
|  | Drain                     |
|  | Water Line                |
|  | Overhead Cable            |
|  | Overhead Electric Cable   |
|  | Bottom Of Bank            |
|  | Top Of Bank               |
|  | Tress Canopy              |
|  | Vegetation                |
|  | Hedge                     |
|  | Fence Open Board          |
|  | Fence Closed Board        |
|  | Fence Iron Rail           |
|  | Fence Chain Link          |
|  | Fence Post Rail           |
|  | Fence Wire Mesh           |
|  | Down Pipe                 |
|  | Rodding Eye               |
|  | Kerb Outlet               |
|  | Post                      |
|  | Bollard                   |
|  | Traffic Light             |
|  | Telegraph Pole            |
|  | Lamp Post                 |
|  | Earth Rod                 |
|  | IC Cover (Circle)         |
|  | Flag Pole                 |
|  | Road Sign                 |
|  | Sign Post (1 of 2)        |
|  | Bus Stop                  |
|  | Gate                      |
|  | Gully                     |
|  | Fire Hydrant              |
|  | Stop Tap                  |
|  | Stop Valve                |
|  | British Telecom           |
|  | Cable TV                  |
|  | Junction Box              |
|  | IC Cover (Square)         |
|  | Flood Light               |
|  | Marker Post               |
|  | Tree (MT - multitrunk)    |
|  | Spot Levels               |
|  | Ridge Level               |
|  | Station                   |

# Celete Industrial Park

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 West Yorkshire  
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North West  
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 Enterprise Village  
 Blackburn Road  
 Haslingdon  
 BB5 2AL  
 T: 01706 224212

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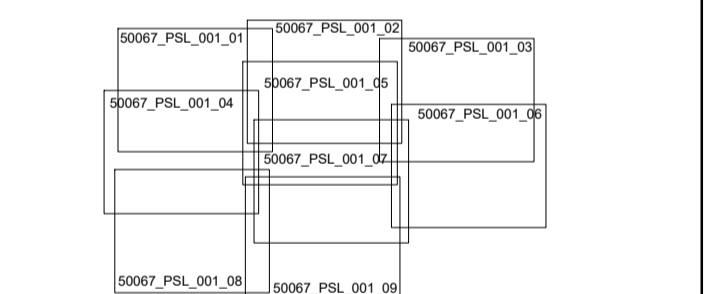
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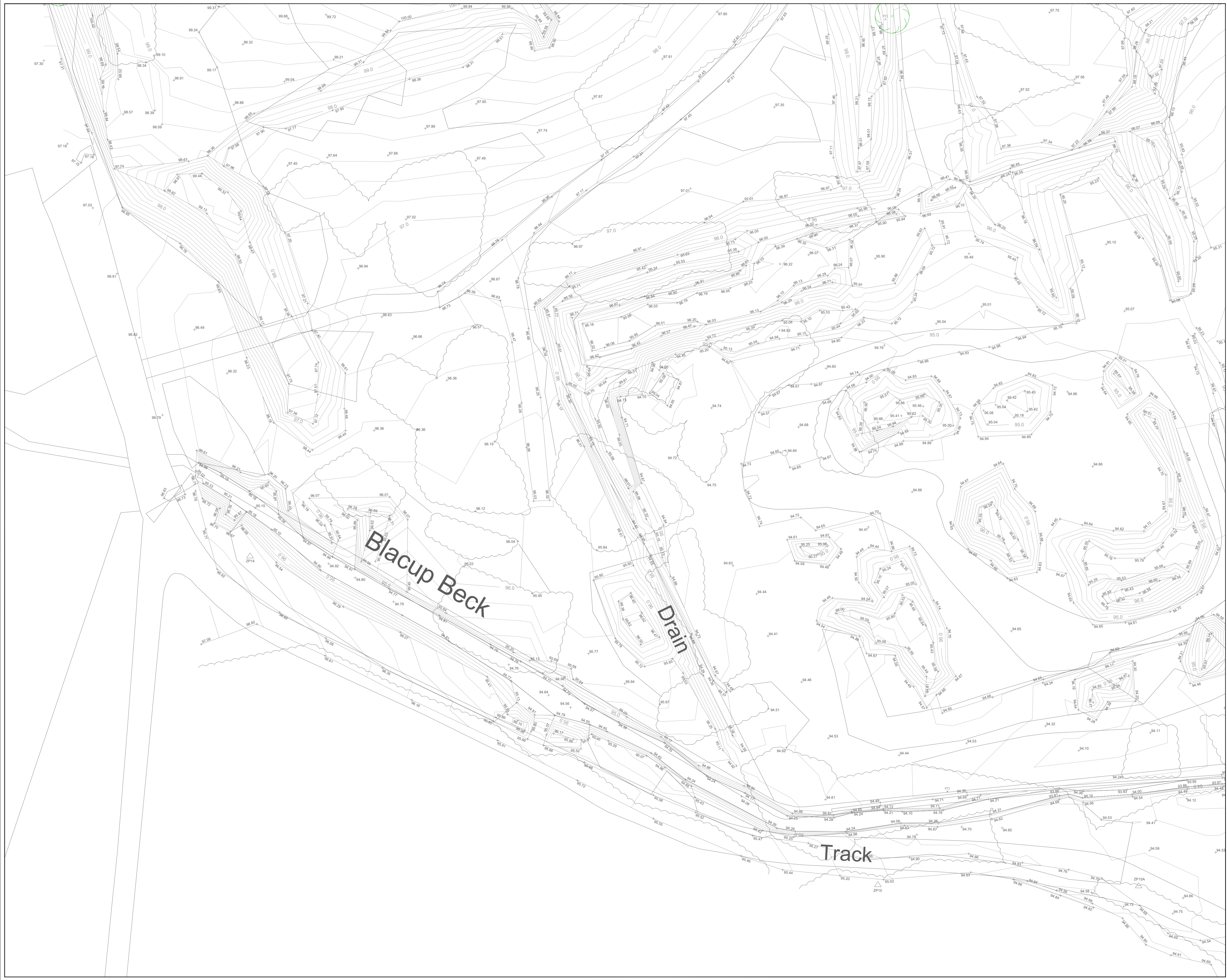
## NOTES

| Station | Easting    | Northing   | Level   | Station | Easting    | Northing   | Level   |
|---------|------------|------------|---------|---------|------------|------------|---------|
| ZP01    | 418443.810 | 425024.260 | 63.513  | ZP12    | 418252.283 | 425035.697 | 100.770 |
| ZP02    | 418253.620 | 425100.026 | 98.623  | ZP13    | 418253.128 | 425016.486 | 99.014  |
| ZP03    | 418497.895 | 425188.535 | 101.038 | ZP14    | 418267.701 | 424931.589 | 96.945  |
| ZP04    | 418444.637 | 425195.267 | 102.822 | ZP15    | 418261.422 | 424951.508 | 95.176  |
| ZP05    | 418388.402 | 425195.036 | 104.829 | ZP16    | 418384.496 | 424933.909 | 94.651  |
| ZP06    | 418434.121 | 425192.350 | 106.728 | ZP17    | 418400.155 | 424969.304 | 94.745  |
| ZP07    | 418202.810 | 425172.465 | 109.607 | ZP18    | 418461.707 | 424991.216 | 96.884  |
| ZP08    | 418191.032 | 425174.646 | 107.851 | ZP19    | 418262.252 | 425016.381 | 92.089  |
| ZP09    | 418241.881 | 425171.342 | 104.846 | ZP20    | 418262.252 | 425016.381 | 100.332 |
| ZP10    | 418324.186 | 425090.278 | 102.466 | ZP21    | 418303.322 | 425032.132 | 97.954  |
| ZP11    | 418322.978 | 425092.191 | 100.602 | ZP24    | 418072.713 | 425153.265 | 99.102  |



## LEGEND

|  |                           |
|--|---------------------------|
|  | Grid (25m Intervals)      |
|  | Contours (200m Intervals) |
|  | Contours (1m Intervals)   |
|  | Building                  |
|  | Wall                      |
|  | Channel                   |
|  | Kerb Top                  |
|  | Road Edge                 |
|  | Ramp                      |
|  | Change Of Surface         |
|  | Concrete                  |
|  | Drain                     |
|  | Water Line                |
|  | Overhead Cable            |
|  | Overhead Electric Cable   |
|  | Bottom Of Bank            |
|  | Top Of Bank               |
|  | Tees Canopy               |
|  | Vegetation                |
|  | Hedge                     |
|  | Fence Open Board          |
|  | Fence Closed Board        |
|  | Fence Iron Rail           |
|  | Fence Chain Link          |
|  | Fence Post Rail           |
|  | Fence Wire Mesh           |
|  | Down Pipe                 |
|  | Rodding Eye               |
|  | Post                      |
|  | Bollard                   |
|  | Traffic Light             |
|  | Telegraph Pole            |
|  | Lamp Post                 |
|  | Earth Rod                 |
|  | IC Cover (Circle)         |
|  | Flag Pole                 |
|  | Road Sign                 |
|  | Sign Post (1 of 2)        |
|  | Bus Stop                  |
|  | Gate                      |
|  | Gully                     |
|  | Kerb Outlet               |
|  | Fire Hydrant              |
|  | Stop Tap                  |
|  | Stop Valve                |
|  | British Telecom           |
|  | Cable TV                  |
|  | Junction Box              |
|  | IC Cover (Square)         |
|  | Flood Light               |
|  | Marker Post               |
|  | Tree (MT - multitrunk)    |
|  | Spot Levels               |
|  | Ridge Level               |
|  | Station                   |



**Yorkshire & Midlands** **North West**  
**4250 Park Approach** **Unit 9 Rising Bridge Business &**  
**Thorpe Park** **Enterprise Village**  
**Leeds** **Blackburn Road**  
**West Yorkshire** **Haslingdon**  
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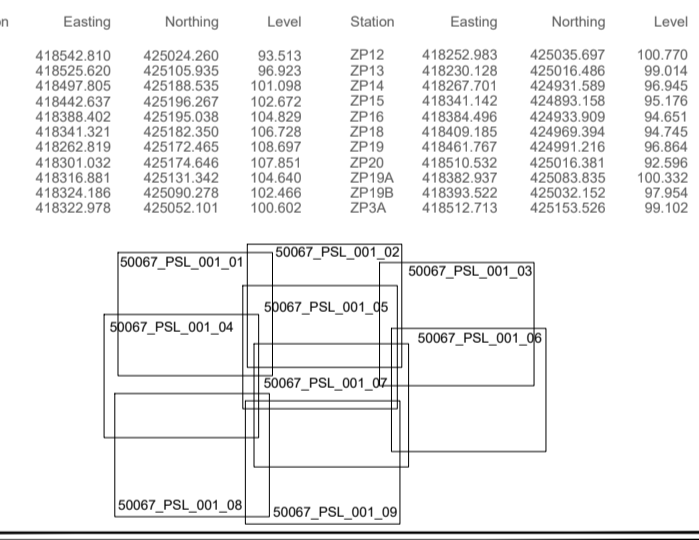
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| REV | DESCRIPTION | BY | DATE |
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| E   |             |    |      |
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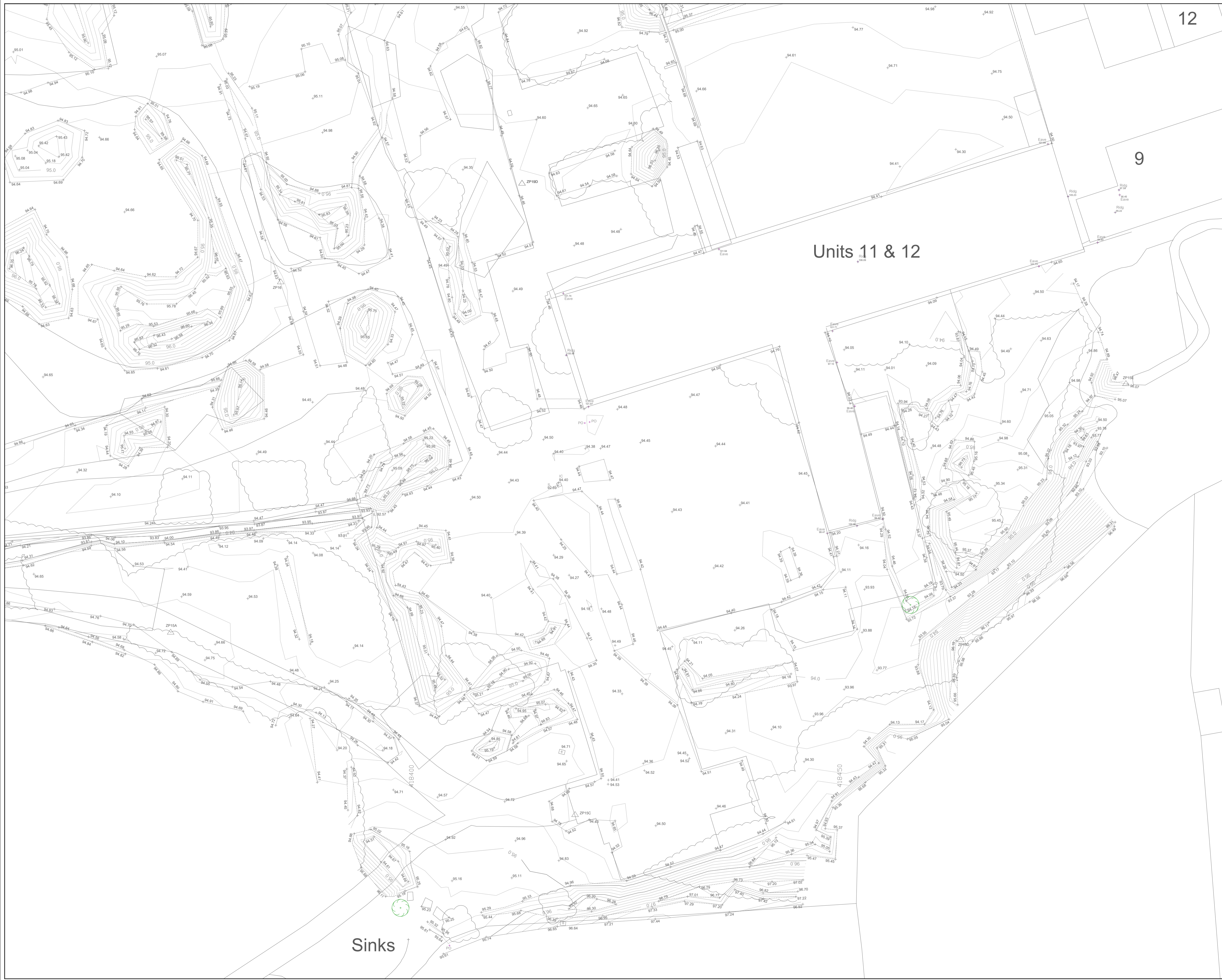
**NOTES**

| Station | Easting    | Northing   | Level   | Station | Easting    | Northing   | Level   |
|---------|------------|------------|---------|---------|------------|------------|---------|
| ZP01    | 418543.810 | 425024.260 | 63.513  | ZP12    | 418252.283 | 425035.697 | 100.770 |
| ZP02    | 418253.020 | 425193.235 | 99.303  | ZP13    | 418267.128 | 425016.486 | 99.014  |
| ZP03    | 419497.895 | 425198.535 | 101.038 | ZP14    | 418267.701 | 424931.089 | 96.945  |
| ZP04    | 418443.821 | 425193.267 | 102.222 | ZP15    | 418267.102 | 424951.084 | 95.176  |
| ZP05    | 418385.402 | 425193.236 | 104.829 | ZP16    | 418384.496 | 424933.909 | 94.651  |
| ZP06    | 418484.121 | 425193.250 | 106.231 | ZP17    | 418383.582 | 424933.904 | 94.745  |
| ZP07    | 418202.810 | 425172.465 | 109.807 | ZP18    | 418461.707 | 424931.216 | 96.884  |
| ZP08    | 418311.020 | 425174.646 | 107.851 | ZP19    | 418322.322 | 425016.381 | 92.099  |
| ZP09    | 418324.189 | 425093.270 | 102.466 | ZP20    | 418323.322 | 425032.152 | 97.954  |
| ZP10    | 418322.978 | 425093.191 | 100.602 | ZP21    | 418072.713 | 425133.926 | 95.102  |



**LEGEND**

|  |                           |
|--|---------------------------|
|  | Grid (25m Intervals)      |
|  | Contours (200m Intervals) |
|  | Contours (1m Intervals)   |
|  | Building                  |
|  | Wall                      |
|  | Channel                   |
|  | Kerb Top                  |
|  | Road Edge                 |
|  | Ramp                      |
|  | Change of Surface         |
|  | Concrete                  |
|  | Drain                     |
|  | Water Line                |
|  | Overhead Cable            |
|  | Overhead Electric Cable   |
|  | Bottom of Bank            |
|  | Top of Bank               |
|  | Tress Canyon              |
|  | Vegetation                |
|  | Hedge                     |
|  | Fence Open Board          |
|  | Fence Closed Board        |
|  | Fence Iron Rail           |
|  | Fence Chain Link          |
|  | Fence Post Rail           |
|  | Fence Wire Mesh           |
|  | Down Pipe                 |
|  | Rodding Eye               |
|  | Post                      |
|  | Bollard                   |
|  | Traffic Light             |
|  | Telegraph Pole            |
|  | Lamp Post                 |
|  | Earth Rod                 |
|  | IC Cover (Circle)         |
|  | Flag Pole                 |
|  | Road Sign                 |
|  | Sign Post (1 of 2)        |
|  | Bus Stop                  |
|  | Gate                      |
|  | Gully                     |
|  | Kerb Outlet               |
|  | Fire Hydrant              |
|  | Stop Tap                  |
|  | Stop Valve                |
|  | British Telecom           |
|  | Cable TV                  |
|  | Junction Box              |
|  | IC Cover (Square)         |
|  | Flood Light               |
|  | Marker Post               |
|  | Tree (MT - multitrunk)    |
|  | Spot Levels               |
|  | Ridge Level               |
|  | Station                   |



12

9

# Units 11 & 12

Sinks

Yorkshire & Midlands  
 4250 Park Approach  
 Thorpe Park  
 Leeds  
 West Yorkshire  
 LS15 8GB  
 T: 01132 641599  
 W www.professional-group.eu

North West  
 Unit 9 Rising Bridge Business &  
 Enterprise Village  
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| C   |             |    |      |
| D   |             |    |      |
| E   |             |    |      |
| F   |             |    |      |

NOTES

| Station | Easting   | Northing  | Level   | Station | Easting   | Northing  | Level   |
|---------|-----------|-----------|---------|---------|-----------|-----------|---------|
| ZP01    | 41842.810 | 42504.260 | 93.513  | ZP12    | 41825.283 | 42503.697 | 100.770 |
| ZP02    | 41825.620 | 42519.235 | 93.923  | ZP13    | 41827.128 | 42516.486 | 99.014  |
| ZP03    | 41847.895 | 42518.535 | 101.038 | ZP14    | 41827.701 | 42493.589 | 96.945  |
| ZP04    | 41844.527 | 42519.267 | 102.822 | ZP15    | 41831.442 | 42493.589 | 94.745  |
| ZP05    | 41838.402 | 42519.036 | 104.829 | ZP16    | 41834.496 | 42493.589 | 94.651  |
| ZP06    | 41834.321 | 42519.250 | 106.728 | ZP17    | 41830.582 | 42493.589 | 94.745  |
| ZP07    | 41820.810 | 42512.465 | 109.807 | ZP18    | 41841.707 | 42493.589 | 96.884  |
| ZP08    | 41831.032 | 42514.646 | 107.811 | ZP19    | 41832.322 | 42503.381 | 92.989  |
| ZP09    | 41811.881 | 42511.342 | 104.846 | ZP20    | 41832.322 | 42503.381 | 100.332 |
| ZP10    | 41834.189 | 42500.278 | 102.466 | ZP21    | 41832.322 | 42503.381 | 97.924  |
| ZP11    | 41822.978 | 42502.191 | 100.602 | ZP24    | 41812.713 | 42513.525 | 99.102  |

LEGEND

|  |                            |
|--|----------------------------|
|  | Grid (25m Intervals)       |
|  | Contours (200mm Intervals) |
|  | Contours (1m Intervals)    |
|  | Building                   |
|  | Wall                       |
|  | Channel                    |
|  | Kerb Top                   |
|  | Road Edge                  |
|  | Ramp                       |
|  | Change Of Surface          |
|  | Concrete                   |
|  | Drain                      |
|  | Water Line                 |
|  | Overhead Cable             |
|  | Overhead Electric Cable    |
|  | Bottom Of Bank             |
|  | Top Of Bank                |
|  | Trees Canopy               |
|  | Vegetation                 |
|  | Hedge                      |
|  | Fence Open Board           |
|  | Fence Closed Board         |
|  | Fence Iron Rail            |
|  | Fence Chain Link           |
|  | Fence Post Rail            |
|  | Fence Wire Mesh            |
|  | Down Pipe                  |
|  | Rodding Eye                |
|  | Post                       |
|  | Bollard                    |
|  | Traffic Light              |
|  | Telegraph Pole             |
|  | Lamp Post                  |
|  | Earth Rod                  |
|  | IC Cover (Circle)          |
|  | Flag Pole                  |
|  | Road Sign                  |
|  | Sign Post (1 of 2)         |
|  | Bus Stop                   |
|  | Gate                       |
|  | Gully                      |
|  | Kerb Outlet                |
|  | Fire Hydrant               |
|  | Stop Tap                   |
|  | Stop Valve                 |
|  | British Telecom            |
|  | Cable TV                   |
|  | Junction Box               |
|  | IC Cover (Square)          |
|  | Flood Light                |
|  | Marker Post                |
|  | Tree (MTR-multitrunk)      |
|  | Spot Levels                |
|  | Ridge Level                |
|  | Station                    |

## Appendix 2 – Development Layout



## Appendix 3 – Flood Mapping

# Flood map for planning

Your reference  
**cleckheaton**

Location (easting/northing)  
**418387/425027**

Created  
**6 Feb 2023 11:55**

**Your selected location is in flood zone 3, an area with a high probability of flooding.**

## **This means:**

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see [www.gov.uk/guidance/flood-risk-assessment-standing-advice](http://www.gov.uk/guidance/flood-risk-assessment-standing-advice))

## **Notes**

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

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


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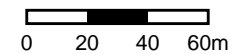
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**cleckheaton**

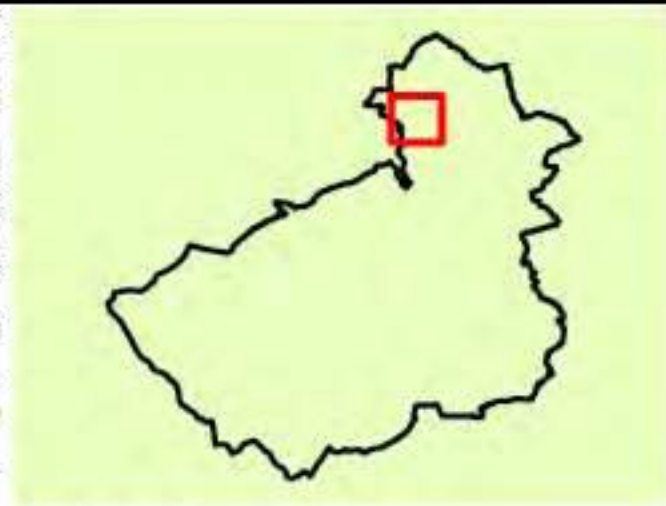
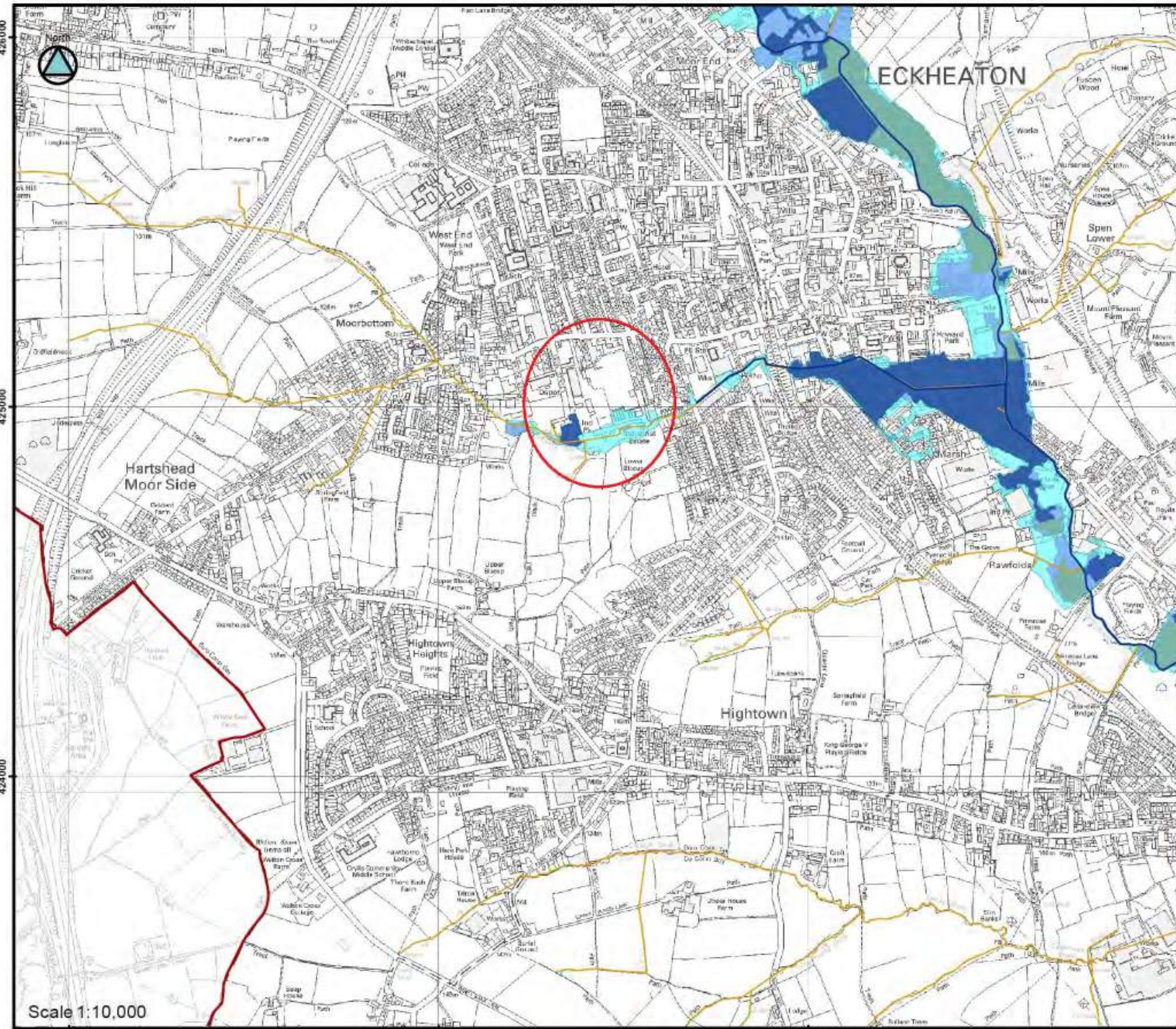
Location (easting/northing)  
**418387/425027**

Scale  
**1:2500**

Created  
**6 Feb 2023 11:55**

-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area





**LEGEND**

- Choose Option **Flood Zones**
-  Council boundary
  -  Main River
  -  Detailed River Network
  - Flood Zones**
  -  Flood Zone 3b
  -  Flood Zone 3a1
  -  Flood Zone 3a
  -  Flood Zone 2

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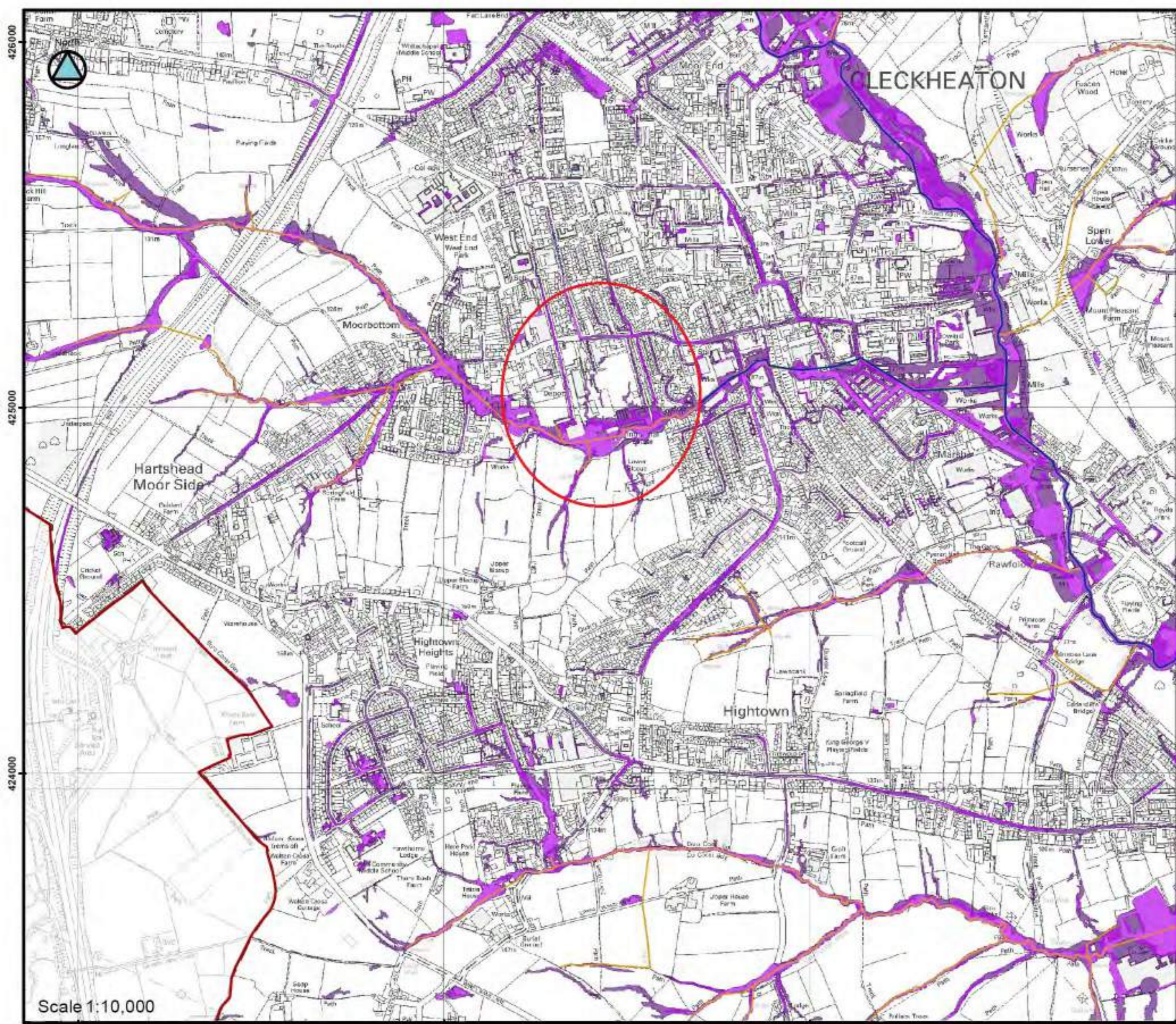


STRATEGIC FLOOD RISK ASSESSMENT  
 For  
 KIRKLEES COUNCIL  
 MAP\_Y








Scale 1:10,000

417000 418000 419000 420000

426000  
425000  
424000



**LEGEND**

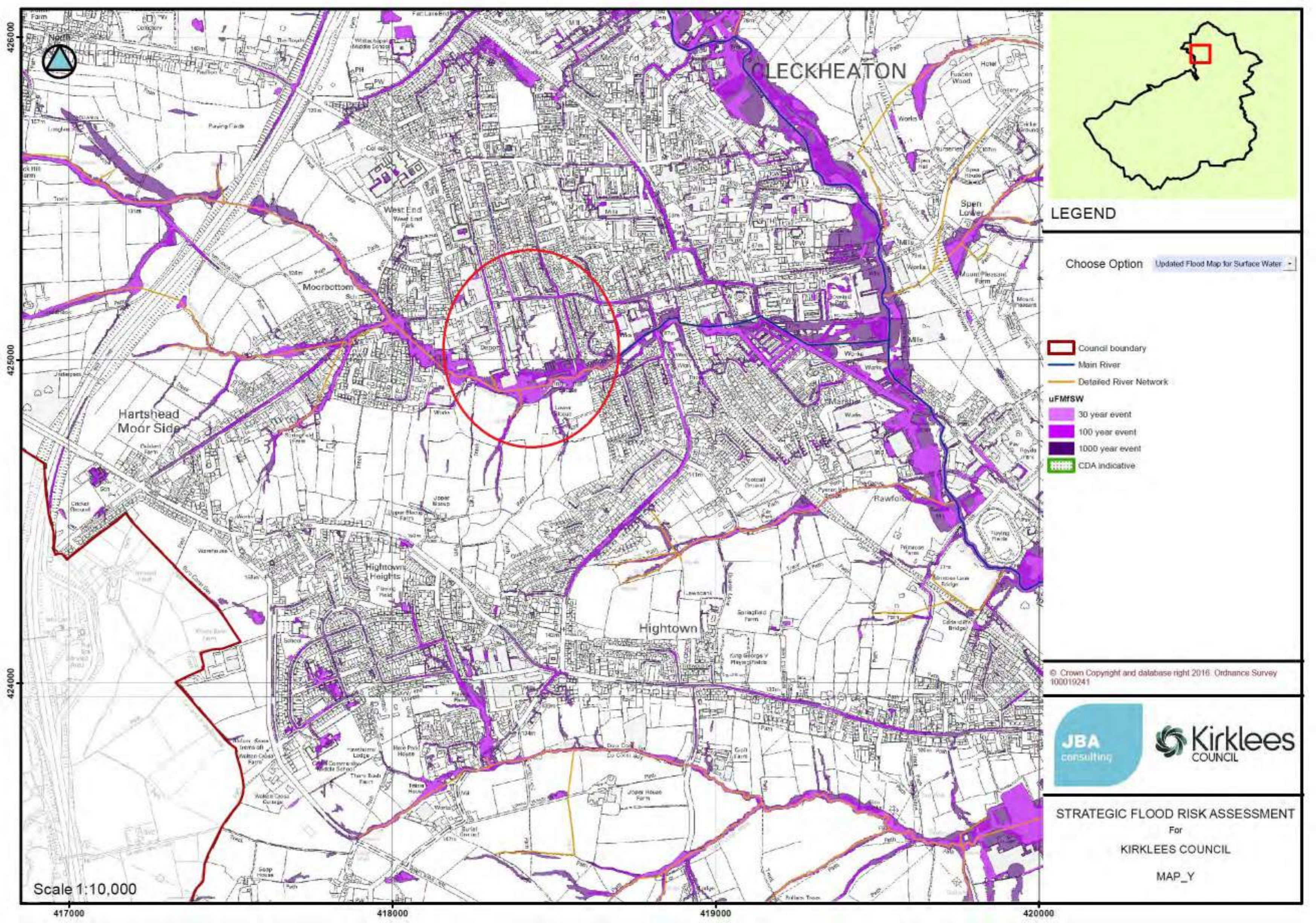
- Choose Option
-  Council boundary
  -  Main River
  -  Detailed River Network
  - uFMSW**
  -  30 year event
  -  100 year event
  -  1000 year event
  -  CDA indicative

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**STRATEGIC FLOOD RISK ASSESSMENT**  
 For  
**KIRKLEES COUNCIL**  
 MAP\_Y

Scale 1:10,000




## Appendix 4 – Flood Map Overlay

-  Main River
-  Detailed River Network
- Flood Zones**
-  Flood Zone 3b
-  Flood Zone 3ai
-  Flood Zone 3a
-  Flood Zone 2



| Rev | Date | Revision Details | Drawn | Checked |
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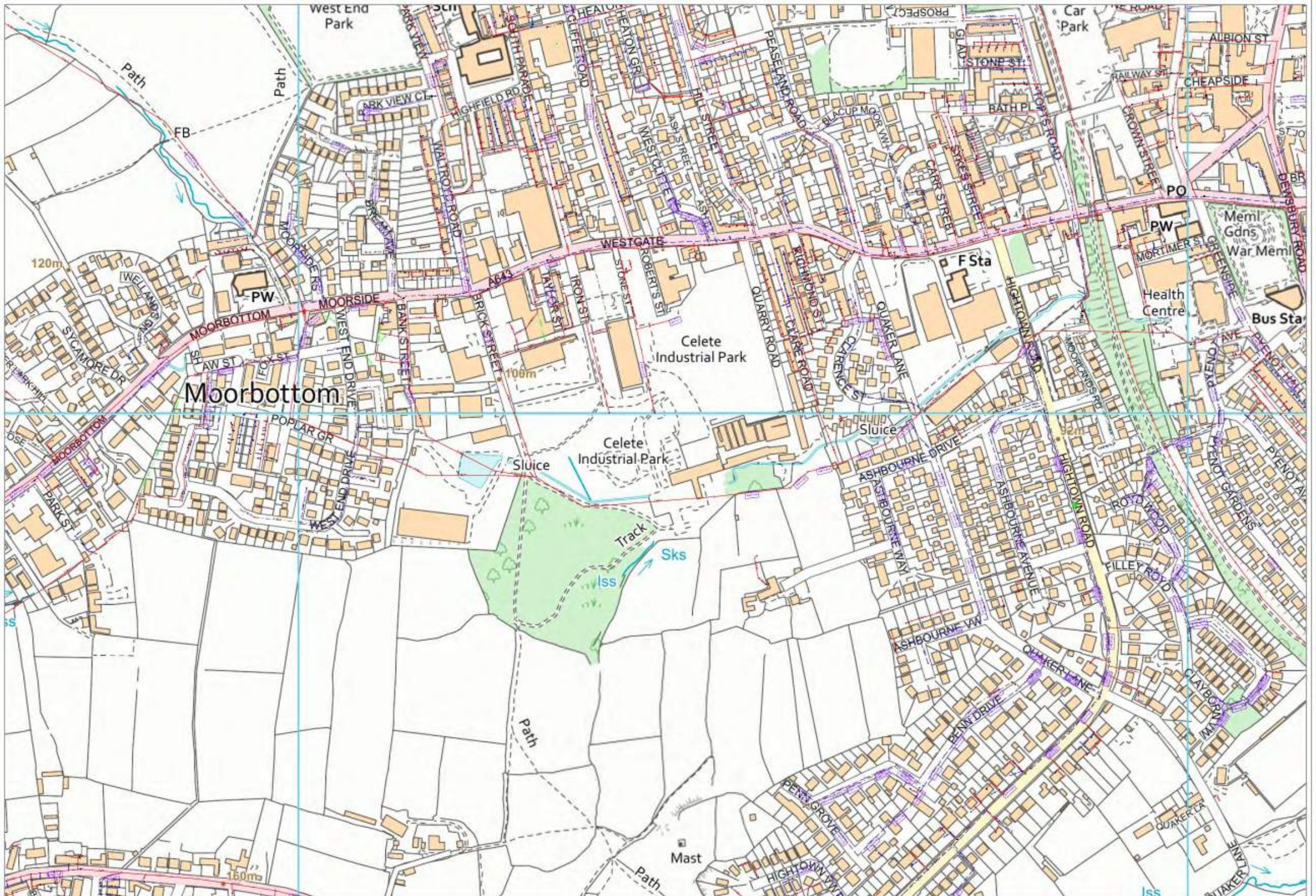
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| Project        | WESTGATE CLECKHEATON   |         |            |
| Title          | SFRA FLOOD MAP OVERLAY |         |            |
| Drawn          | ND                     | Checked | Date       |
| Drawing Number |                        |         | 07.02.2023 |
| Drawing Status | INFORMATION            | Scale   | 1:500 - A1 |

## Appendix 5 – Sewer Records



# Moorbottom

FB

PW

120m

100m

OSF

SS

150m

## Appendix 6 – Fluvial Flood Risk Impact Assessment

# RFI/2021/194183 Node Point Map Centred on Your Site off Westgate, Cleckheaton

Date created: 10/02/2021



www.environment-agency.gov.uk



Scale: 1:10,000

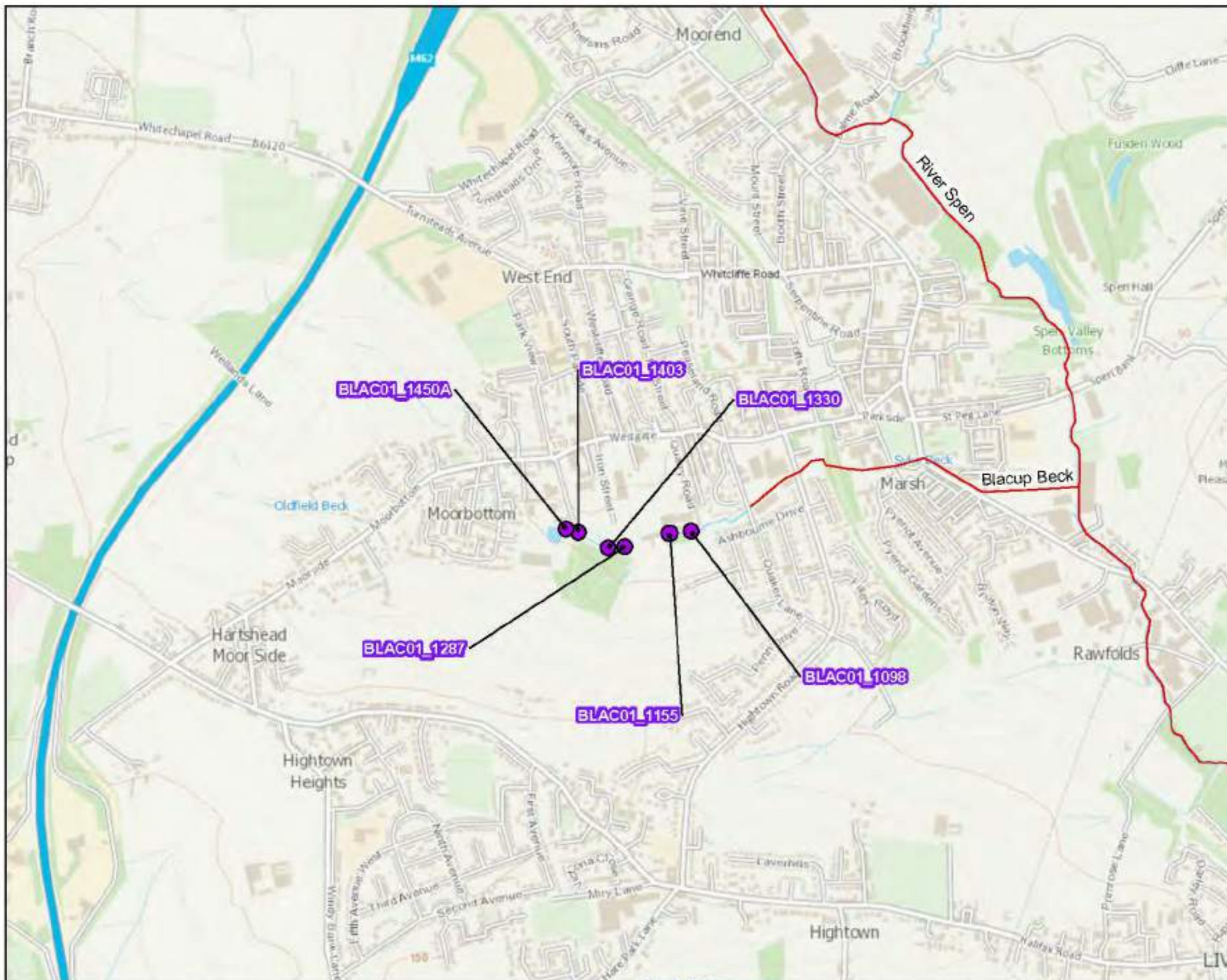


when reproduced @ A3



## LEGEND

-  Main River
-  2009 River Spen Node Points



2009 River Span Model Results (Level - mAOD, Flow - m<sup>3</sup>/s) - RFI/2021/194183

| Node Point   | Annual Exceedance Probability (AEP) |          |                   |          |                  |          |                  |          |                     |          |                   |          |                           |          |                      |          |
|--------------|-------------------------------------|----------|-------------------|----------|------------------|----------|------------------|----------|---------------------|----------|-------------------|----------|---------------------------|----------|----------------------|----------|
|              | 20% AEP (1 in 5)                    |          | 10% AEP (1 in 10) |          | 4% AEP (1 in 25) |          | 2% AEP (1 in 50) |          | 1.33% AEP (1 in 75) |          | 0% AEP (1 in 100) |          | 1% AEP (1 in 100) +20% CC |          | 0.1% AEP (1 in 1000) |          |
|              | Max Stage                           | Max Flow | Max Stage         | Max Flow | Max Stage        | Max Flow | Max Stage        | Max Flow | Max Stage           | Max Flow | Max Stage         | Max Flow | Max Stage                 | Max Flow | Max Stage            | Max Flow |
| BLAC01_1330  | 94.862                              | 1.793    | 94.73             | 2.059    | 94.772           | 2.503    | 94.802           | 2.794    | 94.819              | 2.98     | 94.831            | 3.074    | 94.886                    | 3.591    | 95.123               | 5.912    |
| BLAC01_1155  | 91.177                              | 1.788    | 91.274            | 2.324    | 91.32            | 2.637    | 91.369           | 2.969    | 91.398              | 3.167    | 91.414            | 3.312    | 91.487                    | 3.986    | 91.747               | 6.807    |
| BLAC01_1098  | 90.449                              | 1.784    | 90.509            | 2.289    | 90.54            | 2.688    | 90.561           | 2.978    | 90.575              | 3.174    | 90.586            | 3.314    | 90.738                    | 3.936    | 91.304               | 5.932    |
| BLAC01_1403  | 95.94                               | 1.799    | 95.991            | 2.118    | 98.071           | 2.894    | 98.108           | 3.041    | 98.129              | 3.25     | 98.137            | 3.399    | 98.193                    | 4.074    | 98.47                | 6.018    |
| BLAC01_1287  | 94.477                              | 1.785    | 94.544            | 2.305    | 94.579           | 2.637    | 94.605           | 2.965    | 94.62               | 3.159    | 94.631            | 3.304    | 94.68                     | 4.001    | 94.937               | 7.382    |
| BLAC01_1450A | 97.877                              | 1.815    | 97.984            | 2.12     | 98.073           | 2.835    | 98.098           | 2.944    | 98.109              | 3.123    | 98.116            | 3.268    | 98.147                    | 3.926    | 98.252               | 6.884    |



FLOOD OUTLINE BASED ON NODE BLAC01\_1287  
 LEVEL = 94.680m AOD  
 VOLUME = 1624m<sup>3</sup>  
 AREA = 7885m<sup>2</sup>

# Celete Industrial Park




**2009 River Spen Model Results (Level - mAOD, Flow - m<sup>3</sup>s) - RFI/2021/194183**

| Node Point   | Annual Exceedance Probability (AEP) |          |                   |          |                  |          |                  |          |                     |          |                   |          |                           |          |                      |          |
|--------------|-------------------------------------|----------|-------------------|----------|------------------|----------|------------------|----------|---------------------|----------|-------------------|----------|---------------------------|----------|----------------------|----------|
|              | 20% AEP (1 in 5)                    |          | 10% AEP (1 in 10) |          | 4% AEP (1 in 25) |          | 2% AEP (1 in 50) |          | 1.33% AEP (1 in 75) |          | 1% AEP (1 in 100) |          | 1% AEP (1 in 100) +20% CC |          | 0.1% AEP (1 in 1000) |          |
|              | Max Stage                           | Max Flow | Max Stage         | Max Flow | Max Stage        | Max Flow | Max Stage        | Max Flow | Max Stage           | Max Flow | Max Stage         | Max Flow | Max Stage                 | Max Flow | Max Stage            | Max Flow |
| BLAC01_1330  | 94.682                              | 1.793    | 94.73             | 2.059    | 94.772           | 2.503    | 94.802           | 2.794    | 94.819              | 2.96     | 94.831            | 3.074    | 94.886                    | 3.591    | 95.123               | 5.912    |
| BLAC01_1155  | 91.177                              | 1.788    | 91.274            | 2.324    | 91.32            | 2.637    | 91.369           | 2.969    | 91.398              | 3.167    | 91.414            | 3.312    | 91.487                    | 3.986    | 91.747               | 5.807    |
| BLAC01_1098  | 90.449                              | 1.784    | 90.509            | 2.289    | 90.54            | 2.668    | 90.561           | 2.978    | 90.575              | 3.174    | 90.586            | 3.314    | 90.738                    | 3.936    | 91.304               | 5.932    |
| BLAC01_1403  | 95.94                               | 1.799    | 95.991            | 2.118    | 96.071           | 2.694    | 96.108           | 3.041    | 96.129              | 3.25     | 96.137            | 3.398    | 96.183                    | 4.074    | 96.47                | 6.016    |
| BLAC01_1287  | 94.477                              | 1.785    | 94.544            | 2.305    | 94.579           | 2.637    | 94.605           | 2.965    | 94.62               | 3.159    | 94.631            | 3.304    | 94.68                     | 4.001    | 94.937               | 7.382    |
| BLAC01_1450A | 97.677                              | 1.815    | 97.984            | 2.12     | 98.073           | 2.635    | 98.096           | 2.944    | 98.108              | 3.123    | 98.116            | 3.248    | 98.147                    | 3.826    | 98.252               | 6.684    |

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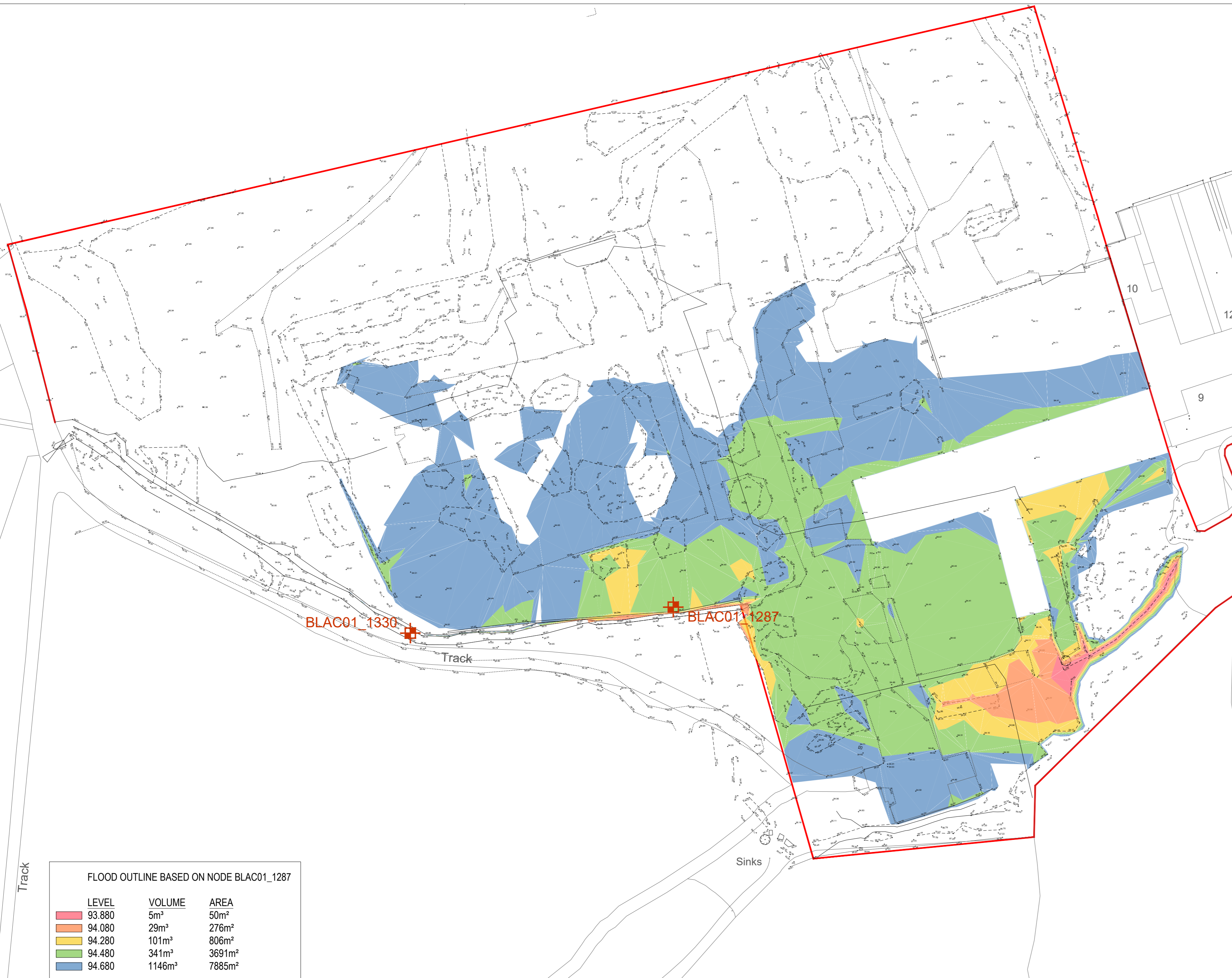
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Project: WESTGATE CLEKCHEATON

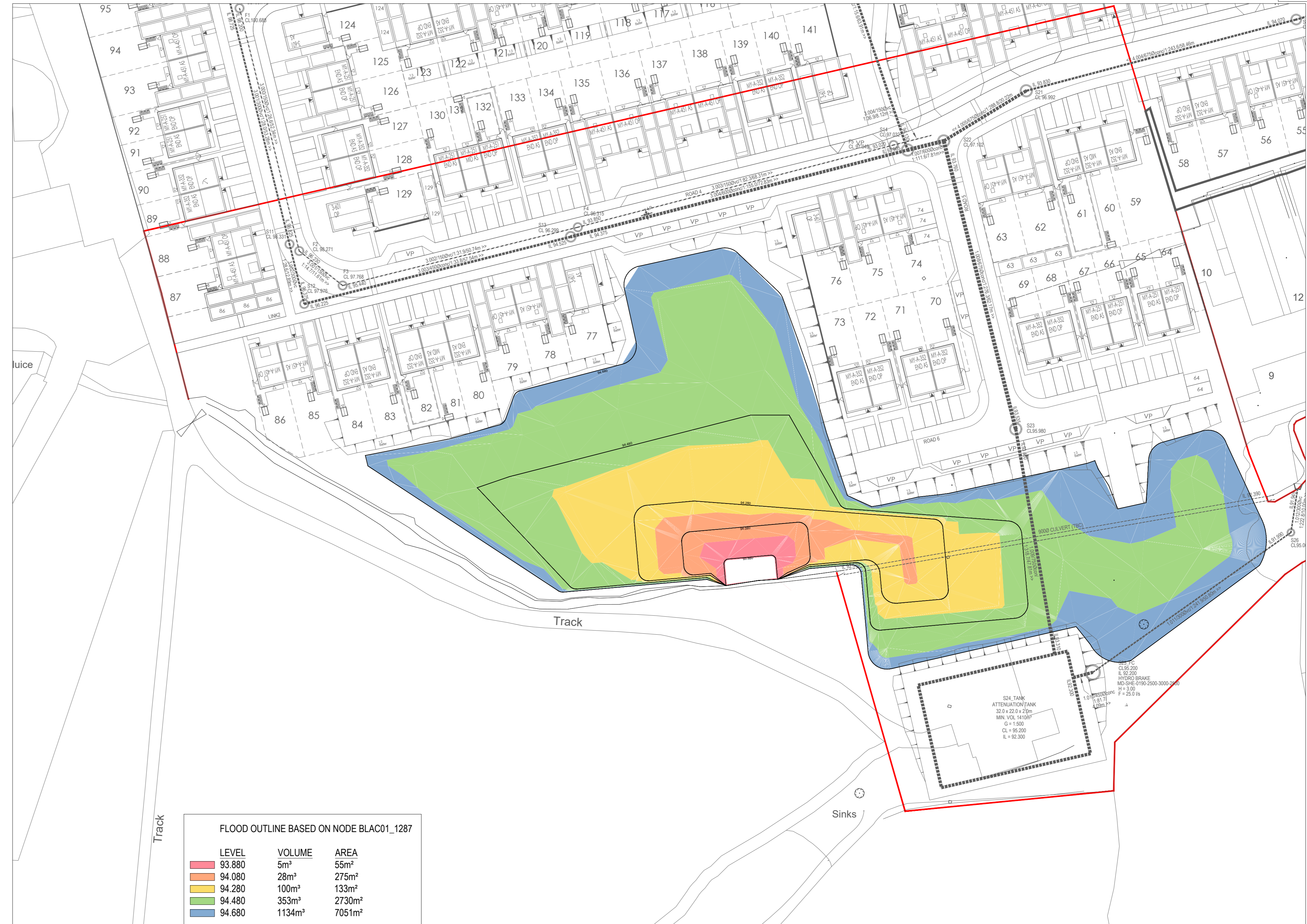
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| Drawing Status | INFORMATION  | Scale   | 1:500 - A1 | Rev. | -          |





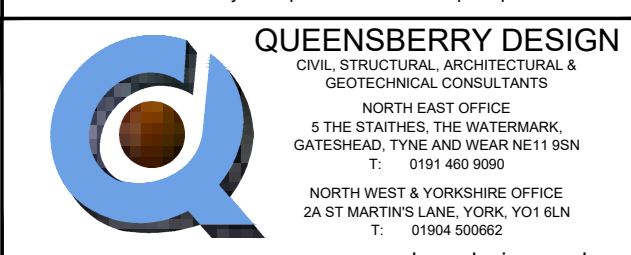
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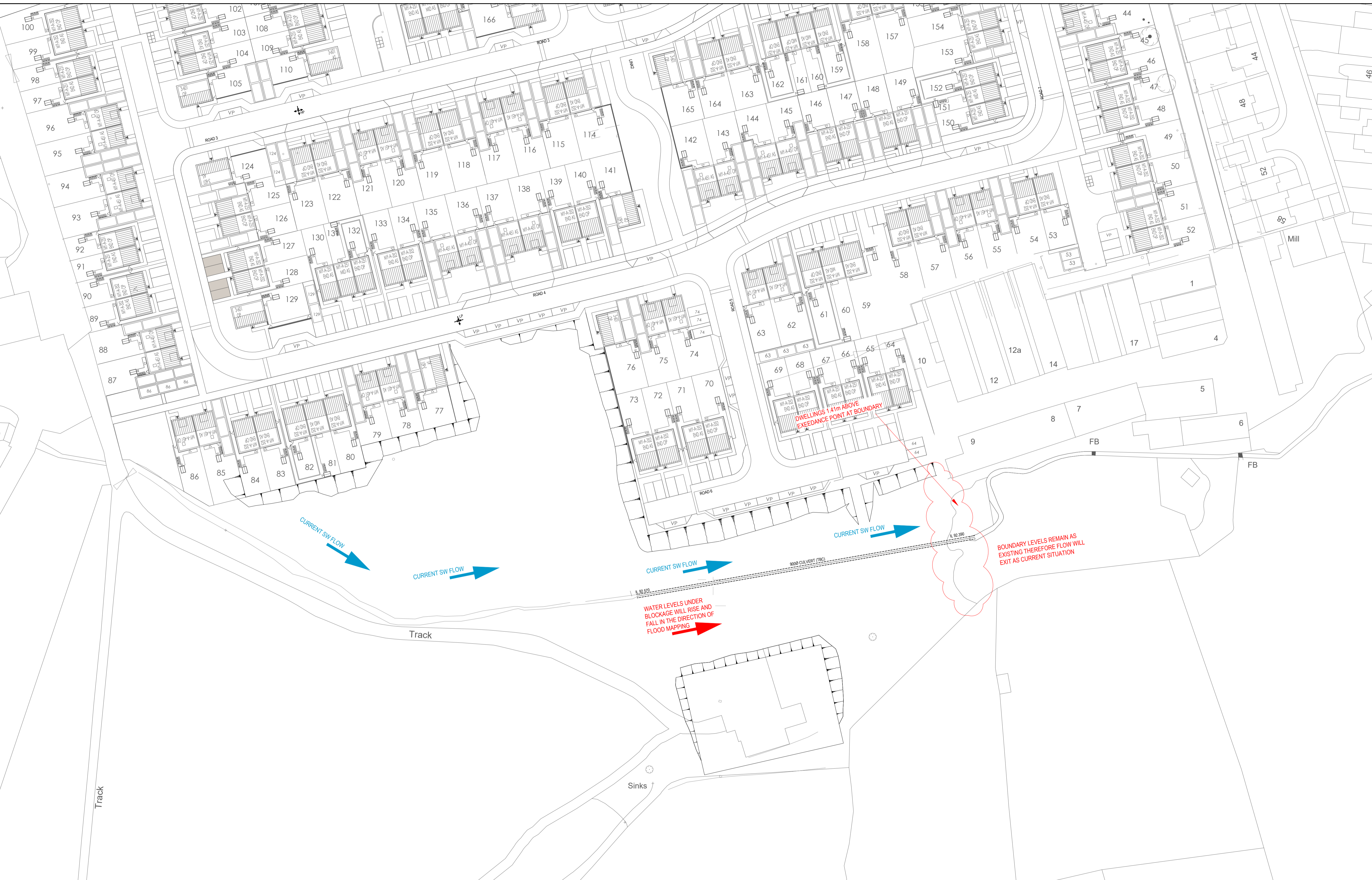


1% AEP +20% WATER DEPTHS/ VOLUMES - AFTER RE-PROFILE



RE-PROFILING CONTOURS

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|   |      |                  |       | 14.03.2023 |
| Drawing Number: QD1776-50-04  |      |                  |       |            |
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| Scale: 1:500 - A0   |      |                  |       |            |



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Drawing Number: QD1776-50-06  
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## Appendix 7 – Surface Water Flooding Assessment



## Appendix 8 – Drainage Strategy

