



# FloodSmart Pro

|                     |                                                                                         |
|---------------------|-----------------------------------------------------------------------------------------|
| Site address        | 16 Selbourne Avenue<br>Havant<br>PO9 4PX                                                |
| Site coordinates    | 470550,108125                                                                           |
| Report prepared for | Mr Leonard Sturgess<br>1 Astra Close<br>Bosham<br>Chichester<br>West Sussex<br>PO18 8QU |
| Report reference    | 72330R1                                                                                 |
| Report status       | FINAL                                                                                   |
| Date issued         | 2019-11-07                                                                              |
| Report author       | Jessica Bayliff<br><b>Consultant</b>                                                    |
| Report checker      | Mike Piotrowski<br><b>Principal Hydrologist</b>                                         |
| Report reviewer     | Bob Sargent<br><b>Associate</b>                                                         |

# 1. Executive summary

The National Planning Policy Framework (NPPF) (2019) and National Planning Practice Guidance (NPPG) (2014) requires that flood risk assessments review flooding from all potential sources. A review has been undertaken of national environmental data sets to assess the potential flood risk to the Site. The review is provided within this concise interpretative report written by an experienced GeoSmart consultant.

## Site analysis

| Source of Flood Risk                    | Baseline | After Mitigation |
|-----------------------------------------|----------|------------------|
| River (fluvial) and Sea (coastal/tidal) | Medium   | Low              |
| Surface water (pluvial) flooding        | Very Low | N/A              |
| Groundwater flooding                    | Moderate | Negligible       |
| Other flood risk factors present        | No       | N/A              |
| Is any other further work recommended?  | Yes      | Yes (see below)  |

N/A = mitigation not required

The Site is currently used within a residential capacity. Development proposals comprise the construction of a detached dwelling to the east of the existing dwellings.

The flood risks from all sources have been assessed as part of this report and are as follows:

- According to the Environment Agency's (EA) Flood Map for Planning Purposes, the Site is located within a fluvial Flood Zone 3 (High probability);
- According to the EA's Risk of Flooding from Rivers and Sea (RoFRS) map, which considers the type, condition and crest height of flood defences, the Site has a Medium risk of flooding from Rivers and the Sea;
- JFLOW Water Depth and Levels at the Site was provided by EA to confirm flood levels at the Site. As the JFLOW models were run using a Digital Terrain Model (DTM) with a 5m x 5m grid, that were generalized to between 5m and 100 m, there is potential for there to be inaccuracies in the level data because of the DTM generalization. Therefore, to try and improve the accuracy of the data, the depths produced by the JFLOW levels have been compared to the EA 1m LiDAR data which was produced in 2011. Using the most up to date guidance on climate change, confirms the maximum flood level at the Site during the 1 in 100 year plus a 105% climate change allowance would be 12.50 mAOD. During this event, flood depths at the Site could be up to 0.42 m;

- According to the EA's Risk of Flooding from Surface Water (pluvial) flood mapping, the Site is at a Very Low risk of pluvial flooding;
- GeoSmart's Groundwater Flood Risk (GW5) mapping confirms there is a Moderate risk of groundwater flooding during the 1 in 100 year event (1% annual probability); and
- The EA's Risk of Flooding from Reservoir map confirms the Site is not at risk of Reservoir Flooding.

## Recommendations / Next steps

Recommendations for mitigation are provided below, based upon the proposed development and the flood risk to the Site:

- As the Site is located in Flood Zone 3 and in accordance with Table 3 of the NPPG (2014), the Sequential Test should be undertaken to compare flood risk at the Site with other available sites to find out which has the lowest flood risk. A Sequential Test is being undertaken separately (Ref: 72330.01R1).
- As there is a risk of flooding from fluvial sources, Finished Floor Levels (FFL) of the proposed development should be set to 12.80 mAOD, which is 0.3 m above the estimated 1 in 100 year plus 105% allowance for climate change flood level of 12.50 mAOD.
- As the Site is located within a Fluvial Flood Zone 3 with an increase in building footprint, there is likely to be a decrease in floodplain storage. Therefore, compensatory floodplain storage should be provided in accordance with Section 5 of this report.
- As there is a risk of flooding from groundwater sources and although it is likely that the mitigation measures put in place for fluvial risk will be sufficient for the groundwater flood risk at the Site, specific groundwater measures that may also be considered include:
  - Waterproof tanking of the ground floor;
  - Interceptor drains;
  - Automatic sump to extract flood water; and
  - Non-return flap valves on the proposed foul and surface water sewer lines.
- Occupants of the Site should be signed up to the EA's flood warning direct service to receive Flood Alerts and Flood Warnings;
- A Flood Warning and Evacuation Plan is recommended to ensure persons using the Site can evacuate safely on receipt of a Flood Warning; and
- A Sustainable Drainage Strategy (SuDS) should be developed for the Site, for effective management of surface water runoff from the proposed development.

GeoSmart recommend the mitigation measures discussed within this report are considered as part of the proposed development where possible and evidence of this is provided to the Local Planning Authority as part of the planning application.

## 2. Introduction

### Background and purpose

This assessment has been undertaken by firstly compiling information concerning the Site and the surrounding area. The information gathered was then used to construct a 'conceptual site model', including an understanding of the appropriateness of the development as defined in the NPPF (2019) and the source(s) of any flood risk present. Finally, a preliminary assessment of the steps that can be taken to manage any flood risk to the development was undertaken.

This report has been prepared with reference to the NPPF (2019) and NPPG (2014).

*"The National Planning Policy Framework set out the Government's planning policies for England and how these are expected to be applied"* (NPPF, 2019).

The NPPF (2019) and NPPG (2014) promotes a sequential, risk based approach to the location of development.

*"This general approach is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. The aim should be to keep development out of medium and high risk flood areas (Flood Zones 2 and 3) and other areas affected by other sources of flooding where possible"* (NPPG, 2014).

The purpose of this report is to provide clear and pragmatic advice regarding the nature and potential significance of flood hazards which may be present at the Site.

### Report scope

A thorough review of a commercially available flood risk report and EA supplied data indicating potential sources of flood risk to the Site from rivers and coastal sources, surface run-off (pluvial), groundwater and reservoirs, including historical flood information and modelled flood extent. Appropriate measures are recommended to manage and mitigate the flood risk to the property.

Information obtained from the EA and a review of the Partnership for Urban South Hampshire Strategic Flood Risk Assessment 2016 Update (SFRA) (Eastern Solent Coastal Partnership, 2016) is used to ascertain local flooding issues and, where appropriate, identify information to support a Sequential and/or Exception test required as part of the NPPF (2019).

Using the available data, the existing and future flood risks to and from the Site from all flood sources is assessed in line with current best practice.

An indication of potential flood risk from the Site to downstream receptors is provided where the proposed development increases run-off from the Site.

### Report limitations

It is noted that the findings presented in this report are based on a desk study of information supplied by third parties. Whilst we assume that all information is representative of past and present conditions, we can offer no guarantee as to its validity and a proportionate programme of site investigations would be required to fully verify these findings.

The basemap used is the OS Street View 1:10,000 scale, however the Site boundary has been drawn using BlueSky aerial imagery to ensure the correct extent and proportion of the Site is analysed.

This report excludes consideration of potential hazards arising from any activities at the Site other than normal use and occupancy for the intended land uses. Hazards associated with any other activities have not been assessed and must be subject to a specific risk assessment by the parties responsible for those activities.

## Datasets

The following table shows the sources of information that have been consulted as part of this report:

**Table 1: Datasets consulted to obtain confirmation of sources of flooding and risk**

| Source of flooding      | Datasets consulted                              |       |                                 |         |
|-------------------------|-------------------------------------------------|-------|---------------------------------|---------|
|                         | Commercial Flood Maps and GW5 Data (Appendix B) | SFRA* | Environment Agency (Appendix C) | OS Data |
| Historical              | X                                               | X     | X                               |         |
| Fluvial/tidal           | X                                               | X     | X                               |         |
| Surface water (pluvial) | X                                               | X     | X                               |         |
| Groundwater             | X                                               | X     |                                 |         |
| Sewer                   |                                                 | X     |                                 |         |
| Culvert/bridges         |                                                 | X     |                                 | X       |
| Reservoir               |                                                 | X     | X                               |         |

\*Partnership for Urban South Hampshire Strategic Flood Risk Assessment 2016 Update (SFRA) (Eastern Solent Coastal Partnership, 2016). Supporting information on the datasets used is provided in the relevant appendix

### 3. Site analysis



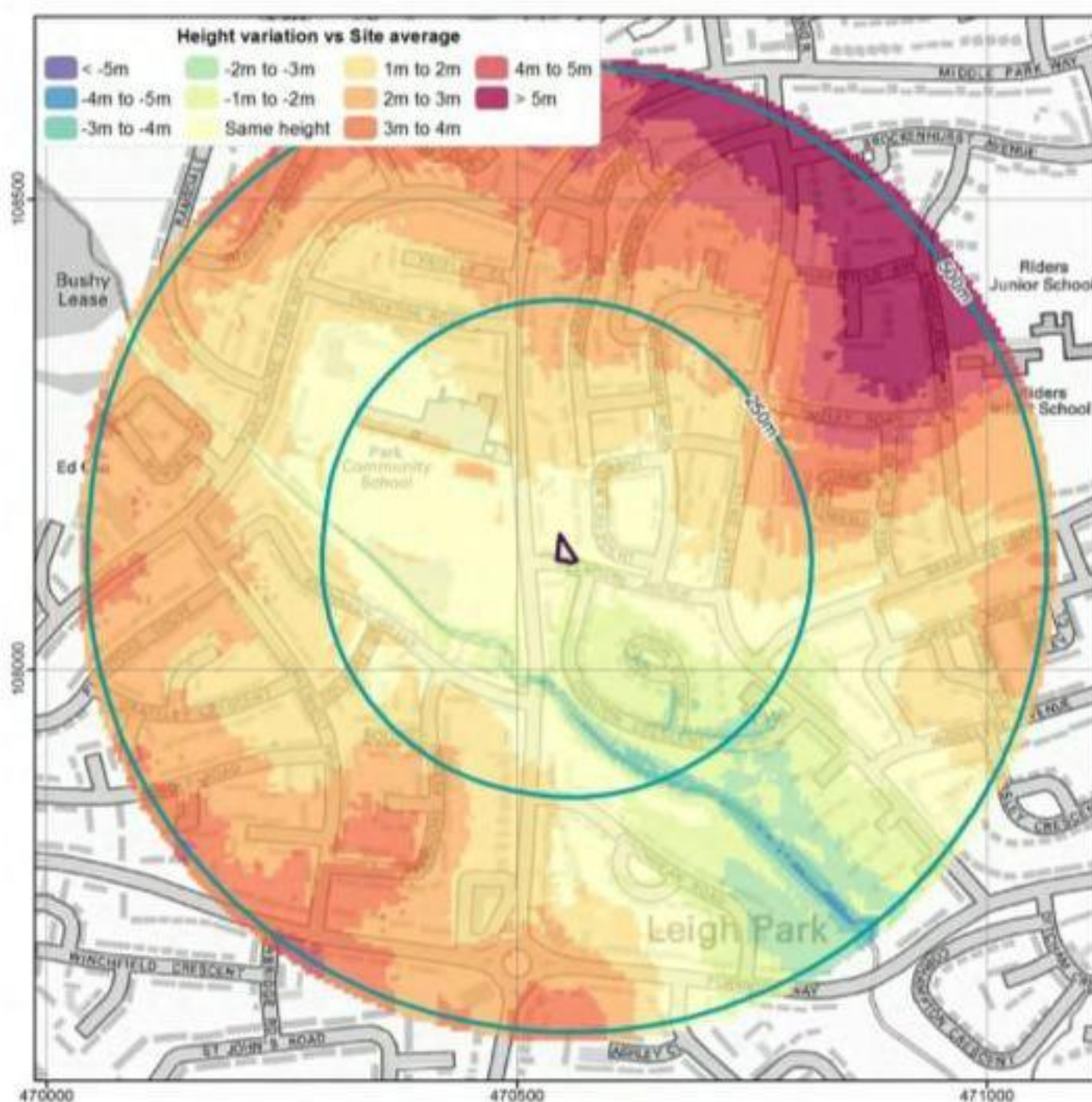
#### Site information

The Site is located in Havant in a setting of residential land use at National Grid Reference SU 70550 08125. Site plans and drawings are provided in Appendix A.

Using a 500 m buffer around the Site, the area is in the base of a valley (Figure 1). It is noted that to the north land rises to c. 17.06 m above Ordnance Datum (AOD). To the west land rises to c. 14.7 m AOD, to the east land rises to c. 14.5 m AOD and to the south, the land falls to c. 11.3 m at Hermitage Stream, before rising again to 14.10 m AOD.

According to the EA's LiDAR ground elevation data, the general level of the Site is between 11.58 and 12.22 m AOD with the Site falling gradually in a southerly direction. This is based on EA elevation data obtained for the Site to a 1 m resolution with a vertical accuracy of  $\pm 150$  mm (Appendix D).

Figure 1 Site Location and Relative Elevations





## Development

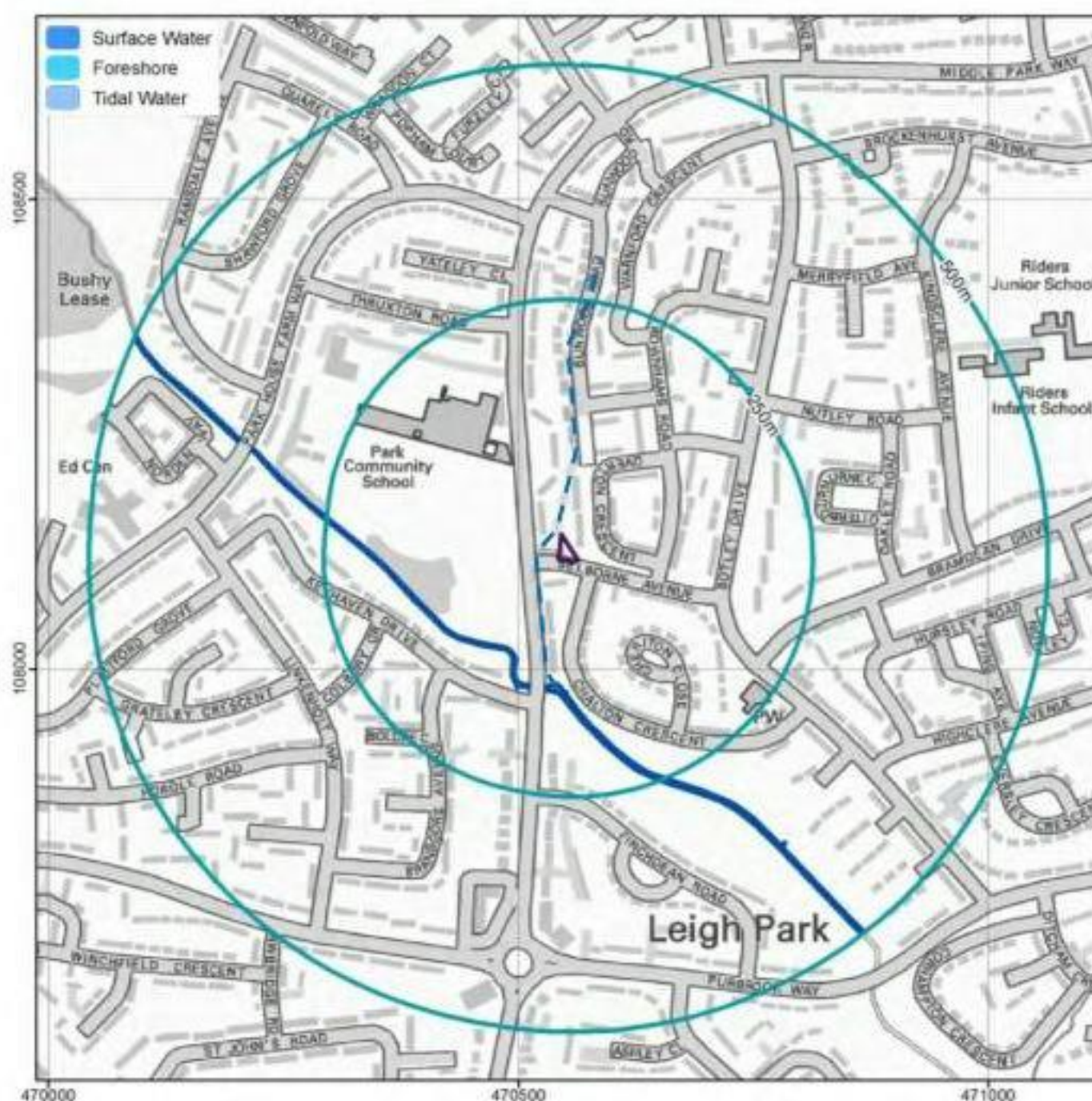
The Site is currently used within a residential capacity. Development proposals comprise the construction of a detached dwelling in the east of the Site to the east of the existing dwellings (Appendix A). The effect of the overall development will result in an increase in number of occupants and/or users of the Site but will not result in the change of use, nature or times of occupation. The estimated lifespan of the development is 100 years.



## Hydrological features

There are numerous surface water features within 500 m of the Site (Figure 2), these are included in the mapping below:

Figure 2 Surface water features



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Hermitage Stream is located approximately 150 m south of the Site.

The Flood Defence Map provided by the Environment Agency shows there is a culvert adjacent to the north west of the Site, this has been displayed on the above map as a dashed line. The full extent of the culvert is unknown.



### Proximity to relevant infrastructure:

In addition to the culvert mentioned on the previous page, there are flood defences in the form of high ground along the extent of Hermitage Stream.



### Hydrogeological features

British Geological Survey (BGS) mapping indicates the underlying superficial geology consists of Head (BGS, 2019) and is classified as a Secondary Undifferentiated Aquifer (EA, 2019).

BGS mapping indicates the underlying bedrock geology consists of the London Clay Formation (BGS, 2019) and is classified as a Unproductive Strata (EA, 2019).

The Site is located within a Zone 1 (subsurface activity) groundwater Source Protection Zone (EA, 2019).

## 4. Flood risk to the development

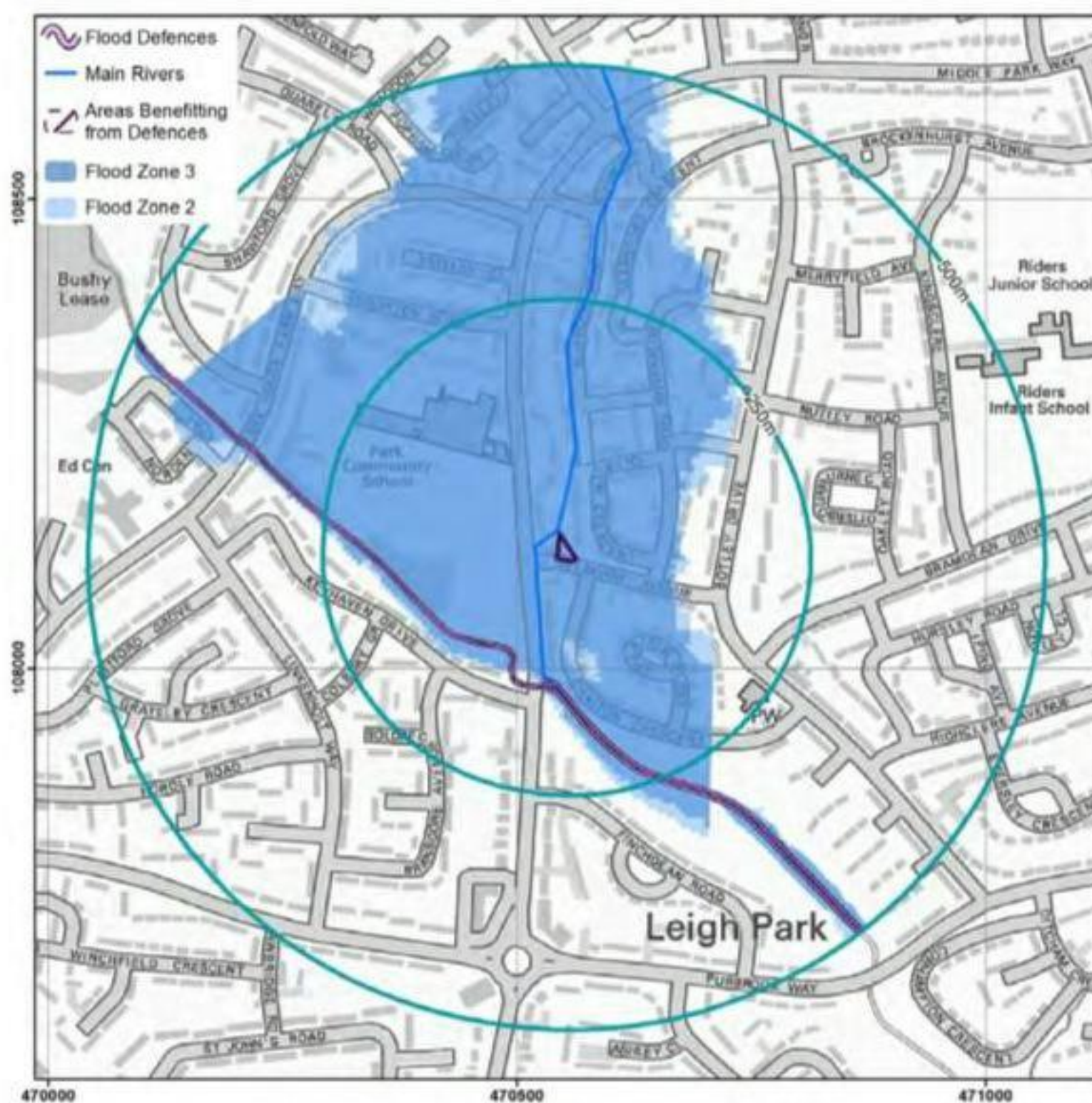
### Historical flood events

According to the EA's historical flood map no historical flood events have been recorded at the Site (EA, 2019). The purpose of historical flood data is to provide information on where and why flooding may have occurred in the past. The absence of any recorded events does not mean flooding has never occurred on Site or that flooding will never occur at the Site.

### Rivers (fluvial) / Sea (coastal/tidal) flooding

According to the EA's Flood Map for Planning Purposes (Figure 3), the Site is located within fluvial Flood Zone 3 and is therefore classified as having a High probability of fluvial flooding from the Hermitage Stream and The Warren. The Site lies approximately 160 m to the west of the nearest area of Flood Zone 1.

Figure 3 EA Flood Map for Planning Purposes (EA, 2019)



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As defined in the NPPF (2019):

Guidance

Ignoring the presence of any defences, land located in a Flood Zone 3 is considered to have High probability of flooding with a 1 in 100 year or greater annual probability of fluvial flooding or a 1 in 200 or greater annual probability of coastal flooding in any one year.

Development of "Water-Compatible", "Essential Infrastructure", "Less Vulnerable" and "More Vulnerable" land uses are suitable for this zone with "Highly Vulnerable" land uses requiring an Exception Test to be passed prior to development taking place (see glossary for terminology).

## Flood defences

Guidance

Sites that are located close to flood defences are likely to be zones where rapid inundation will occur in the event of the flood defences being overtopped or breached. A Site located close to flood defences (within 250m) may require a more detailed FRA subject to local topography.

- The Site is not in a designated area which benefits from flood defences.
- There are flood defences within 250 m of the Site.
- It is unknown if there are proposed flood defences within 250 m of the Site.

Information from the EA relating to the defences is outlined below.

- According to the EA (2019) there are multiple flood defences along Hermitage Stream, with standards of protection between 1 in 40 to 1 in 100 years.
- All defences along the stream are high ground and were last inspected on 28<sup>th</sup> June 2019. The conditions of the defences were predominately fair, with one defences condition rated as good.
- The crest height of the defences to the north of the Hermitage Stream are between 11.53 and 12.43 mAOD. The nearest flood defences to the Site are located c. 150 m to the south. A map of the flood defences can be found in Appendix C.

## Model data

As the Site is located within the EA's fluvial floodplain, modelled flood elevation data was obtained from the EA. As no modelled levels were included as part of the SFRA the data provided by the EA has been used to assess flood risk and to provide recommendations for mitigation for the proposed development.

The EA have provided undefended JFLOW Water Depth and Levels at the Site and included information on the Sites ground levels, with 14 node points across the Site used to assess flood risk. The data is provided in the table below and is included within Appendix C.

**Table 2: EA modelled flood level data**

| Point | Ground levels (mAOD) | Water Depth (Metres) |                | Water Surface Level (mAOD) |                |
|-------|----------------------|----------------------|----------------|----------------------------|----------------|
|       |                      | 1 in 100 year        | 1 in 1000 year | 1 in 100 year              | 1 in 1000 year |
| 1     | 11.06                | 0.23                 | 0.24           | 11.29                      | 11.30          |
| 2     | 11.03                | 0.13                 | 0.28           | 11.16                      | 11.31          |
| 3     | 11.03                | 0.12                 | 0.28           | 11.15                      | 11.31          |
| 4     | 11.00                | 0.14                 | 0.30           | 11.14                      | 11.30          |
| 5     | 11.00                | 0.14                 | 0.30           | 11.14                      | 11.30          |
| 6     | 11.00                | 0.14                 | 0.30           | 11.14                      | 11.30          |
| 7     | 10.99                | 0.15                 | 0.32           | 11.14                      | 11.31          |
| 8     | 10.99                | 0.15                 | 0.16           | 11.14                      | 11.15          |
| 9     | 10.96                | 0.16                 | 0.17           | 11.12                      | 11.13          |
| 10    | 10.96                | 0.17                 | 0.18           | 11.13                      | 11.14          |
| 11    | 11.00                | 0.13                 | 0.14           | 11.13                      | 11.14          |
| 12    | 10.94                | 0.19                 | 0.20           | 11.13                      | 11.14          |
| 13    | 10.96                | 0.17                 | 0.18           | 11.13                      | 11.14          |
| 14    | 10.94                | 0.19                 | 0.20           | 11.13                      | 11.14          |

As the JFLOW models were run using a Digital Terrain Model (DTM) with a 5m x 5m grid, that were generalized to between 5m and 100 m, there is potential for there to be inaccuracies in the level data because of the DTM generalization. Therefore, to try and improve the accuracy of the data, the depths produced by the JFLOW levels have been compared to the EA 1m LIDAR data which was produced in 2011.

Table 3: Comparison of EA provided Ground Levels & EA 1m LiDAR Levels

| Point | EA provided Ground levels (mAOD) | EA 1m LiDAR Levels (mAOD) |
|-------|----------------------------------|---------------------------|
| 1     | 11.06                            | 12.22                     |
| 2     | 11.03                            | 12.02                     |
| 3     | 11.03                            | 12.01                     |
| 4     | 11.00                            | 11.93                     |
| 5     | 11.00                            | 12.02                     |
| 6     | 11.00                            | 11.85                     |
| 7     | 10.99                            | 12.08                     |
| 8     | 10.99                            | 11.88                     |
| 9     | 10.96                            | 12.03                     |
| 10    | 10.96                            | 11.90                     |
| 11    | 11.00                            | 11.86                     |
| 12    | 10.94                            | 11.87                     |
| 13    | 10.96                            | 11.58                     |
| 14    | 10.94                            | 11.71                     |

Comparison of the two elevations show there is a large difference between the two datasets, with the ground levels provided by the EA ( $\pm 1-2$  m accuracy) being approximately 0.8-0.9 m lower than the LiDAR 1m DTM data ( $\pm 0.15$  m accuracy).

Table 4: Surface water level estimations using JFLOW Levels & EA 1m LiDAR data.

| Point | EA 1m LiDAR Elevation (mAOD) | Water Depth (Metres) |                | Estimated Water Surface Level (mAOD) |                |
|-------|------------------------------|----------------------|----------------|--------------------------------------|----------------|
|       |                              | 1 in 100 year        | 1 in 1000 year | 1 in 100 year                        | 1 in 1000 year |
| 1     | 12.22                        | 0.23                 | 0.24           | 12.45                                | 12.46          |
| 2     | 12.02                        | 0.13                 | 0.28           | 12.15                                | 12.30          |
| 3     | 12.01                        | 0.12                 | 0.28           | 12.13                                | 12.29          |

|    |       |      |      |       |       |
|----|-------|------|------|-------|-------|
| 4  | 11.93 | 0.14 | 0.30 | 12.07 | 12.23 |
| 5  | 12.02 | 0.14 | 0.30 | 12.16 | 12.32 |
| 6  | 11.85 | 0.14 | 0.30 | 11.99 | 12.15 |
| 7  | 12.08 | 0.15 | 0.32 | 12.23 | 12.40 |
| 8  | 11.88 | 0.15 | 0.16 | 12.03 | 12.04 |
| 9  | 12.03 | 0.16 | 0.17 | 12.19 | 12.20 |
| 10 | 11.90 | 0.17 | 0.18 | 12.07 | 12.08 |
| 11 | 11.86 | 0.13 | 0.14 | 11.99 | 12.00 |
| 12 | 11.87 | 0.19 | 0.20 | 12.06 | 12.07 |
| 13 | 11.58 | 0.17 | 0.18 | 11.75 | 11.76 |
| 14 | 11.71 | 0.19 | 0.20 | 11.90 | 11.91 |

## Climate Change factors

The EA's *Flood risk assessments: climate change allowances* guidance (2017) has been used to inform a suitable increase in river flows for the proposed development.

As the Site is located within the South East Basin and the proposed development is classed as More Vulnerable, where the proposed lifespan is 100 years, the Higher Central (45%) and Upper End (105%) allowances have been used to determine a suitable climate change factor. The updated guidance confirms 'More Vulnerable' developments are required to undertake a Basic assessment approach.

A stage / discharge relationship graph (Appendix C) has been produced using the EA's modelled flood flow and level data. The climate change allowances have been derived as a proportion of the 100 year peak flow to the 1 in 1000 year event, using the Flood Studies Report. For the South East Region, the 1 in 1000 year event flow is approximately 65% greater than the 1 in 100 year flow, therefore the following flood levels apply.

**Table 5: Flood levels plus climate change allowances**

| Point | EA 1m LiDAR Elevation (mAOD) | Estimated Water Surface Level (mAOD) |                | Estimated Water Surface Level (mAOD)                                   |                                                                         |
|-------|------------------------------|--------------------------------------|----------------|------------------------------------------------------------------------|-------------------------------------------------------------------------|
|       |                              | 1 in 100 year                        | 1 in 1000 year | 1 in 100 year plus 45% allowance for climate change flood level (mAOD) | 1 in 100 year plus 105% allowance for climate change flood level (mAOD) |
| 1     | 12.22                        | 12.45                                | 12.46          | 12.46                                                                  | 12.47                                                                   |

|    |       |       |       |       |       |
|----|-------|-------|-------|-------|-------|
| 2  | 12.02 | 12.15 | 12.30 | 12.25 | 12.39 |
| 3  | 12.01 | 12.13 | 12.29 | 12.24 | 12.39 |
| 4  | 11.93 | 12.07 | 12.23 | 12.18 | 12.33 |
| 5  | 12.02 | 12.16 | 12.32 | 12.27 | 12.42 |
| 6  | 11.85 | 11.99 | 12.15 | 12.10 | 12.25 |
| 7  | 12.08 | 12.23 | 12.40 | 12.35 | 12.50 |
| 8  | 11.88 | 12.03 | 12.04 | 12.04 | 12.05 |
| 9  | 12.03 | 12.19 | 12.20 | 12.20 | 12.21 |
| 10 | 11.90 | 12.07 | 12.08 | 12.08 | 12.09 |
| 11 | 11.86 | 11.99 | 12.00 | 12.00 | 12.01 |
| 12 | 11.87 | 12.06 | 12.07 | 12.07 | 12.08 |
| 13 | 11.58 | 11.75 | 11.76 | 11.76 | 11.77 |
| 14 | 11.71 | 11.90 | 11.91 | 11.91 | 11.92 |

Given the location of the proposed development and given the range of flood levels across the Site, node location point 7 has been used to base any mitigation measures on due to it being located within the developed area and using a conservative approach.

## Fluvial flood risk

The type and condition of the existing flood defences influence the 'actual' risk of fluvial flooding to the Site, albeit the residual risk of flooding should be considered when proposing new development.

According to the EA's Risk of Flooding from Rivers and the Sea (RoFRS) mapping (Figure 4), which considers the crest height, standard of protection and condition of defences, the flood risk from Rivers and the Sea is Medium. A high risk has been identified in the northern corner of the Site, associated with the presence of the culvert. However, as the culvert is located beneath the ground level, the risk of flooding at the surface of the Site can be reduced to Medium in this area.

Figure 4 Risk of Flooding from Rivers and Sea map (EA, 2019)



## Surface water (pluvial) flooding

According to the EA's Risk of Flooding from Surface Water (pluvial) mapping, there is a Very Low risk of flooding from pluvial sources. Figure 5 confirms the extent and depth of flooding during a 1% annual probability (1 in 100 year – medium risk) pluvial event. The Site lies immediately adjacent to areas at Medium risk where flood depths range between 0.15 m and 0.3 m, however flooding is likely to be contained within the highway of Selbourne Avenue so is unlikely to affect the Site.

Figure 5 EA Medium surface water flood risk map (EA, 2019)



### Guidance

According to EA's surface water flood risk map, a site at Very Low risk has a chance of flooding of less than 1 in 1000 (0.1%)

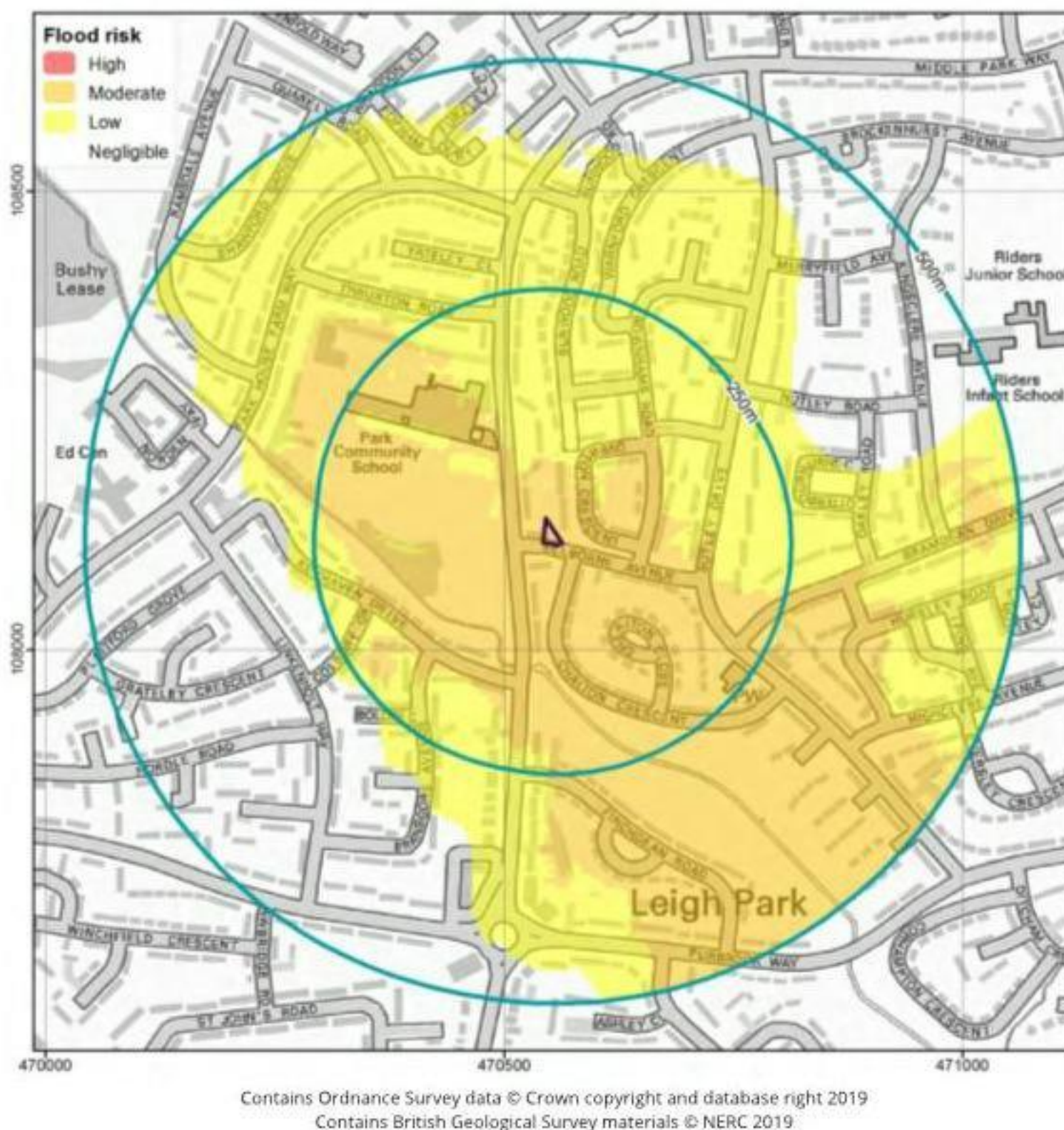
Analysis of OS mapping, ground elevation data and the EA's pluvial flow route mapping confirm the Site is not located on a potential overland flow route but does contain a small localized depression in the centre of the Site.

The SFRA does not include mapped reported incidents of historical surface water flooding (Eastern Solent Coastal Partnership, 2016). The SFRA confirms that the EA have not designated any Critical Drainage Areas (CDA)<sup>1</sup> within the PUSH region (Eastern Solent Coastal Partnership, 2016).

## Groundwater flooding

Based on GeoSmart's Groundwater Flood Risk (GW5) Map (Figure 6) the Site is considered to be at Moderate risk of groundwater flooding. The risk map below confirms the risk of groundwater emergence at the surface during a 1% annual probability (1 in 100 year) event.

Figure 6 GeoSmart GW5 Groundwater Flood Risk Map (GeoSmart, 2019)



<sup>1</sup> Critical Drainage Areas (CDA) are specific areas in Flood Zone 1 only, where runoff can cause problems downstream, and is not necessarily an area where flooding problems may occur.

Moderate Risk - There will be a significant possibility that incidence of groundwater flooding could lead to damage to property or harm to other sensitive receptors at, or near, this location.

The main mechanisms of groundwater flooding at the Site are related to flooding via permeable Superficial Deposits potentially in response to river and tidal events. The Site is unlikely to be at risk of Bedrock or Clearwater flooding relating to prolonged recharge and a rise in the water table.

It is noted that groundwater flooding may occur in response to prolonged high river levels even if overtopping of flood defences does not occur.

The risks may be higher for basements and below ground structures and mitigation measures such as sumps and pumps may be required. The interactive SFRA mapping does not show any locations of groundwater flood incidents on the Site or in the immediate surrounding area (Eastern Solent Coastal Partnership, 2016).

## Flooding from Artificial Sources

Artificial sources of flood risk include waterbodies or watercourses that have been amended by means of human intervention rather than natural processes. Examples include reservoirs (and associated water supply infrastructure), docks, sewers and canals. The flooding mechanism associated with flood risk from artificial sources is primarily related to breach or failure of structures (reservoir, lake, sewer, canal, flood storage areas, etc.)

### Sewer flooding

The interactive SFRA mapping does not show any locations of 'South Water Observed Flooding' on the Site or in the immediate surrounding area (Eastern Solent Coastal Partnership, 2016). However, it is advisable to contact the local water company to obtain more recent flooding events that may have occurred at, or in close proximity to, the Site.

Properties classified as "at risk" are those that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system either once or twice in the ten year reference period. Records held by the sewage utility company provide information relating to reported incidents, the absence of any records does not mean that the Site is not at risk of flooding.

### Canal Failure

According to Ordnance Survey (OS) mapping, there are no canals within 500 m of the Site.

### Water supply infrastructure

Water supply infrastructure is comprised of a piped network to distribute water to private houses or industrial, commercial or institution establishments and other usage points. In urban areas, this represents a particular risk of flooding due to the large amount of water supply infrastructure, its condition and the density of buildings. The risks of flooding to properties from burst water mains cannot be readily assessed.

If more information regarding the condition and history of the water supply infrastructure within the vicinity of the Site is required, then it is advisable to contact the local water supplier (Southern Water).

### Culverts and bridges

Culverts and bridges have been identified within close proximity to the Site. The Site may be at risk of flooding in the event of a blockage/collapse of the nearby culvert, where the condition of those features would increase the likelihood and associated risk.

### Reservoir flooding

According to the EA's Risk of Flooding from Reservoir mapping the Site is not at risk of flooding from reservoirs (EA, 2019).

#### Guidance

The risk of reservoir flooding is related to the failure of a large reservoir (holding over 25,000 m<sup>3</sup> of water) and is based on the worst-case scenario. Reservoir flooding is extremely unlikely to occur (EA, 2019).

## 5. Flood risk from the development

### Floodplain storage

As the development is located within fluvial Flood Zone 3 and involves an increase in building footprint, compensatory flood storage is likely to be required for any loss in flood plain storage. Any losses in floodplain storage are likely to displace flooding and could potentially alter flood flow routes, increasing flood risk elsewhere.

Compensation for any reduction in floodplain storage and displacement of flood water (up to the 1 in 100 year event with allowance made for climate change) should be provided. Compensatory flood storage must be provided through a level for level, volume for volume approach and may require an area at the edge of the floodplain to provide storage.

Where this is not possible, the EA and Lead Local Flood Authority (LLFA) may accept voids, stilts or undercroft parking as options for flood plain storage compensation. These solutions should be discussed at an early stage and may require a management and maintenance plan, as they can become blocked over time leading to a gradual reduction in storage. More information is provided in the EA's *Framework and Guidance for Assessing and Managing Flood Risk for New Development* FD2320/TR2 publication (EA, 2005).

Scoping estimates of the storage requirements can be made by multiplying the increase in building footprint by the average flood depth at the development, during the 1 in 100 year flood event with an allowance for climate change.

### Drainage and run-off

The proposed development involves an increase of impermeable surfaces at the Site. An estimation of run-off is therefore required to permit effective site water management and prevent any increase in flood risk to off-site receptors from the Site.

Using FEH 2013 rainfall data from the online Flood Estimation Handbook (FEH), developed by NERC (2009) and CEH (2016), the potential surface water run-off generated from the Site during a 1 in 100 year return period should be calculated. Guidance included within the National Planning Policy Framework (NPPF) recommends that the effects of climate change are incorporated into Flood Risk Assessments (Flood Risk Assessments: Climate Change Allowances Guidance, 2016). As the proposed development is being changed to residential, the lifespan of the development and requirements for climate change should allow up to the 2115 scenario.

**Table 6: Climate change rainfall allowances**

| Applies across all of England | Total potential change anticipated for 2010 to 2039 | Total potential change anticipated for 2040 to 2059 | Total potential change anticipated for 2060 to 2115 |
|-------------------------------|-----------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|
| Upper end                     | 10%                                                 | 20%                                                 | 40%                                                 |
| Central                       | 5%                                                  | 10%                                                 | 20%                                                 |

It is recommended that attenuation of run-off is undertaken on site to compensate for proposed increases in impermeable surface areas. Attenuation may comprise the provision

of storage within a sustainable drainage system (SuDS). Recommendations of potential SuDS options are presented in the table below, subject to further investigation:

**Table 7: SuDS features which may be feasible for the Site**

| Option               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rainwater harvesting | Rain water harvesting can collect run-off from the roofs for use in non-potable situations, using water butts for example.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Green roof           | Having part/all of the roof as a green roof covered in vegetation can intercept and store a proportion of the rainfall to result in an overall reduction in the amount of surface water run-off generated from a building structure.<br>They comprise a substrate (growth medium) layer which can be seeded with specially selected plants suitable for the local climatic conditions. Beneath the growth medium is a geotextile filter layer which filters out the substrate from entering the aggregate/geo-composite drainage layer below. At the very bottom of the green roofing, a waterproof membrane protects the roof structure below. |
| Permeable paving     | Permeable pavements can be used for driveways, footpaths and parking areas to increase the amount of permeable land cover. Suitable aggregate materials (angular gravels with suitable grading as per CIRIA, 2007) will improve water quality due to their filtration capacity. Plastic geocellular systems beneath these surfaces can increase the void space and therefore storage but do not allow filtration unless they are combined with aggregate material and/or permeable geotextiles.                                                                                                                                                 |
| Swales               | Shallow, wide and vegetated channels that can store excess run-off whilst removing any pollutants.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Soakaways            | An excavation filled with gravel within the Site. Surface water run-off is piped to the soakaway.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

It is assumed that any changes to the existing drainage system will be undertaken in accordance with best practice and that care will be taken to ensure the new development does not overload/block any existing drainage or flow pathways to/from the Site. Based on the topography and low surface water flood risk in the vicinity interference with overland flow paths is considered unlikely.

GeoSmart could provide a separate outline drainage strategy as required, through our SuDSmart Pro report range. A separate proposal could be provided upon request.

## 6. Suitability of proposed development

The information below outlines the suitability of proposed development in relation to national and local planning policy.

### National

The aims of the national planning policies are achieved through application of the Sequential Test and in some cases the Exception Test.

#### Guidance

**Sequential test:** The aim of this test is to steer new development towards areas with the lowest risk of flooding (NPPF, 2019). Reasonably available sites located in Flood Zone 1 should be considered before those in Flood Zone 2 and only when there are no reasonably available sites in Flood Zones 1 and 2 should development in Flood Zone 3 be considered.

**Exception test:** In some cases, this may need to be applied once the Sequential Test has been considered. For the exception test to be passed it must be demonstrated that the development would provide wider sustainability benefits to the community that outweigh flood risk and a site-specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

Suitability of the proposed development, and whether the Sequential and Exceptions Test is required, is based on the Flood Zone the Site is located within and the flood risk vulnerability classification of the development proposals. Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

This report has been produced to assess all development types, prior to any development. The vulnerability classification and Flood Zones are compared within Table 8 overleaf (Table 3 of the NPPG (2014)).

As the Site is located within Flood Zone 3a and the proposed development is defined as More Vulnerable; the proposals would be acceptable subject to the Sequential and Exceptions Test.

Where the Sequential Test is required it must be demonstrated that there are no alternative reasonably available Sites at lower risk of flooding within Havant. For a site to be considered to be reasonably available it must be 'deliverable' and 'developable' as defined by the NPPF (2019).

Table 8: Flood risk vulnerability and flood zone 'compatibility' (taken from NPPG, 2014)

| Flood risk vulnerability classification |                                  | Essential infrastructure | Water compatible | Highly vulnerable       | More vulnerable         | Less vulnerable |
|-----------------------------------------|----------------------------------|--------------------------|------------------|-------------------------|-------------------------|-----------------|
| Flood Zone                              | Zone 1 – low probability         | ✓                        | ✓                | ✓                       | ✓                       | ✓               |
|                                         | Zone 2 – medium probability      | ✓                        | ✓                | Exception test required | ✓                       | ✓               |
|                                         | Zone 3a – high probability       | Exception test required  | ✓                | X                       | Exception test required | ✓               |
|                                         | Zone 3b – functional flood plain | Exception test required  | ✓                | X                       | X                       | X               |

## Local policy and guidance

For this report, several documents have been consulted for local policy and guidance and relevant information is outlined below:

### Partnership for Urban South Hampshire (PUSH) Strategic Flood Risk Assessment 2016 Update (East Solent Coastal Partnership, 2016):

- The document was prepared as a revision to the PUSH SFRA report originally compiled by Atkins in 2007. The 2016 report and supporting GIS outputs represents the reviewed and updated SFRA and therefore superseded the 2007 report.
- PUSH is a partnership of Hampshire County Council, Isle of Wight, Portsmouth and Southampton and district authorities of Eastleigh, East Hampshire, Fareham, Gosport, Havant, New Forest, Test Valley and Winchester. The Site is located within Havant Borough Council.
- The records of flooding provided by Southern Water are the result of surcharge from surface, combined and foul water sewers.
- The EA has the ability to locally designate Critical Drainage Areas but has not currently done so within the PUSH region.
- Where data does not exist in the response of climate change outlines, Flood Zone 2 has been assumed to broadly be the extent of the currently Flood zone 3a in 2115 as a result of climate change.

- Modelling information to define the fluvial functional floodplain (Flood Zone 3b) is currently only available for the Wallington Stream and the Tadburn Lake Stream. For the remainder of the main rivers, the SFRA has assumed that the functional floodplain is the whole of the high probability flood area (Flood Zone 3). This is a conservative approach that should be updated in the future when modelling information becomes available. A review of the flood Zone 3 undefended Flood Hazard mapping included within the interactive GIS mapping confirms the Site is located in a low risk area and is therefore is designated as Flood Zone 3a.

#### Guidance

Strategic Flood Risk Assessments are carried out by local authorities, in consultation with the Environment Agency, to assess the flood risk to the area from all sources both now and in the future due to climate change. They are used to inform planning decisions to ensure inappropriate development is avoided (NPFF, 2019).

## EA pre-application response:

The EA (2019) was contacted as part of this FloodSmart report. However, a response was not received within the timeframe of this report.

## EA Flood Risk Standing Advice for Sites located in Flood Zones 2 or 3

For all relevant vulnerable developments (i.e. more vulnerable, less vulnerable and water compatible), advice on the points should be followed:

- Surface water management;
- Access and evacuation; and
- Floor levels.

### Surface water management

Plans for the management of surface water need to meet the requirements set out in either the local authority's:

- Surface water management plan where available; OR
- Strategic flood risk assessment.

They also need to meet the requirements of the approved building regulations Part H: drainage and water disposal. Read section H3 rainwater drainage.

Planning permission is required to use a material that can't absorb water (e.g. impermeable concrete) in a front garden larger than 5 square metres.

### Access and evacuation

Details of emergency escape plans should be provided for any parts of a building that are below the estimated flood level:

Plans should show:

- Single storey buildings or ground floors that don't have access to higher floors can access a space above the estimated flood level, e.g. higher ground nearby;
- Basement rooms have clear internal access to an upper level, e.g. a staircase;

- Occupants can leave the building if there's a flood and there's enough time for them to leave after flood warnings.

#### Floor levels

The following should be provided:

- Average ground level of the building; and
- Finished floor level of the lowest habitable room in the building.

Ground floor levels should be a minimum of whichever is higher of:

- 300 millimetres (mm) above the general ground level of the site; OR
- At least 600 mm above the estimated river or sea flood level.

## 7. Resilience and mitigation

Based on the available information mitigation measures outlined within this section of the report are likely to help protect the development from flooding.

### Rivers (fluvial) / Sea (coastal/tidal) flood mitigation measures

Table 9: Estimated Flood levels using JFLOW depth compared to EA 1m LiDAR elevation levels

| Point | EA 1m LiDAR Elevation (mAOD) | Estimated Water Surface Level (mAOD) |                | Estimated Water Surface Level (mAOD)                                   |                                                                         |
|-------|------------------------------|--------------------------------------|----------------|------------------------------------------------------------------------|-------------------------------------------------------------------------|
|       |                              | 1 in 100 year                        | 1 in 1000 year | 1 in 100 year plus 45% allowance for climate change flood level (mAOD) | 1 in 100 year plus 105% allowance for climate change flood level (mAOD) |
| 7     | 12.08                        | 12.23                                | 12.40          | 12.35                                                                  | 12.50                                                                   |

The Site is located within Flood Zone 3 and at a lower elevation than the estimated 1 in 100 year plus 105% climate change modelled flood level from the Hermitage Stream and The Warren. Flood depths have been estimated up to 0.42m during this event.

#### Compensatory floodplain storage

As the Site is located within a Fluvial Flood Zone 3 with an increase in building footprint, there is likely to be a decrease in floodplain storage. Therefore, compensatory floodplain storage should be provided in accordance with Section 5 of this report.

#### Raising minimum floor levels

The vulnerability classification of the site and the Flood Zone means proposals for the Site fall under DEFRA and EA Flood Risk Standing Advice (FRSA) for more vulnerable developments, which states that ground floor levels should be a minimum of whichever is higher of:

- 0.3 m above the general ground level of the site
- 0.6 m above the estimated river or sea flood level (EA/DEFRA, 2012)

Due to the potential inaccuracies in the data, it is recommended that the minimum finished floor level should be set at least 0.3 m above the estimated 1 in 100 year plus 105% allowance for climate change flood level of 12.50 mAOD.

Table 10: Recommended Minimum Finished Floor Level Required

|                                          |            |
|------------------------------------------|------------|
| Recommended Minimum Finished Floor Level | 12.80 mAOD |
|------------------------------------------|------------|

### Additional Mitigation

Where it is not possible to raise the minimum finished floor levels to the recommended elevation, it may be appropriate to adopt a water exclusion strategy for flood depths up to 0.3 m. A water exclusion strategy, using avoidance and resistance measures, is appropriate where floods are expected to last for short durations. Potential water exclusion strategies include:

- Landscaping to divert water away from the property;
- Sustainable Drainage Systems (SuDS) to store/intercept flood water;
- Boundary walls/fencing;
- Use of building materials with low permeability up to 0.3 m; and
- Use of flood resilient materials and designs.

Avoidance and resistance measures are unlikely to completely prevent floodwater entering a property, particular during longer duration flood events. Therefore, it is recommended that flood resilience measures are considered.

Where flood depths are expected to be between 0.3-0.6 m both water exclusion and water entry strategies should be adopted depending on a structural assessment of the building. Potential water entry strategies include:

- Ground floors designed to permit water passage at high flood depths;
- Hard flooring and flood resilient metal staircases.
- Heating systems, electrical sockets and utility meters should be raised above the predicted flood level where possible; and
- Sump and pump.

More information can be found here:

[http://www.planningportal.gov.uk/uploads/br/flood\\_performance.pdf](http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf)

[www.knowyourfloodrisk.co.uk](http://www.knowyourfloodrisk.co.uk)

### Surface water (pluvial) flood mitigation measures

As the Site is not identified as being at risk of pluvial flooding, mitigation measures are not required.

However, the regular maintenance of any drains and culverts surrounding/on the Site should be undertaken to reduce the flood risk.

As there will be an increase in the impermeable coverage of the Site through the construction of the new dwelling, a surface water (SuDS) strategy should be produced to ensure surface water runoff from the Site can be managed effectively over the lifetime of the proposed development.

### Groundwater flood mitigation measures

It is likely that the mitigation measures put in place for fluvial risk will be sufficient to reduce the groundwater flood risk at the Site. However specific groundwater measures that may also be considered include:

- Waterproof tanking of the ground floor;

- Interceptor drains;
- Automatic sump to extract flood water; and
- Non-return flap valves on the proposed foul and surface water sewer lines.

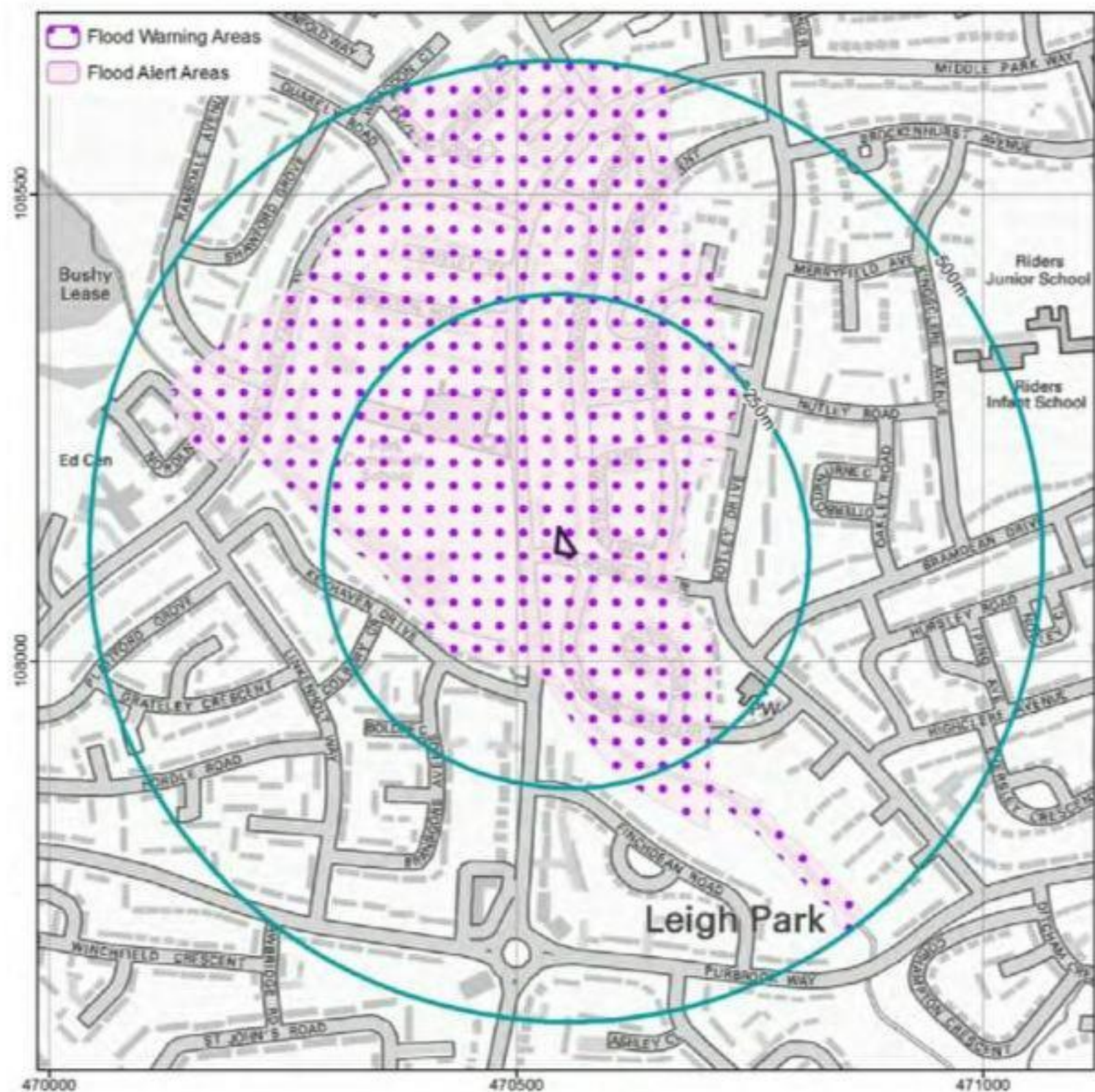
## Other flood risk mitigation measures

As the Site is not identified as at risk from other sources such as reservoirs, sewers or canals, mitigation measures are not required.

## Emergency evacuation/safe access and egress routes

The EA operates a flood warning service in all areas at risk of flooding, available on their website: <https://www.gov.uk/check-flood-risk>. The Site is located in a Flood Warning Coverage area so is able to receive warnings via the EA Flood Warnings Direct Service (Figure 7).

Figure 7 EA Flood Warning Coverage for the local area.



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Flood warnings are broadcast on TV and radio weather and travel bulletins and, in designated flood warning areas, direct to the local community by siren, loudhailer or flood wardens, and in high risk areas by phone or fax. The flood warning information on the EA website is updated every 15 minutes. All warnings are also available through the EA's 24 hour Floodline Service 0845 988 1188. Furthermore, people may sign up to Flood Warnings Direct (FWD) to receive a pre-recorded flood warning message sent to their home, work or mobile phone number.

The EA aims to issue flood warnings 2 hours in advance of a flood event. Flood warnings can provide adequate time to enable protection of property and evacuation from a Site, reducing risk to life and property.

### **Emergency Evacuation**

Where possible, a safe access and egress route with a 'very low' hazard rating from areas within the floodplain to an area wholly outside the 1 in 100 year flood event including an allowance for climate change should be demonstrated.

A flood warning would be required to trigger an evacuation with a 'very low' hazard rating from the development. Based on the EA Flood Risk Map the closest dry evacuation area within Flood Zone 1 is along Botley Drive (c.150 m east – direct measurement). It is advised that evacuation from the premises would be the preferred option in a flood event if safe to do so. It is recommended that residents prepare to evacuate as soon as an EA flood warning is issued in order to completely avoid flood waters.

### **Principal escape route**

Residents should exit the property and travel east along Selbourne Avenue for 170 m before turning onto Botley Drive. Following this route will lead residents into Flood Zone 1 into an area within a 'Very Low Hazard' rating where provisions can be made for alternative accommodation.

In total, the proposed primary evacuation route is 170 m from the Site and would take approximately 1 minute without traffic to complete by car and 2 minutes by foot. Upon inspection of OS data, the EA flood map and LiDAR data, this is considered to be the most appropriate evacuation route from the Site. The proposed primary evacuation route utilises a public highway, which should allow for easier navigation.

### **On-site refuge**

Evacuation should be the primary action in preference, however safe refuge could be sought at first floor level in a worst-case scenario as the residential areas of the development are situated on the first and second floor.

### **Other relevant information**

A flood evacuation plan is recommended, and occupants should be signed up to the EA's Flood Warning Direct (FWD) scheme.

Registration to the Environment Agency's flood warning scheme can be done by following this link: <https://www.gov.uk/sign-up-for-flood-warnings>.

It is recommended that main communication lines required for contacting the emergency services, electricity sockets/meters, water supply and first aid stations and supplies are not compromised by flood waters. Where possible these should all be raised above the extreme flood level.

## 8. Conclusions and recommendations

A **MEDIUM** fluvial flood risk has been identified.

A **VERY LOW** surface water (pluvial) flood risk has been identified.

A **MODERATE** groundwater flood risk has been identified.

The Site is not located in an area classified as being at risk of flooding from reservoir failure or any other artificial sources.

As the Site is located within Flood Zone 3a and the proposed development is defined as More Vulnerable; the proposals would normally be acceptable subject to satisfying the Sequential and Exception Test.

The table below provides a summary of where the responses to key questions are discussed in this report. Providing the recommended mitigation measures are put in place it is likely that flood risk to this Site will be reduced to an acceptable level.

Table 11: Summary of responses to key questions in the report

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Key sources of flood risks identified                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Fluvial and Groundwater (see Section 3). |
| Are standard mitigation measures likely to provide protection from flooding to/from the Site?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Yes (see Section 7).                     |
| Is any further work recommended?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          |
| <p>Recommendations for mitigation are provided below, based upon the proposed development and the flood risk to the Site:</p> <ul style="list-style-type: none"><li>• As the Site is located in Flood Zone 3 and in accordance with Table 3 of the NPPG (2014), the Sequential Test should be undertaken to compare flood risk at the Site with other available sites to find out which has the lowest flood risk. A Sequential Test is being undertaken separately (Ref: 72330.01R1).</li><li>• As there is a risk of flooding from fluvial sources, Finished Floor Levels (FFL) of the proposed development should be set to 12.80 mAOD, which is 0.3 m above the estimated 1 in 100 year plus 105% allowance for climate change flood level of 12.50 mAOD.</li><li>• As the Site is located within a Fluvial Flood Zone 3 with an increase in building footprint, there is likely to be a decrease in floodplain storage. Therefore, compensatory floodplain storage should be provided in accordance with Section 5 of this report.</li><li>• As there is a risk of flooding from groundwater sources and although it is likely that the mitigation measures put in place for fluvial risk will be sufficient for the</li></ul> |                                          |

groundwater flood risk at the Site, specific groundwater measures that may also be considered include:

- Waterproof tanking of the ground floor;
  - Interceptor drains;
  - Automatic sump to extract flood water; and
  - Non-return flap valves on the proposed foul and surface water sewer lines.
- Occupants of the Site should be signed up to the EA's flood warning direct service to receive Flood Alerts and Flood Warnings;
  - A Flood Warning and Evacuation Plan is recommended to ensure persons using the Site can evacuate safely on receipt of a Flood Warning; and
  - A Sustainable Drainage Strategy (SuDS) should be developed for the Site, for effective management of surface water runoff from the proposed development.

GeoSmart recommend the mitigation measures discussed within this report are considered as part of the proposed development where possible and evidence of this is provided to the Local Planning Authority as part of the planning application.

## 9. Further information

The following table includes a list of additional products by GeoSmart:

| Additional GeoSmart Products |                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ✓                            | <p>Additional assessment:</p> <p><b>SuDSmart Report</b></p>       | <p>The SuDSmart Report range assesses which drainage options are available for a Site. They build on technical detail starting from simple infiltration screening and work up to more complex SuDS Assessments detailing alternative options and designs.</p> <p>Please contact <a href="mailto:info@geosmartinfo.co.uk">info@geosmartinfo.co.uk</a> for further information.</p>                                                                                                                                                                                                                                               |
| ✓                            | <p>Additional assessment:</p> <p><b>EnviroSmart Report</b></p>  | <p>Provides a robust desk-based assessment of potential contaminated land issues, taking into account the regulatory perspective.</p> <p>Our EnviroSmart reports are designed to be the most cost effective solution for planning conditions. Each report is individually prepared by a highly experienced consultant conversant with Local Authority requirements.</p> <p>Ideal for pre-planning or for addressing planning conditions for small developments. Can also be used for land transactions.</p> <p>Please contact <a href="mailto:info@geosmartinfo.co.uk">info@geosmartinfo.co.uk</a> for further information.</p> |

## 10. References and glossary

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## Glossary

### General terms

|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BGS                                   | British Geological Survey                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| EA                                    | Environment Agency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| GeoSmart groundwater flood risk model | GeoSmart's national groundwater flood risk model takes advantage of all the available data and provides a preliminary indication of groundwater flood risk on a 50m grid covering England and Wales. The model indicates the risk of the water table coming within 1 m of the ground surface for an indicative 1 in 200 year return period scenario.                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Dry-Island                            | An area considered at low risk of flooding (e.g. In a Flood Zone 1) that is entirely surrounded by areas at higher risk of flooding (e.g. Flood Zone 2 and 3)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Flood resilience                      | Flood resilience of wet-proofing accepts that water will enter the building, but through careful design will minimise damage and allow the re-occupancy of the building quickly. Mitigation measures that reduce the damage to a property caused by flooding can include water entry strategies, raising electrical sockets off the floor, hard flooring.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Flood resistance                      | Flood resistance, or dry-proofing, stops water entering a building. Mitigation measures that prevent or reduce the likelihood of water entering a property can include raising flood levels or installation of sandbags.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Flood Zone 1                          | This zone has less than a 0.1% annual probability of river flooding                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Flood Zone 2                          | This zone has between 0.1 and 1% annual probability of river flooding and between 0.1% and 0.5 % annual probability sea flooding                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Flood Zone 3                          | This zone has more than a 1% annual probability of river flooding and 0.5% annual probability of sea flooding                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Functional Flood Plain                | An area of land where water has to flow or be stored in times of flood.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Hydrologic model                      | A computer model that simulates surface run-off or fluvial flow. The typical accuracy of hydrologic models such as this is $\pm 0.25\text{m}$ for estimating flood levels at particular locations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| OS                                    | Ordnance Survey                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Residual Flood Risk                   | The flood risk remaining after taking mitigating actions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| SFRA                                  | Strategic Flood Risk Assessment. This is a brief flood risk assessment provided by the local council                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| SuDS                                  | A Sustainable drainage system (SuDS) is designed to replicate, as closely as possible, the natural drainage from the Site (before development) to ensure that the flood risk downstream of the Site does not increase as a result of the land being developed. SuDS also significantly improve the quality of water leaving the Site and can also improve the amenity and biodiversity that a site has to offer. There are a range of SuDS options available to provide effective surface water management that intercept and store excess run-off. Sites over 1 Ha will usually require a sustainable drainage assessment if planning permission is required. The current proposal is that from April 2014 for more than a single dwelling the drainage system will require approval from the SuDS Approval Board (SABs). |

## Aquifer Types

|                            |                                                                                                                                                                                                                                               |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Principal aquifer          | These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. |
| Secondary A aquifer        | Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.                                                                           |
| Secondary B aquifer        | Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.                                                          |
| Secondary undifferentiated | Has been assigned in cases where it has not been possible to attribute either category A or B to a rock type due to the variable characteristics of the rock type.                                                                            |
| Unproductive Strata        | These are rock layers or drift deposits with low permeability that has negligible significance for water supply or river base flow.                                                                                                           |

## NPPF (2019) terms

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Exception test           | Applied once the sequential test has been passed. For the exception test to be passed it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk and a site-specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall. |
| Sequential test          | Aims to steer new development to areas with the lowest probability of flooding.                                                                                                                                                                                                                                                                                                                                                                                 |
| Essential infrastructure | Essential infrastructure includes essential transport infrastructure, essential utility infrastructure and wind turbines.                                                                                                                                                                                                                                                                                                                                       |
| Water compatible         | Water compatible land uses include flood control infrastructure, water-based recreation and lifeguard/coastal stations.                                                                                                                                                                                                                                                                                                                                         |
| Less vulnerable          | Less vulnerable land uses include police/ambulance/fire stations which are not required to be operational during flooding and buildings used for shops/financial/professional/other services.                                                                                                                                                                                                                                                                   |
| More vulnerable          | More vulnerable land uses include hospitals, residential institutions, buildings used for dwelling houses/student halls/drinking establishments/hotels and sites used for holiday or short-let caravans and camping.                                                                                                                                                                                                                                            |
| Highly vulnerable        | Highly vulnerable land uses include police/ambulance/fire stations which are required to be operational during flooding, basement dwellings and caravans/mobile homes/park homes intended for permanent residential use.                                                                                                                                                                                                                                        |

# Appendices

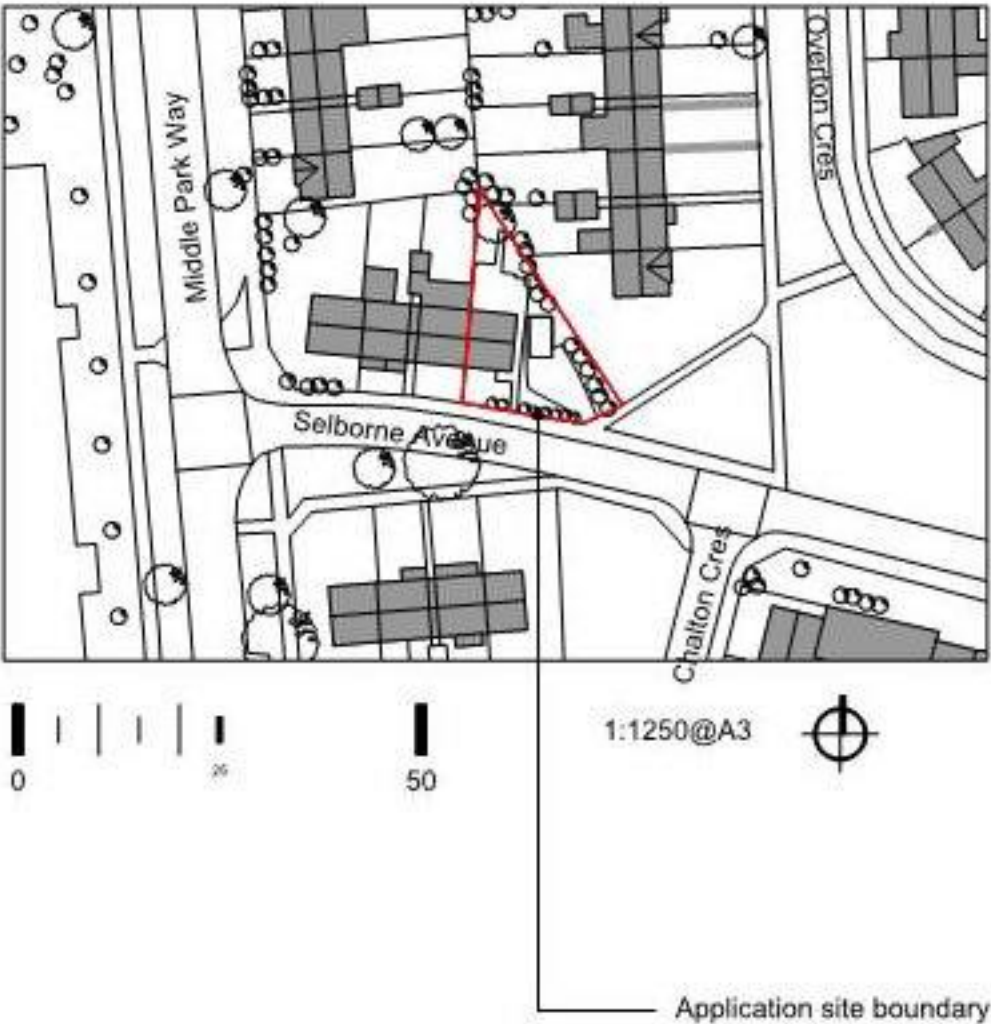
# Appendix A

## Site plans

Existing Site Plan



Location Plan



- 16 Selborne Avenue
- Footprint of original garage
- Application site boundary

Proposed Site Plan



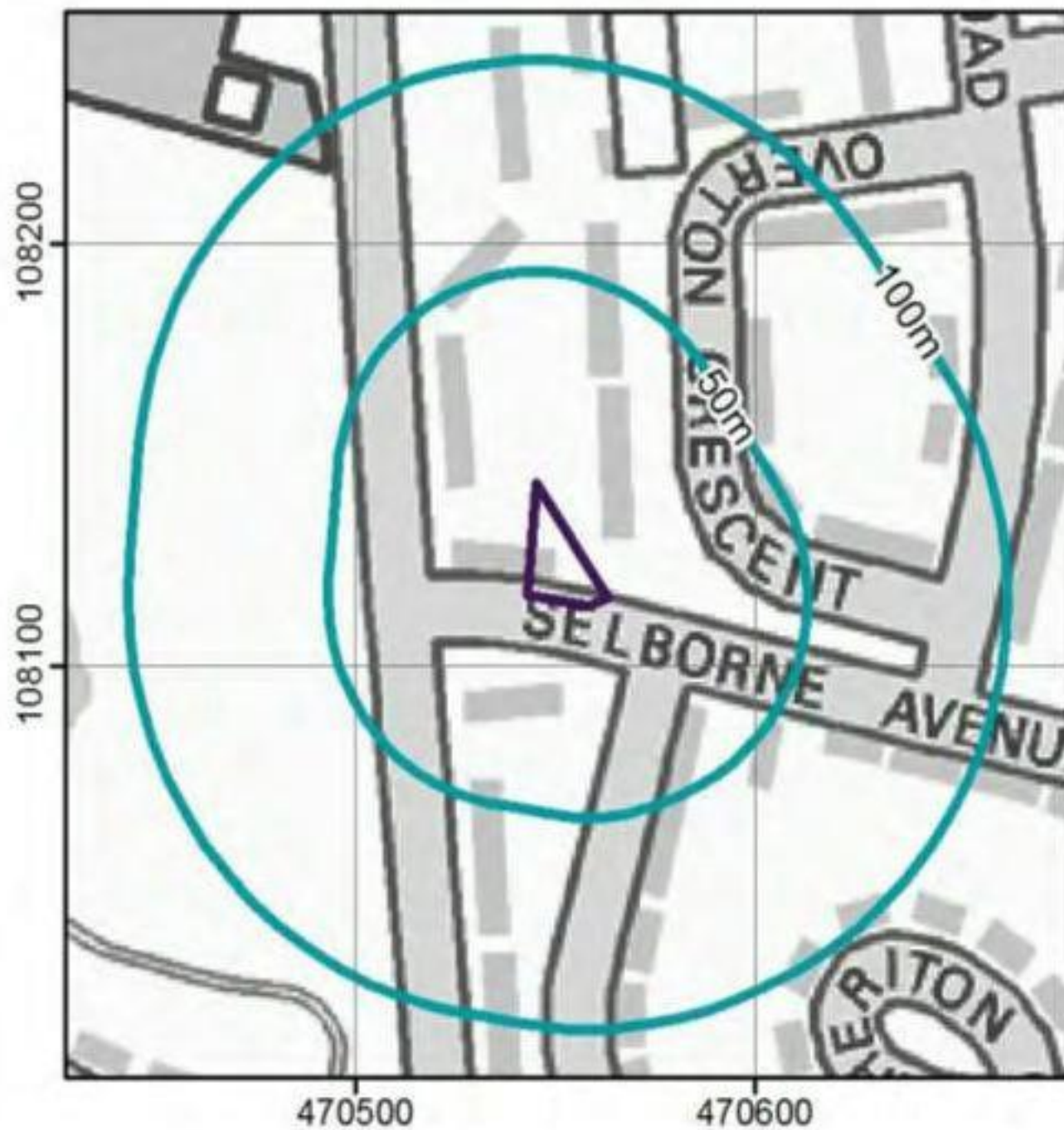
Proposed Ground Floor Plan



# Appendix B

## Commercial flood mapping

Site Location Plan (OS, 2019)



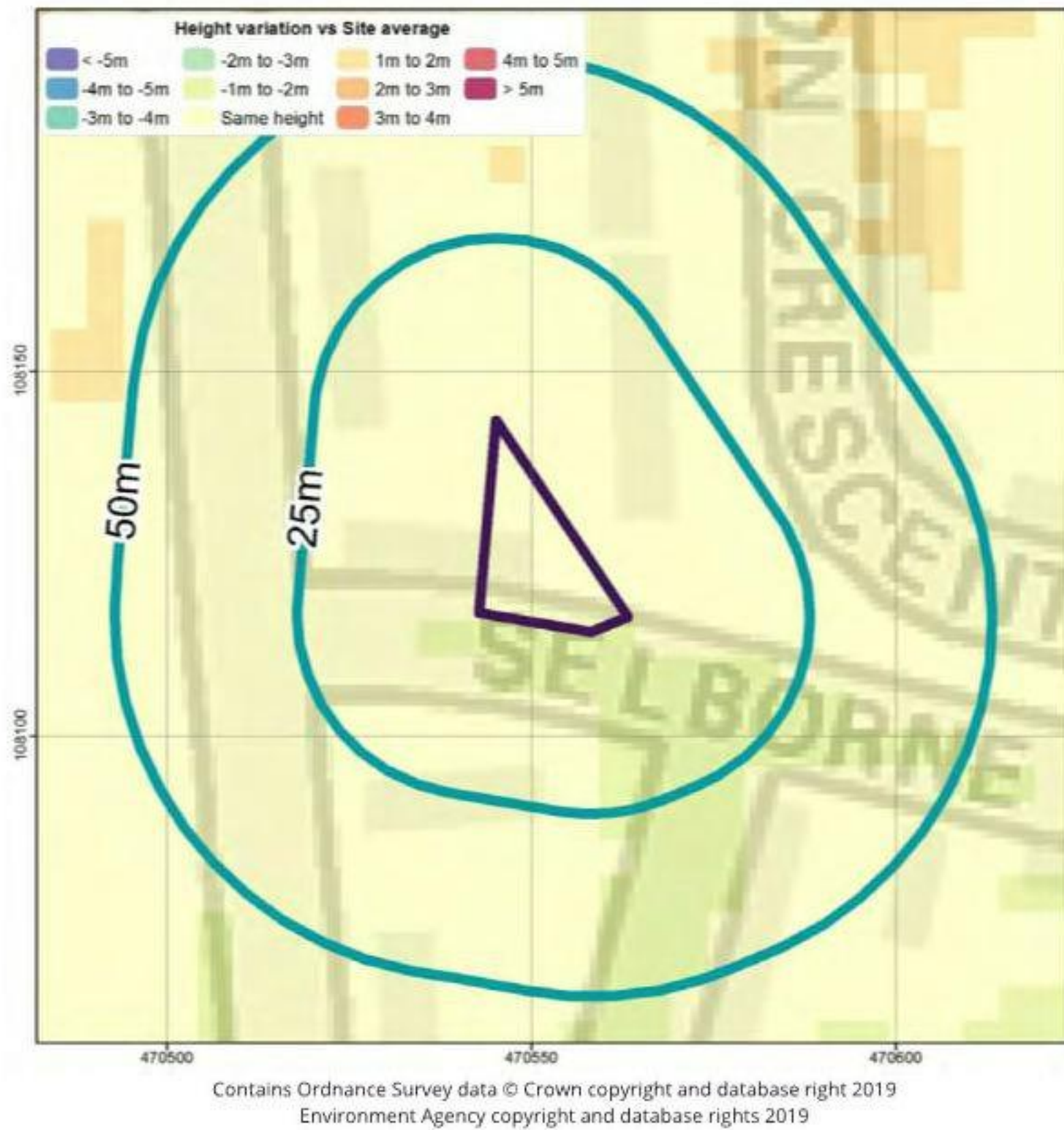
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Aerial Photograph (BlueSky, 2019)

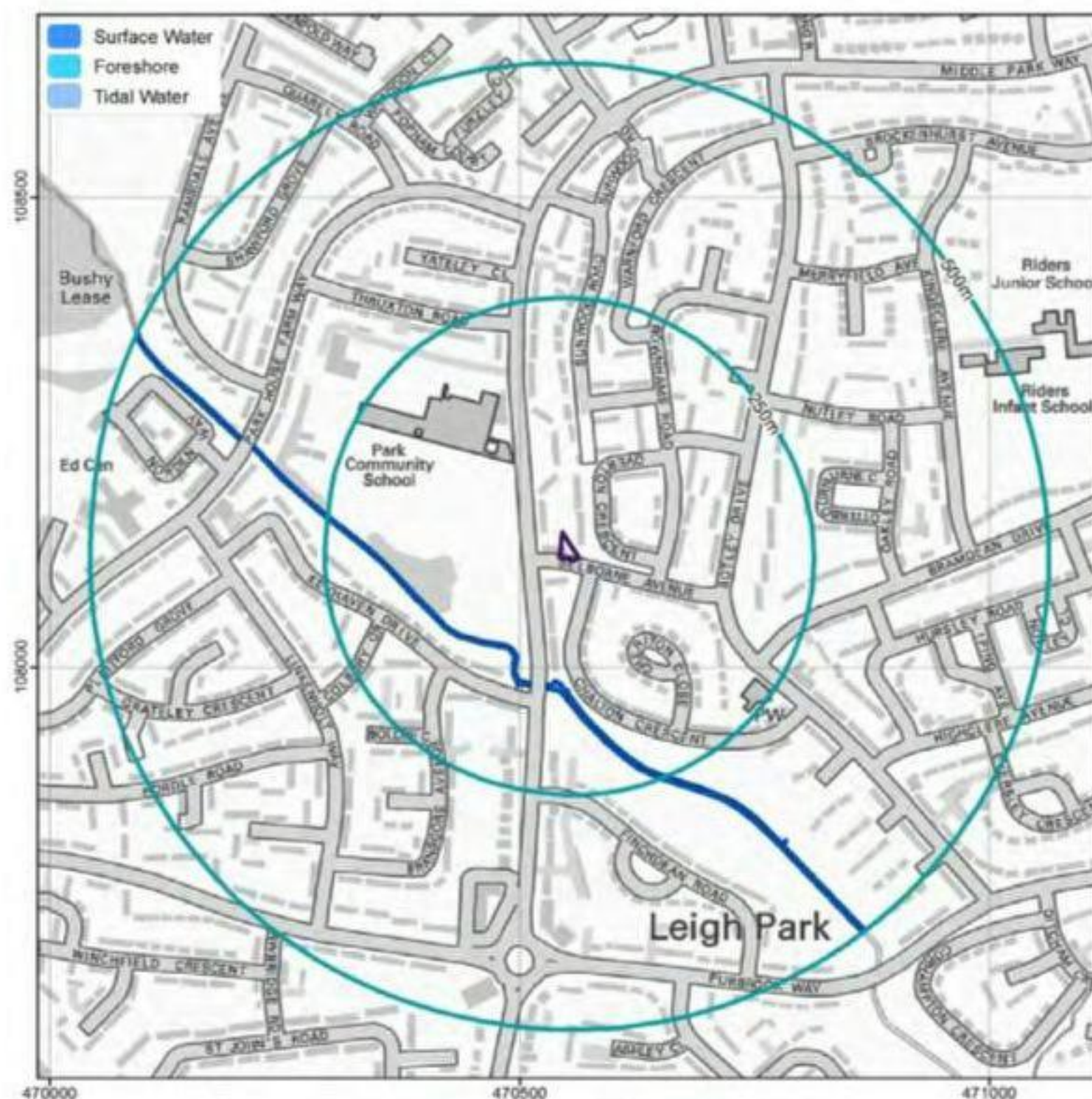


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GeoSmart DTM5 (5m) map (EA, 2019)



# Ordnance Survey Surface Water Feature Vector Map (OS, 2019)



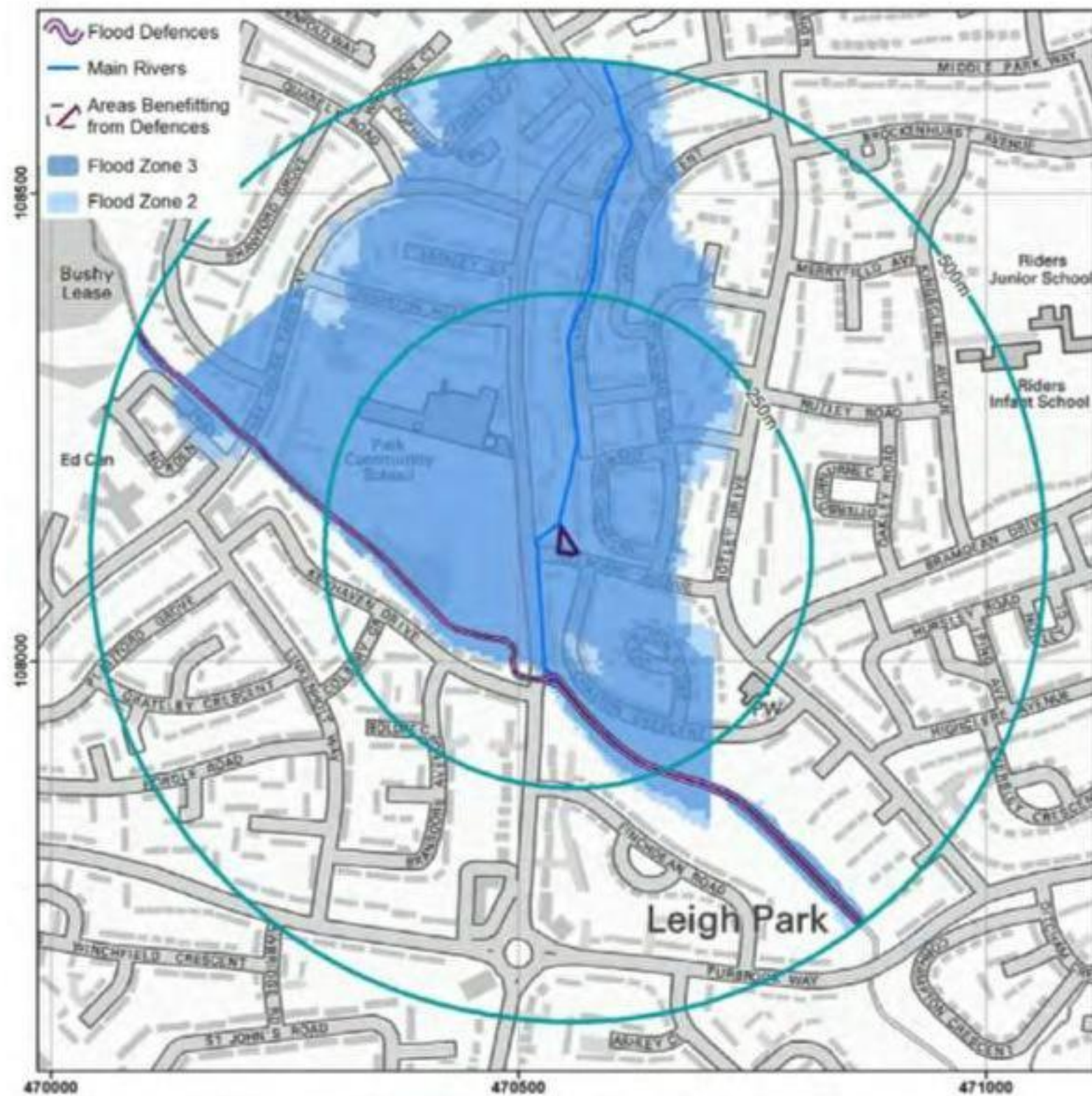
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# Environment Agency Historic Flood Map (EA, 2019)



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Environment Agency's Flood Map for Planning Purposes (EA, 2019)



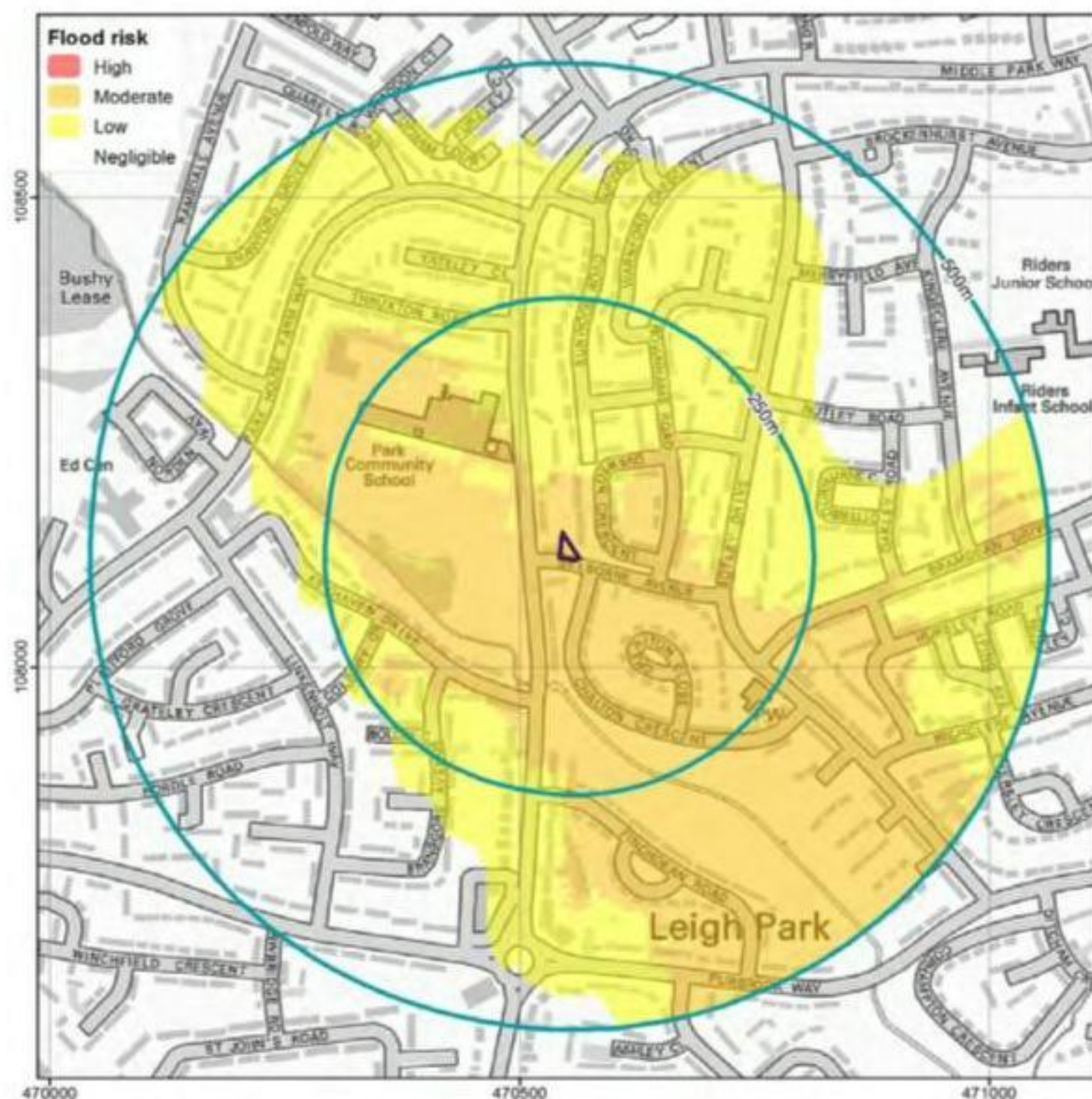
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Environment Agency's Flood Risk from Rivers and Sea map (EA, 2019)



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# GeoSmart Groundwater Flood Risk (GW5, v2.3) Map (GeoSmart, 2019)



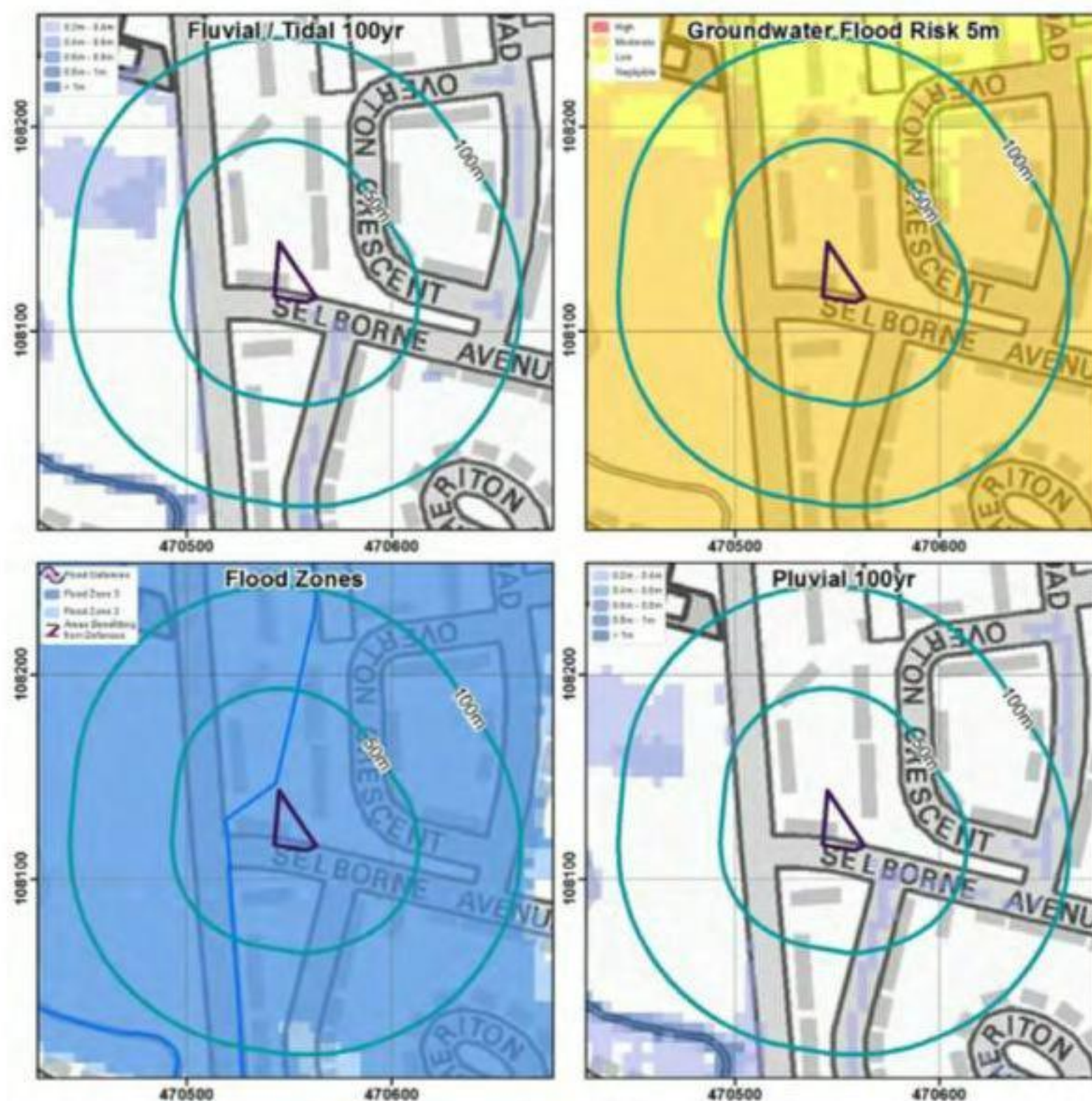
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EA Risk of Flooding Surface Water (pluvial) Depth map 1 in 100 year (EA, 2019)



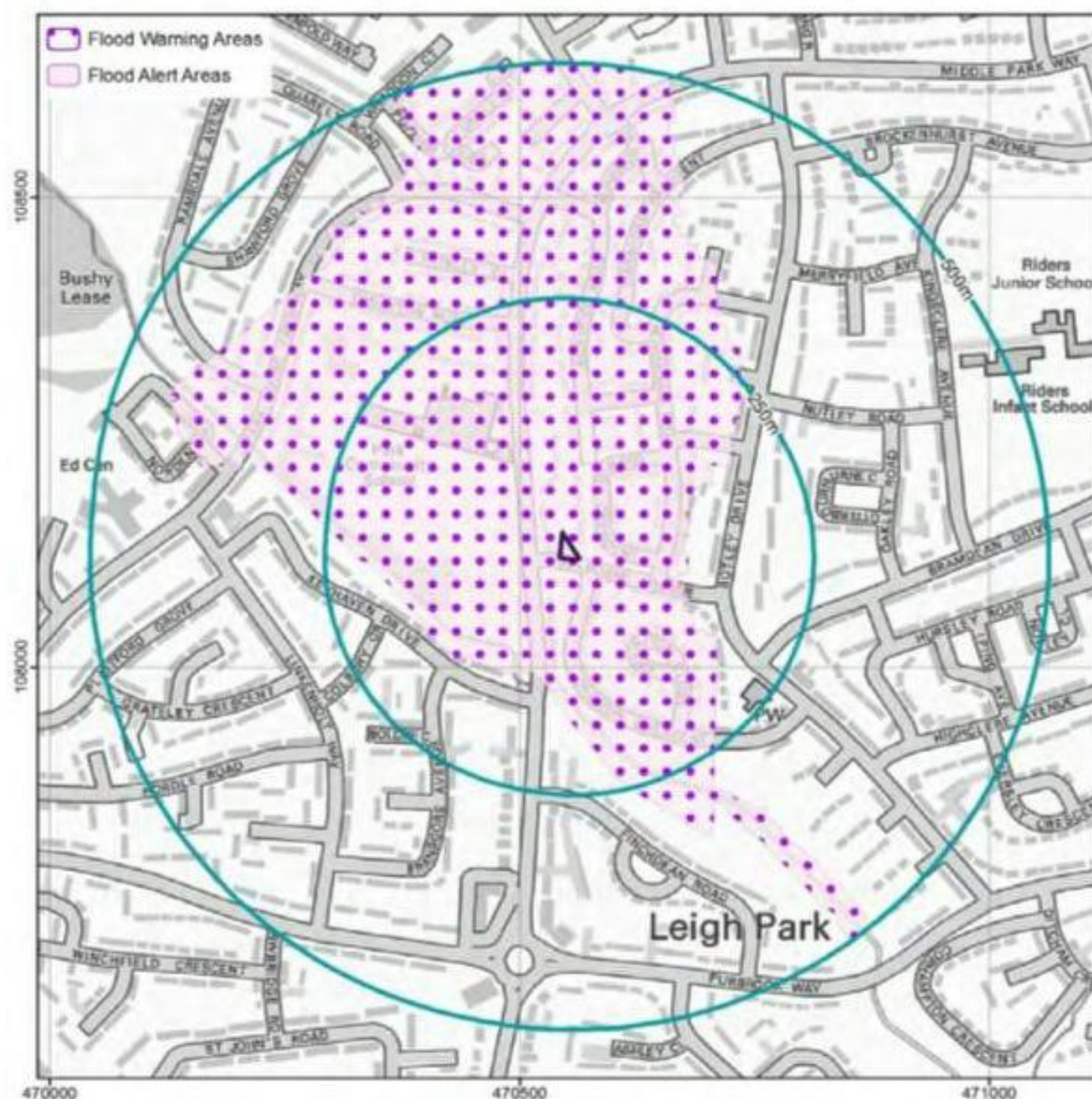
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# Quad Map (EA and Ambient Data, 2019)



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 Contains Ambiental UKFloodMap4TM data 2019 / Environment Agency copyright and database rights 2019

# Environment Agency Flood Alert and Flood Warning Areas Map (EA, 2019)

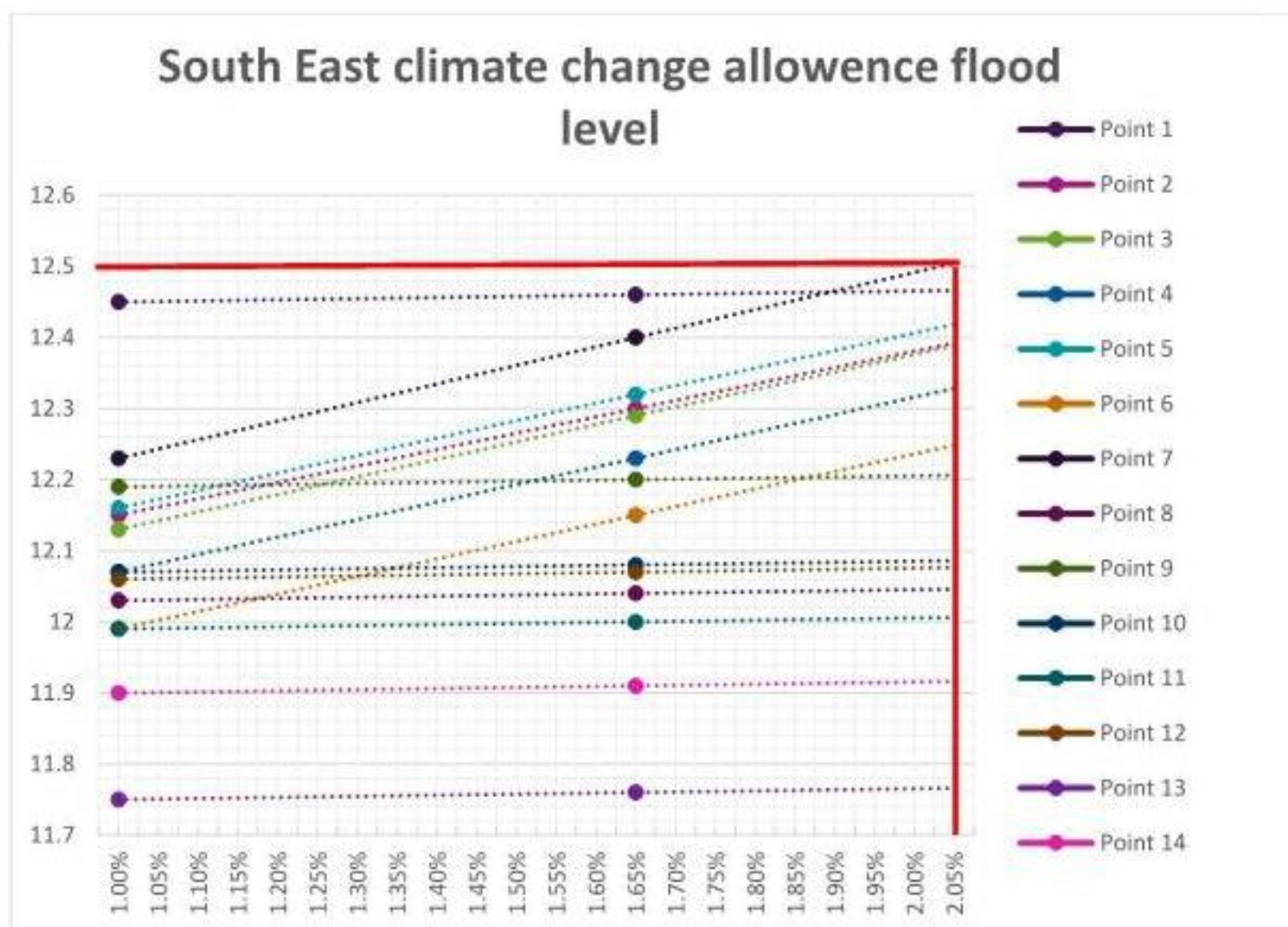


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# Appendix C

## Environment Agency data

| Point | EA 1m LiDAR Elevation (mAOD) | Estimated Water Surface Level (mAOD) |                | Estimated Water Surface Level (mAOD)                                   |                                                                         |
|-------|------------------------------|--------------------------------------|----------------|------------------------------------------------------------------------|-------------------------------------------------------------------------|
|       |                              | 1 in 100 year                        | 1 in 1000 year | 1 in 100 year plus 45% allowance for climate change flood level (mAOD) | 1 in 100 year plus 105% allowance for climate change flood level (mAOD) |
| 1     | 12.22                        | 12.45                                | 12.46          | 12.46                                                                  | 12.47                                                                   |
| 2     | 12.02                        | 12.15                                | 12.30          | 12.25                                                                  | 12.39                                                                   |
| 3     | 12.01                        | 12.13                                | 12.29          | 12.24                                                                  | 12.39                                                                   |
| 4     | 11.93                        | 12.07                                | 12.23          | 12.18                                                                  | 12.33                                                                   |
| 5     | 12.02                        | 12.16                                | 12.32          | 12.27                                                                  | 12.42                                                                   |
| 6     | 11.85                        | 11.99                                | 12.15          | 12.10                                                                  | 12.25                                                                   |
| 7     | 12.08                        | 12.23                                | 12.40          | 12.35                                                                  | 12.50                                                                   |
| 8     | 11.88                        | 12.03                                | 12.04          | 12.04                                                                  | 12.05                                                                   |
| 9     | 12.03                        | 12.19                                | 12.20          | 12.20                                                                  | 12.21                                                                   |
| 10    | 11.90                        | 12.07                                | 12.08          | 12.08                                                                  | 12.09                                                                   |
| 11    | 11.86                        | 11.99                                | 12.00          | 12.00                                                                  | 12.01                                                                   |
| 12    | 11.87                        | 12.06                                | 12.07          | 12.07                                                                  | 12.08                                                                   |
| 13    | 11.58                        | 11.75                                | 11.76          | 11.76                                                                  | 11.77                                                                   |
| 14    | 11.71                        | 11.90                                | 11.91          | 11.91                                                                  | 11.92                                                                   |



## JFLOW Levels Centred on Selborne Avenue - Created 23 October 2019



### Legend

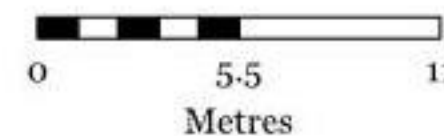
+ Location Points

Flood Zone 3

Flood Zone 2

1:275

\*when printed at A4.



### Water Depths & Levels for 16 Selborne Avenue

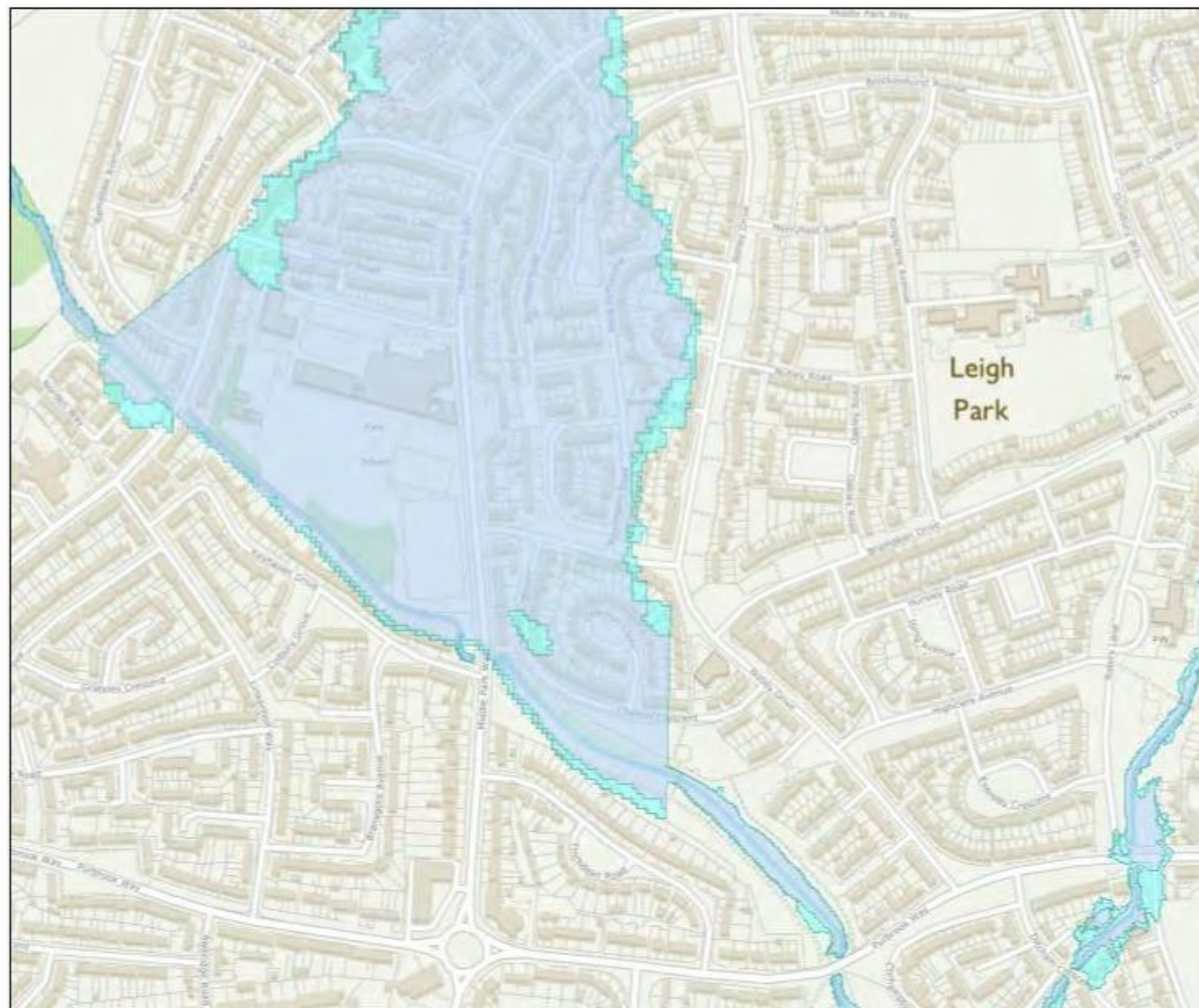
| Point | Water Depth (Metres)                               |                                                       | Water Surface Level (mAOD*)                        |                                                       | Ground Level |
|-------|----------------------------------------------------|-------------------------------------------------------|----------------------------------------------------|-------------------------------------------------------|--------------|
|       | 1% Annual Probability/1 in 100 Year (Flood Zone 3) | 0.1% Annual Probability/1 in 1000 Year (Flood Zone 2) | 1% Annual Probability/1 in 100 Year (Flood Zone 3) | 0.1% Annual Probability/1 in 1000 Year (Flood Zone 2) |              |
| 1     | 0.23                                               | 0.24                                                  | 11.29                                              | 11.30                                                 | 11.06        |
| 2     | 0.13                                               | 0.28                                                  | 11.16                                              | 11.31                                                 | 11.03        |
| 3     | 0.12                                               | 0.28                                                  | 11.15                                              | 11.31                                                 | 11.03        |
| 4     | 0.14                                               | 0.30                                                  | 11.14                                              | 11.30                                                 | 11.00        |
| 5     | 0.14                                               | 0.30                                                  | 11.14                                              | 11.30                                                 | 11.00        |
| 6     | 0.14                                               | 0.30                                                  | 11.14                                              | 11.30                                                 | 11.00        |
| 7     | 0.15                                               | 0.32                                                  | 11.14                                              | 11.31                                                 | 10.99        |
| 8     | 0.15                                               | 0.16                                                  | 11.14                                              | 11.15                                                 | 10.99        |
| 9     | 0.16                                               | 0.17                                                  | 11.12                                              | 11.13                                                 | 10.96        |
| 10    | 0.17                                               | 0.18                                                  | 11.13                                              | 11.14                                                 | 10.96        |
| 11    | 0.13                                               | 0.14                                                  | 11.13                                              | 11.14                                                 | 11.00        |
| 12    | 0.19                                               | 0.20                                                  | 11.13                                              | 11.14                                                 | 10.94        |
| 13    | 0.17                                               | 0.18                                                  | 11.13                                              | 11.14                                                 | 10.96        |
| 14    | 0.19                                               | 0.20                                                  | 11.13                                              | 11.14                                                 | 10.94        |

\* Levels in metres above Ordnance Datum Newlyn

## **JFLOW - Appendix**

- Our work to produce Flood Zones followed a 10 year programme which delivered more detailed mapping for 821 locations. However, in order to complete Flood Zones we needed national coverage, hence a generalised approach was used to provide this national coverage within the time available, to fill the gaps between the 821 locations where we had more detailed information. The Flood Zones are therefore not as accurate as we would normally specify for river modelling, but they do provide an adequate indication of the extent of flood risk such that developers can consider flooding as part of their proposals to ensure they are not unknowingly putting additional lives at risk. This is the purpose for which the Flood Zones were produced.
- Neither water depths nor water levels were outputs that were specified when we commissioned this generalised modelling for Flood Zones. Whilst the modelling process does provide some information on depth of water, it would have been possible to produce the flood extents without storing the water depth values, since water depth is only a 'by-product' of the calculation process. As the JFLOW modelling method was developed, tested and reviewed for production of the Flood Zone extents only, we currently have no information on the accuracy of the water depth data.
- The models were run using a Digital Terrain Model (DTM) with a 5m x 5m grid. However the DTM grids were generalised to between 5m and 100m (depending on the type of model and location, for reasons such as processing speed). Fluvial modelling produced depth data which can be processed using the DTM to provide water level data. However the differing grid sizes means that there is a significant potential for inaccuracy in producing level data, because of the DTM generalisation.
- Therefore because of the nature of the model and the DTM, in many cases it will not be possible to confidently assess whether or not a site is above the resulting water level. This is because there are further inherent uncertainties in the depth calculation and within the DTM itself
- Depth or level outputs from the National Generalised Modelling (JFLOW) are only suitable to be used for decision making at a broad catchment or Shoreline Management Plan coastal cell scale (or larger).
- **They are not suitable for use in site specific Flood Risk Assessments or Strategic Flood Risk Assessments and must not normally be used for these studies. However, where in exceptional circumstances Nationalised Generalised Modelling outputs are requested to be used for anything other than at a broad catchment or Shoreline Management Plan coastal cell scale further verification must be undertaken. As part of this verification the outputs must be proven to be suitable and appropriate bearing in mind the conclusions the user wishes to draw from them and this use must be agreed in writing by the local Environment Agency staff.**
- If any agreement is given by the Environment Agency in pursuance of the above, the User accepts and agrees that such agreement by the Environment Agency that that National Generalised Modelling outputs are suitable for a particular use does not imply agreement that the proposals are appropriate or that the Environment Agency has no further comment on flood risk, rather that following verification the User has proven that the outputs are suitable to help assess the flood risk in the particular circumstances.
- Any assessment of Flood Risk undertaken must be appropriate for the decisions that need to be based upon it, consider the risks and also take into account any limitations of the data used
- Please read the enclosed Notice and be aware that the Environment Agency does not guarantee that this data is suitable for your purposes.
- **The consultants employed to deliver JFLOW Flood Zones to the Environment Agency were Jeremy Benn Associates (JBA). I should make you aware that JBA will not release information that either is owned by the Environment Agency or based upon Environment Agency information as they are not licensed to do so. You will need to request any information you require from the Environment Agency.**
- Information provided relates solely to flood risk issues and is based on the best available information to date in the Environment Agency. If further information becomes available to the Environment Agency (on flood risk issues or on other environmental issues which affect a FRA) or policy changes, we reserve the right to comment further or to supply further information or to amend information sent.
- If this information is supplied in connection with a flood risk assessment of development proposals and any material amendments made thereto at any stage prior to the submission of a planning application, the User should be aware of the need to consult the Environment Agency further

# Flood Map for Planning (Rivers and Sea) Centred on Selborne Avenue - Created 17 Oct 2019



Scale 1: 6,250



## Flood Map for Planning (Rivers & Sea)

- Defences
- Flood Storage Areas
- Areas benefiting from flood defences
- Flood Zone 3
- Flood Zone 2

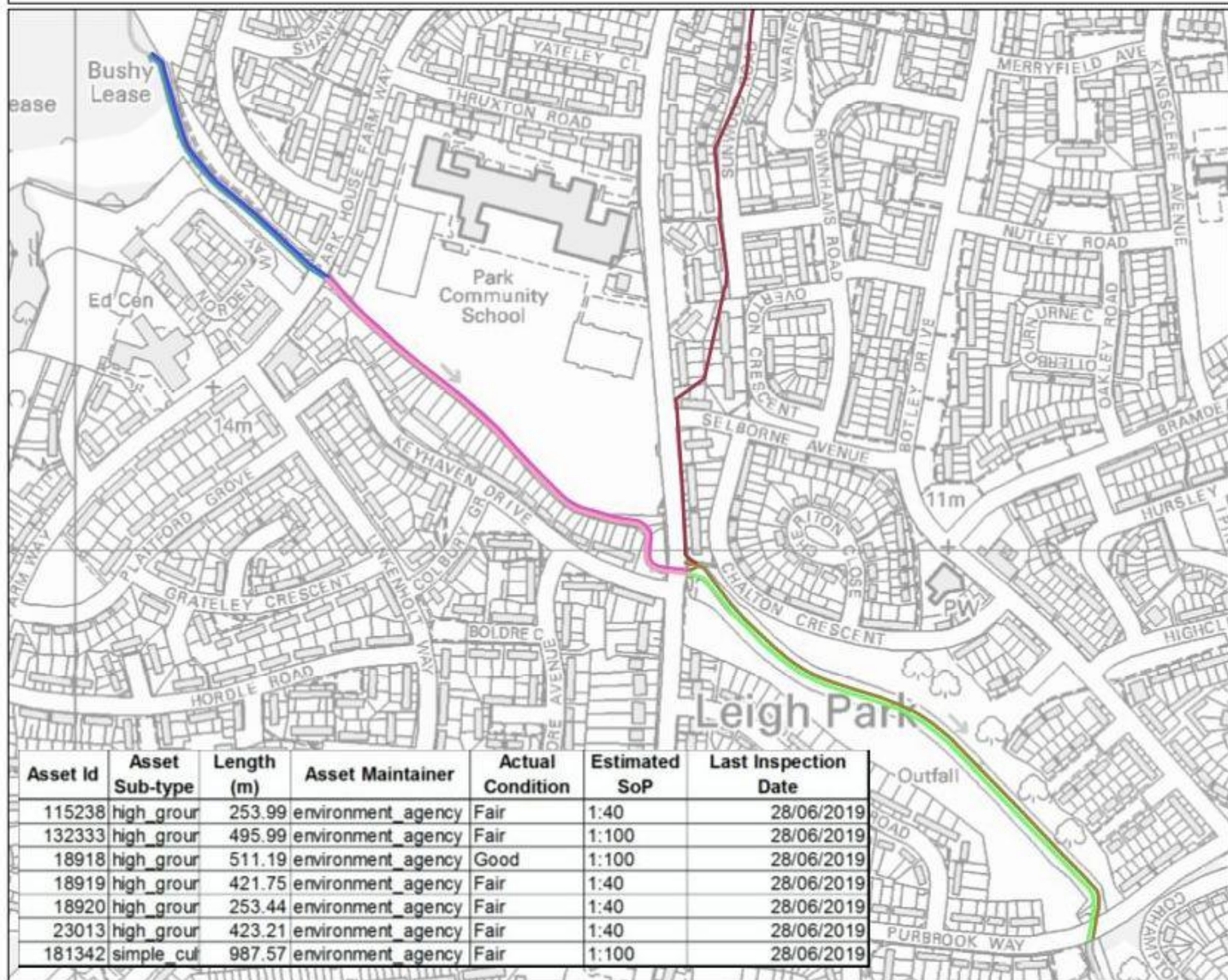
### Flood Map Areas (assuming no defences)

**Flood Zone 3** shows the area that could be affected by flooding:

- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

**Flood Zone 2** shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

## Defences Centred on Selborne Avenue - Created 18 October 2019



### Legend

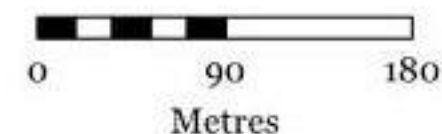
#### ASSET\_ID

- 18918
- 18919
- 18920
- 23013
- 115238
- 132333
- 181342

| Asset Id | Asset Sub-type | Length (m) | Asset Maintainer   | Actual Condition | Estimated SoP | Last Inspection Date |
|----------|----------------|------------|--------------------|------------------|---------------|----------------------|
| 115238   | high_grou      | 253.99     | environment_agency | Fair             | 1:40          | 28/06/2019           |
| 132333   | high_grou      | 495.99     | environment_agency | Fair             | 1:100         | 28/06/2019           |
| 18918    | high_grou      | 511.19     | environment_agency | Good             | 1:100         | 28/06/2019           |
| 18919    | high_grou      | 421.75     | environment_agency | Fair             | 1:40          | 28/06/2019           |
| 18920    | high_grou      | 253.44     | environment_agency | Fair             | 1:40          | 28/06/2019           |
| 23013    | high_grou      | 423.21     | environment_agency | Fair             | 1:40          | 28/06/2019           |
| 181342   | simple cul     | 987.57     | environment_agency | Fair             | 1:100         | 28/06/2019           |

1:4,844 \*

\*when printed at A4.



# Risk of flooding from Surface Water Centred on Selborne Avenue - Created 17 Oct 2019



Scale 1:6,250



Likelihood of flooding from Surface Water

- High ( $\geq 3.3\%$ )
- Medium (3.3% - 1%)
- Low (1% - 0.1%)
- Very Low

Likelihood of flooding from Surface Water

- |           |                                                                                                 |
|-----------|-------------------------------------------------------------------------------------------------|
| High:     | Greater than or equal to 3.3% (1 in 30) chance in any given year                                |
| Medium:   | Less than 3.3% (1 in 30) but greater than or equal to 1% (1 in 100) chance in any given year    |
| Low:      | Less than 1% (1 in 100) but greater than or equal to 0.1% (1 in 1,000) chance in any given year |
| Very Low: | Less than 0.1% (1 in 1,000) chance in any given year                                            |

This information is shown on the Risk of Flooding from Surface Water map on our website.

## **Use of Environment Agency Information for Flood Risk Assessments**

### **Important**

The Environment Agency are keen to work with partners to enable development which is resilient to flooding for its lifetime and provides wider benefits to communities. If you have requested this information to help inform a development proposal, then we recommend engaging with us as early as possible by using the pre-application form available from our website:

<https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion>

We recognise the value of early engagement in development planning decisions. This allows complex issues to be discussed, innovative solutions to be developed that both enables new development and protects existing communities. Such engagement can often avoid delays in the planning process following planning application submission, by reaching agreements up-front. We offer a charged pre-application advice service for applicants who wish to discuss a development proposal.

We can also provide a preliminary opinion for free which will identify environmental constraints related to our responsibilities including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

In preparing your planning application submission, you should refer to the Environment Agency's Flood Risk Standing Advice and the Planning Practice Guidance for information about what flood risk assessment is needed for new development in the different Flood Zones. This information can be accessed via:

<https://www.gov.uk/flood-risk-assessment-standing-advice>  
<http://planningguidance.planningportal.gov.uk/>

You should also consult the Strategic Flood Risk Assessment or other relevant materials produced by your local planning authority.

You should note that:

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk Assessment (FRA) where one is required, but does not constitute such an assessment on its own.
2. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as groundwater or surface water runoff. Information produced by the local planning authority referred to above may assist here.
3. Where a planning application requires an FRA and this is not submitted or is deficient, the Environment Agency may raise an objection.



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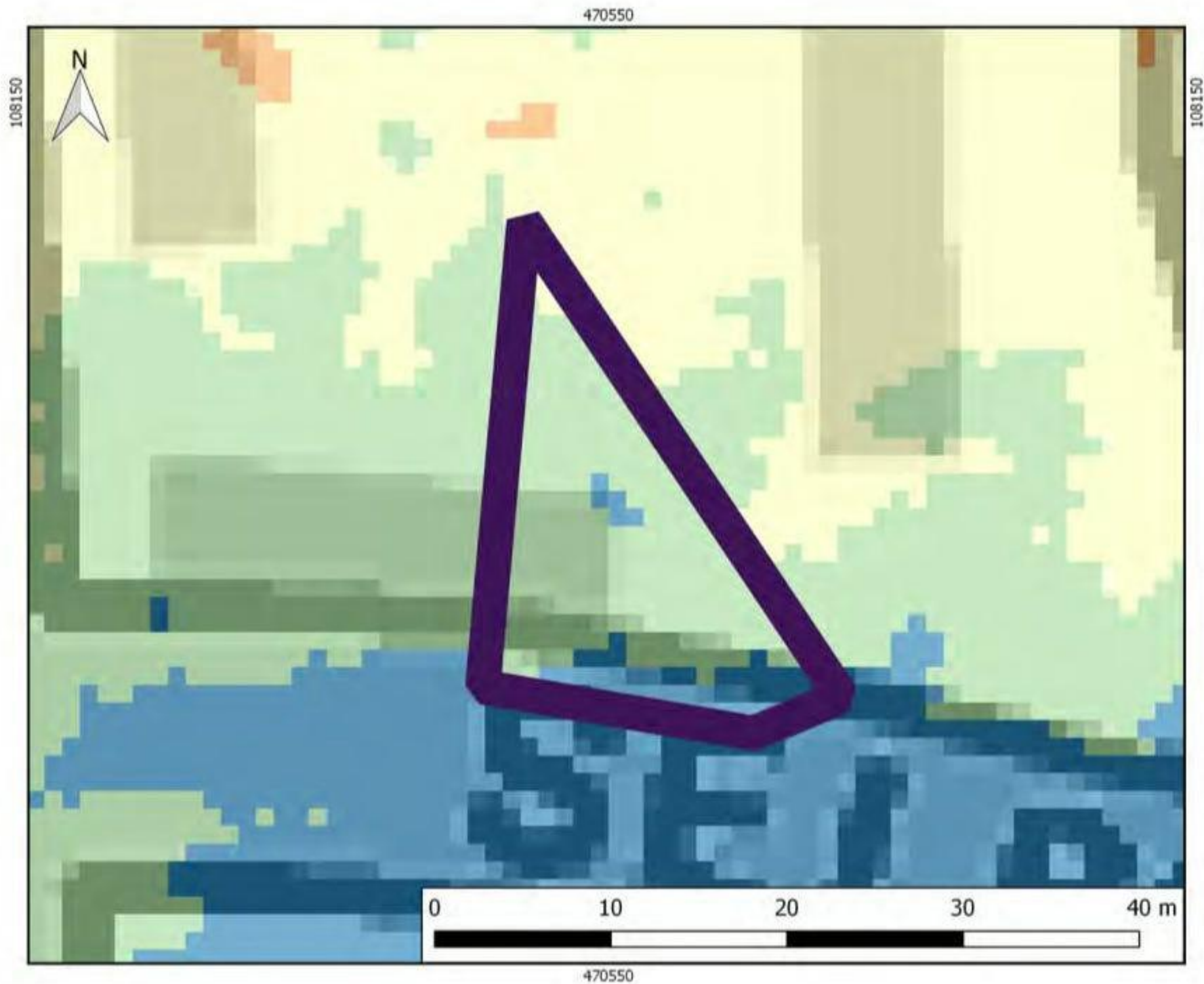
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# Appendix D

## Environment Agency LiDAR Elevation Data



**Figure D.1**  
**Elevation on Site**  
**(LIDAR Data)**

**Legend**

-  Site Boundary
- su7008\_DTM\_1M
-  ≤ 11.81
-  11.81 - 12.11
-  12.11 - 12.4
-  12.4 - 12.7
-  > 12.7



|                    |          |
|--------------------|----------|
| Date<br>30/10/2019 | Drawn    |
| Scale<br>1:301     | Checked  |
| Original           | Revision |
| File Reference     |          |

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- By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

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Milford House  
43-55 Milford Street  
Salisbury  
Wiltshire SP1 2BP  
Tel: 01722 333306  
Fax: 01722 332296  
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Please ask your search provider if you would like a copy of the search code

#### Complaints procedure

GeoSmart Information Limited is registered with the Property Codes Compliance Board as a subscriber to the Search Code. A key commitment under the Code is that firms will handle any complaints both speedily and fairly.

If you want to make a complaint, we will:

- Acknowledge it within 5 working days of receipt.
- Normally deal with it fully and provide a final response, in writing, within 20 working days of receipt.
- Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.
- Provide a final response, in writing, at the latest within 40 working days of receipt.
- Liaise, at your request, with anyone acting formally on your behalf.

If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman scheme (TPOs): Tel: 01722 333306, E-mail: [admin@tpos.co.uk](mailto:admin@tpos.co.uk).

We will co-operate fully with the Ombudsman during an investigation and comply with his final decision.

Complaints should be sent to:

Jemma Prydderch  
Operations Manager

GeoSmart Information Limited  
Suite 9-11, 1st Floor,  
Old Bank Buildings,  
Bellstone, Shrewsbury, SY1 1HU  
Tel: 01743 298 100

[jemmaprydderch@geosmartinfo.co.uk](mailto:jemmaprydderch@geosmartinfo.co.uk)

# Terms and Conditions

GEOSMART INFORMATION LIMITED  
Conditions of contract for environmental  
reports

June 2016, Version 1.2

Definitions:

The following words shall have the  
following meaning:

- a) "Client" means the person for whom the Report has been procured either directly or through an Intermediary;
- b) "Conditions" means these terms and conditions of sale, the User Guide and the Order;
- c) "GEOSMART" means GeoSmart Information Ltd of Suite 9-11, Old Bank Buildings, Bellstone, Shrewsbury, SY1 1HU, registered in England and Wales with company registration number 05475394.
- d) "Information" means environmental data, including other third party sources of information;
- e) "Intermediary" means the party that places the Order acting on behalf of the Beneficiary, who might be a lawyer, consultant or other party;
- f) "Order" means the order for Services sent by a Client or an Intermediary to GEOSMART;
- g) "Report" or "Reports" means a report which relates to environmental information (as distinct from opinion) and which is prepared by GEOSMART in respect of a Site;

- h) "Services" means the preparation and provision of Report(s) by GEOSMART from the Information;
- i) "Site" shall mean the site specified in the Order;
- j) "User Guide" means the document (if any) which may be produced from time to time by GEOSMART entitled 'GeoSmart User Guide', which may be requested with the Report by writing to GEOSMART at the above address and will be provided if applicable.

## 1. Conditions

1.1 Subject to receipt of a valid Order, GEOSMART agrees to supply to the Client or the Intermediary (if the Client has appointed one) the Services subject to these Conditions and the Client or the Intermediary agrees that by placing an Order for the Services it accepts these Conditions. The User Guide applicable to each Report should be read in conjunction with the Report and is incorporated into these Conditions as if it were repeated herein. A Report is sold subject to all information contained in such User Guide

1.2 GEOSMART acknowledges that in the provision of the Report and Services it owes a duty of care to the Intermediary and to the Client.

1.3 In providing search reports and services GEOSMART will comply with Search Code and will take into account the requirements of the Alternative Dispute Resolution for Consumer Disputes (Amendment) Regulations 2015.

Further details are provided in the PCCB Bulletin which accompanies GEOSMART Reports.

## 2. Report

GEOSMART shall use reasonable care, skill and diligence in carrying out the Services and providing the Report to the Intermediary (and the Client). However, the Report is provided to the Intermediary (and the Client) on the express basis that the Intermediary (and the Client) acknowledge and agree to the following:

2.1 information and data supplied in Report(s) is derived from the Information and GEOSMART does not warrant the accuracy or completeness of such Information;

2.2 the sources of information and data supplied in Report(s) are specifically cited in the Report and the User Guide; however, GEOSMART does not claim that these sources represent an exhaustive or comprehensive list of all sources that could or might be consulted; and

2.3 GEOSMART does not guarantee that all environmental risks that are or might be associated with the Site will be identified in the Report; and

2.4 Reports and other services provided by GEOSMART are generally professional business to business services and intended as such for use or interpretation by professional persons skilled in the use of environmental information; and

2.5 GEOSMART shall not be responsible for any error or corruption in a Report resulting from inaccuracy or omission of third party information and data provided by the Intermediary or the Client (as applicable), inaccurate processing of

information and data by third parties, computer malfunction or corruption of data whilst in the course of conversion, coding, processing by computer or electronic means, or in the course of transmission by telephone or other communication link.

## 3. Liability

3.1 As some of the data and information which GEOSMART interprets in Reports is obtained by GEOSMART from third parties, GEOSMART cannot control the accuracy or completeness of such data and information, nor is it within the scope of the Services to verify the data or information by a physical inspection of the Site. Save as provided in Conditions 3.5 and 3.11 GEOSMART will only be liable to the Client or to the Intermediary in respect of the Services:

3.1.1 for loss or damage caused by breach by GEOSMART of these Conditions accordingly save as provided in Condition 3.5 GEOSMART shall not be liable in any other circumstances for any errors, inaccuracies, faults or omissions in the Services;

3.1.2 for any obvious errors or obvious inaccuracies in any information obtained by it where GEOSMART should reasonably have been alerted to such error or inaccuracy;

3.2 GEOSMART has no liability whatsoever for, under or in respect of any insurance policy purchased by the Client or the Intermediary where insurance is made available to the Client or Intermediary following the provision of a Report by GEOSMART issued in accordance with these Conditions. Where such a policy has been purchased, all liability arising from or

relating to the Site shall remain exclusively with the insurers. Moreover, GEOSMART is not endorsing any policy recommended by insurers and the Client or the Intermediary is entirely responsible for ensuring the insurance policy offered is suitable for its needs and should seek independent advice.

3.3 GEOSMART does not guarantee that an insurance policy will be available for the environmental risks that may be associated with the Site specified in the Report and the provision of a Report does not constitute any indication by GEOSMART that insurance will be available for the Site.

3.4 GEOSMART has undertaken the Services for use by the Client or the Intermediary and those persons referred to at condition 5.1 and 5.2 and for no other purpose whatsoever and the Services should not be relied upon by any other third party. GEOSMART cannot accept responsibility and will not be liable to any other party for any loss caused as a result of reliance upon the Services. Any other party relying on the Services does so entirely at its own risk, including without limitation, any insurers. Recipients of the Services are to rely on their own skill and judgment in determining the suitability of the Services for their own purpose and use.

3.5 Nothing in these Conditions shall exclude or restrict GEOSMART's liability for death or personal injury resulting from the negligence of GEOSMART or their employees while acting in the course of their employment or arising from a breach of its statutory duty or fraud.

3.6 GEOSMART shall not be liable to any recipient of the Service for loss of profits,

loss of contracts, (or other indirect or consequential loss or damage) resulting from any event or default by GEOSMART in the provision of the Services to the fullest extent permitted by law.

3.7 GEOSMART shall make reasonable endeavors to supply the Report on the date agreed with the Intermediary or the Client (as applicable). This date will be taken as a guideline for time planning purposes only. Time shall not be of the essence with respect to the provision of the Services except where it has agreed in writing to a deadline with the Client or Intermediary in which it is stated that time is of the essence.

3.8 GEOSMART shall not be liable for any delay, interruption or failure in performance of its obligations hereunder which is caused by war, flood, riot, Act of God, strike or other labour dispute (including those affecting Government officials), suspension or delay of service at public registries, lack of power, telecommunications failure or overload, or computer malfunction caused by any event beyond the reasonable control of GEOSMART.

3.9 The Client or the Intermediary (as appropriate) shall on receipt of the Services make a reasonable inspection of the Site to satisfy itself that there are no apparent defects or failures with respect to the description of the Site.

3.10 GEOSMART's liability under the Conditions shall cease upon the expiry of six (6) years from the date when the Client, Intermediary or any person making use of the Report in accordance with Condition 5.2 became aware that it may have a claim in respect of a particular Report provided always that there shall be

no liability at the expiration of six (6) years from the date of the Report. For the avoidance of doubt, any claims in respect of which proceedings are notified to GEOSMART prior to the expiry of the time periods referred to in this Condition shall survive the expiry of those time periods.

3.11 Subject as otherwise provided in these Conditions, GEOSMART's aggregate liability arising out of the provision or use of the Services, in contract, negligence or in any other way, for damages or loss sustained or incurred by the Intermediary shall be limited to an aggregate amount not exceeding £5,000,000 pounds. For the avoidance of doubt, if multiple parties make use of the Report, the limit referred to above applies to all users of that Report in aggregate.

3.12 GEOSMART undertakes for the duration of the six (6) year period of liability provided for by Condition 3.11 to maintain and renew annually Professional Indemnity Insurance in respect of the Services with a liability limit of not less than £5,000,000 provided that such insurance is available at commercially reasonable rates (and in such case then at the next highest limit which is available in the market at commercially reasonable rates). Details of Professional Indemnity Insurance shall be made available to the Client or Intermediary (as applicable) on request.

3.13 Where GEOSMART procures for the Intermediary, otherwise than as part of a Report, any third party service, including but not limited to, environmental reports, risk models, risk assessments, professional opinions, or any other service, GEOSMART accepts no liability whatsoever for the information contained therein.

3.14 The Client and the Intermediary warrant that they shall: (i) comply with all applicable laws, statutes and regulations relating to anti-bribery and anti-corruption including but not limited to the Bribery Act 2010; (ii) comply with such of GEOSMART'S anti-bribery and anti-corruption policies as are notified to them from time to time; and (iii) promptly report to GEOSMART any request or demand for any undue financial or other advantage of any kind received by the or on their behalf in connection with these Conditions. Breach of this clause shall be deemed a material breach of these Conditions.

#### 4. Copyright

4.1 The Intermediary, the Client and any recipient of the Report pursuant to the provisions of condition 5.2 acknowledge that the proprietary rights subsisting in copyright, design rights and any other intellectual property rights in respect of the data and information in the Report are and shall remain the property of GEOSMART and these Conditions do not purport to grant, assign, or transfer any such rights in respect thereof.

4.2 Reports may be stored on the Intermediary's server and used on up to ten (10) units (where a "Unit" means a single client personal computer or workstation) on the Intermediary's network and any network of a recipient of the Report pursuant to the provisions of Condition 5.2. Data in Reports is deemed to be in use when it is loaded into the temporary memory (i.e. RAM) or installed onto the permanent memory (i.e. memory chip, hard disc, CDROM) of that computer.

4.3 The Intermediary, the Client and all recipients of the Report pursuant to the

provisions of Condition 5.2 are all entitled to make up to five printed copies only of any Report. Copies of the Report may be provided for information purposes for proper and lawful use only to a person who is considering whether to acquire or hold an interest in the Site or to provide funding in relation to the Site. Further copies may not be made in whole or in part without the written permission of GEOSMART who shall be entitled to make a charge for each additional copy.

4.4 The Intermediary and the Client (as applicable) shall (and shall procure that all recipients of the Report pursuant to the provisions of Condition 5.2 shall):

4.4.1 not remove, suppress or modify any trademark, copyright or other proprietary marking belonging to GEOSMART from the Services;

4.4.2 not create any product which is derived directly or indirectly from the data contained in the Services; save for products documents and advice provided by those acting in a professional or commercial capacity in accordance with 5.2.3;

4.4.3 not combine the Services with or incorporate such Services into any other information data or service;

4.4.4 not re-format or otherwise change (whether by modification, addition or enhancement) data contained in the Services save for those modifications made by those acting in a professional or commercial capacity in accordance with 5.2.3;

4.5 The mapping (if any) contained in any Services is protected by Crown Copyright and must not be used for any purpose outside the context of the Services.

## 5. Confidentiality and reliance

5.1 Subject to (i) full payment of all relevant Fees and (ii) compliance with this Contract, the Client or the Intermediary is entitled to rely on the report and information provided.

5.2 Subject to Condition 5.3, the Client or the Intermediary (as applicable) may without further charge make the Report available to:

5.2.1 Up to a maximum of three (3) persons who acquire or hold an interest in the Site or an interest in the Client or the entity which holds or acquires an interest in the Site save that nothing shall hereby entitle any such person to recover twice (whether directly or indirectly) in respect of the same loss nor seek recovery in respect of any loss relating to any period after such entity ceases to hold its interest or to have potential liability for the Site (whichever is the later) (unless otherwise agreed by the parties);

5.2.2 Up to a maximum of three (3) persons who provide funding to the Client or to a person at condition 5.2.3;

5.2.3 Up to a maximum of three (3) persons acting in a professional or commercial capacity for the Client in relation to the Site.

5.3 GEOSMART shall have the same duties and obligations to those persons referred to in Conditions 5.2.1, 5.2.2, 5.2.3 in respect of the Services as it has to the Client and the Intermediary, and such persons shall be entitled to rely on the relevant Report as if it was addressed to them and any such person shall be entitled to enforce each of these Conditions as if they were named as joint Client in the Order, provided always that

the person to whom the Report is made available accepts these Conditions by writing accordingly to GEOSMART citing the Report and the Site.

5.3 The Report is to be used solely for the benefit of such persons as are set out in Condition 5.1 and 5.2, and GEOSMART exclude all liability to all other persons unless GEOSMART has expressly agreed in writing to a third party taking the benefit of the Report and has been paid reasonable fees for so doing.

5.4 Any information provided by the Intermediary or the Client to GEOSMART in contemplation of the Services to be provided together with the Report will be treated as confidential information.

5.5 GEOSMART agrees not to disclose or publish any statement relating to such confidential information (in whole or in part) to any third party without the prior written consent of the Intermediary save for its provision to GEOSMART's employees who require access to the confidential information in order to perform their duties to GEOSMART.

5.6 GEOSMART will procure that its employees will maintain the confidential information in strict confidence.

## 6. GEOSMART's charges

6.1 The Client or the Intermediary (as applicable) shall pay GEOSMART's charges for the Services at the rate set out in the Order.

6.2. Unless otherwise stated all prices are exclusive of Value Added Tax which shall, where applicable, be payable in addition to any sum payable for the Services at the relevant rate in force from time to time,

against delivery of an appropriate tax invoice.

6.3 The Client or the Intermediary (as applicable) shall pay the price referred to in Condition 6.1 above for the Services:

6.3.1 without any set off, deduction or counterclaim;

6.3.2 GEOSMART requests upfront payment by debit or credit card (No surcharges for credit cards) or by bank transfer. A credit agreement can be set up for repeat clients with terms based on 14 days from the date of GEOSMART's invoice.

6.4 GEOSMART shall not be obliged to invoice any party other than the Client or the Intermediary (as applicable) for the provision of Services, but where GEOSMART does so invoice any third party at the written request of the Client Intermediary, and such invoice is not accepted or remains unpaid, GEOSMART shall have the right at any time to cancel such invoice and invoice the Client or the Intermediary (as applicable) direct for such Services. Where the Intermediary's order comprises a number of Services or separate elements within any one or more Services, any failure by GEOSMART to provide an element or elements of the Services shall not prejudice GEOSMART's ability to require payment in respect of the other Services delivered to the Intermediary or the Client (as applicable).

6.5 If the Intermediary or the Client (as applicable) fails to make any payment on the due date GEOSMART shall be entitled to cancel or suspend any further orders or delivery. In addition, GEOSMART may charge the Intermediary or the Client (as applicable) interest on overdue amounts

at 4% over the NatWest plc base rate (as varied from time to time) from the due date until payment in full is made (whether before or after judgment).

## 7. General

7.1 These Conditions constitute the entire agreement between the parties and no statement given orally or in writing should be deemed incorporated herein unless executed in writing by a director of GEOSMART and countersigned by the Intermediary or the Client (as applicable). Each of the Conditions and Sub-conditions of these Conditions is distinct and severable. If any provision of these Conditions shall be determined to be invalid, illegal or unenforceable, the remainder of these Conditions shall continue to be valid, legal and enforceable to the fullest extent of the law.

7.2 Any time or indulgence granted by GEOSMART or the Client or the Intermediary or delay in exercising any of its rights under these Conditions shall not prejudice or affect GEOSMART's or the Client's or the Intermediary's rights or operate as a waiver of the same.

7.3 GEOSMART, the Client and the Intermediary shall not be entitled to assign their respective rights or obligations pursuant to these Conditions without the prior written approval of the other parties.

7.4 GEOSMART may suspend or terminate the provision of the Services if the Client

or the Intermediary (as applicable) is bankrupt or insolvent or makes any voluntary arrangements with its creditors or become subject to an administration order or has an administrative receiver appointed over any of its assets or GEOSMART has reason to believe that any of foregoing circumstances may come into existence or any amount owing to GEOSMART that is overdue or where the Client or Intermediary (as applicable) has exceeded any credit limit.

7.5 These Conditions shall at all times be governed construed and enforced in accordance with English Law which shall be the proper law of these Conditions, and both parties thereby submit to the exclusive jurisdiction of the English courts.

7.6 Except as otherwise provided in these Conditions a person who is not a party to any contract made pursuant to these Conditions shall have no right under the Contracts (Rights of Third Parties) Act 1999 to enforce any terms of such contract and GEOSMART shall not be liable to any such third party in respect of the Products.