21.0 Leven Road Gas Works

Site Number:	20
Site Location:	Leven Road Gas Works
Grid Reference:	538690 181590

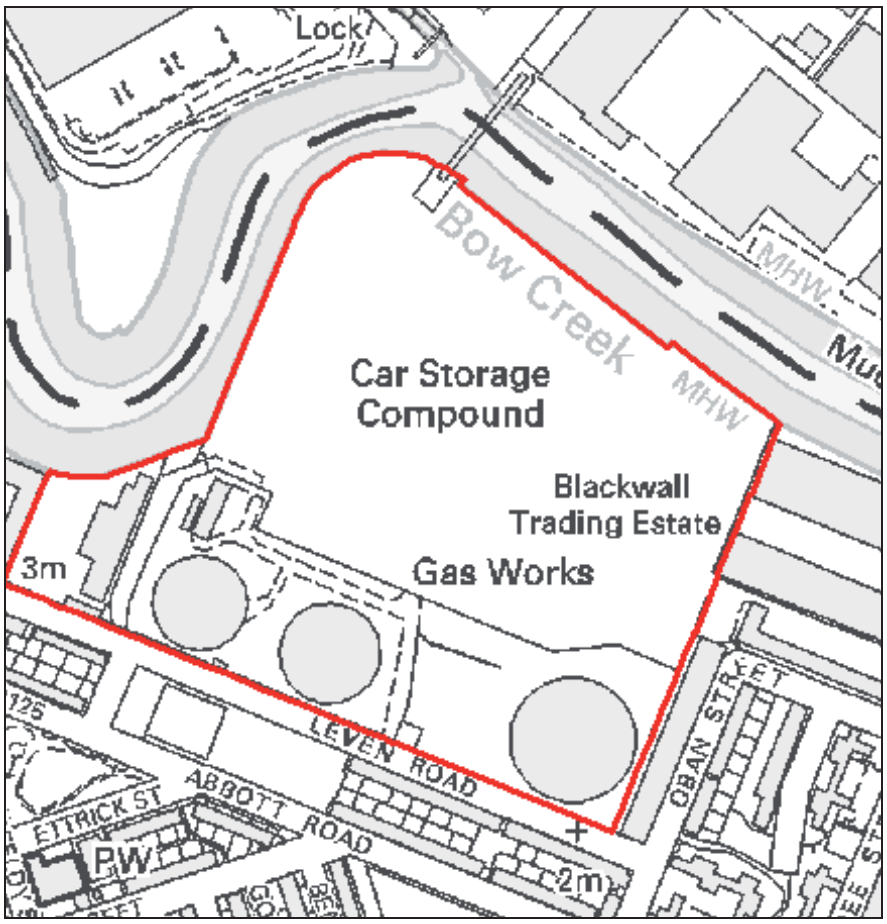

Figure 21-1 Leven Road Gas Works Site

21.1 Site Description

The Leven Road Gas Works site occupies an area of 8.56ha and is bound by the River Lee along the northern boundary. The site is predominately industrial and currently contains active gas holders. The proposed uses of the site are as follows:

- Large Scale housing development;
- Strategic open space; and
- District heating facility.

In accordance with Table D2 of PPS 25, the classifications of the proposed uses are as follows:

Proposed Land Use	Vulnerability Classification
Large Scale housing development	More Vulnerable
Strategic Open space	Water Compatible Development
District heating facility	Less vulnerable

21.2 SUMMARY OF FLOOD RISK

21.2.1 FLOOD ZONE MAPS

The site is located within Flood Zone 3. All proposed uses are permitted within this flood zone, however 'more vulnerable' uses are subject to the Sequential and Exception Tests.

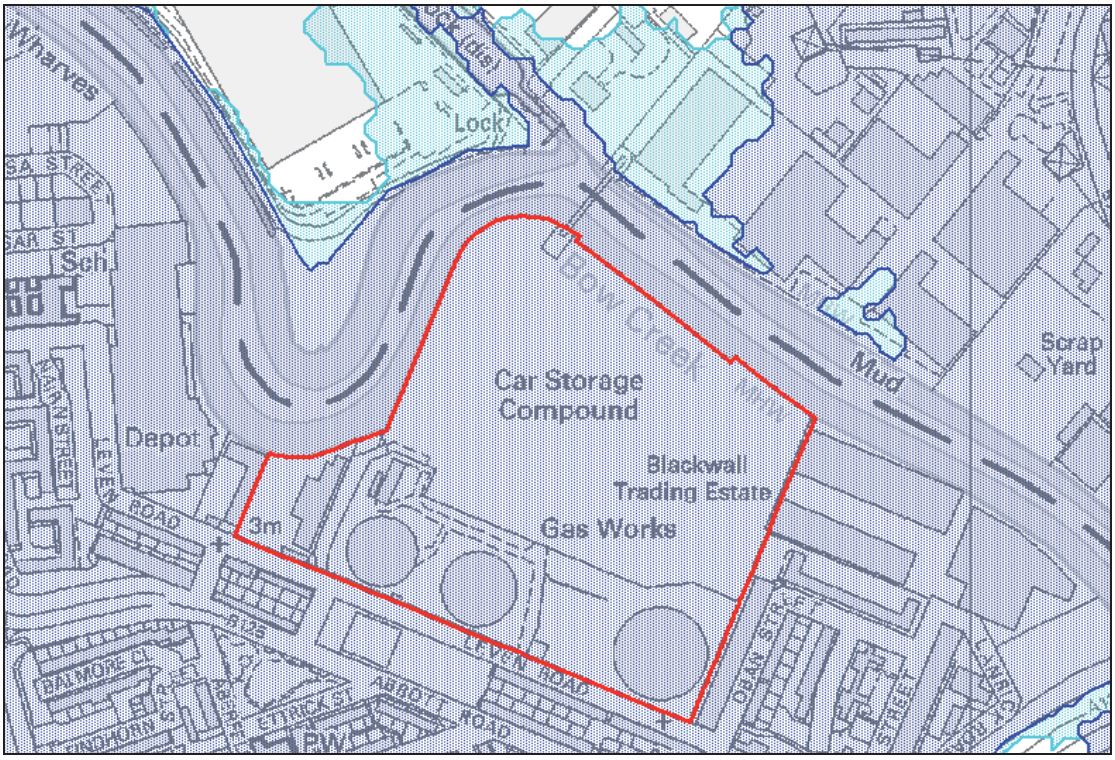

Figure 21-2 PPS25 Flood Zones at the Leven Road Gas Works Site

21.3 SOURCES OF FLOODING

21.3.1 TIDAL

Actual Risk

The site is defended from tidal inundation during the 0.5% AEP tidal event by the existing Thames Tidal Flood Defences (including the Thames Barrier) for the lifetime of the development. The site is considered to be at low risk of tidal flooding.

Residual Risk

There is a residual risk of tidal flooding from an extreme surge event. The site is defended against inundation from the River Thames during a 0.1% AEP tidal event and is considered as having a low probability of the

defences overtopping.

Breach assessments carried out as part of the Level 1 SFRA, show that a breach in the defences at Blackwall (Breach 2) floods the southern portion of the site. The hazard is assessed to be 'low' to 'significant'.

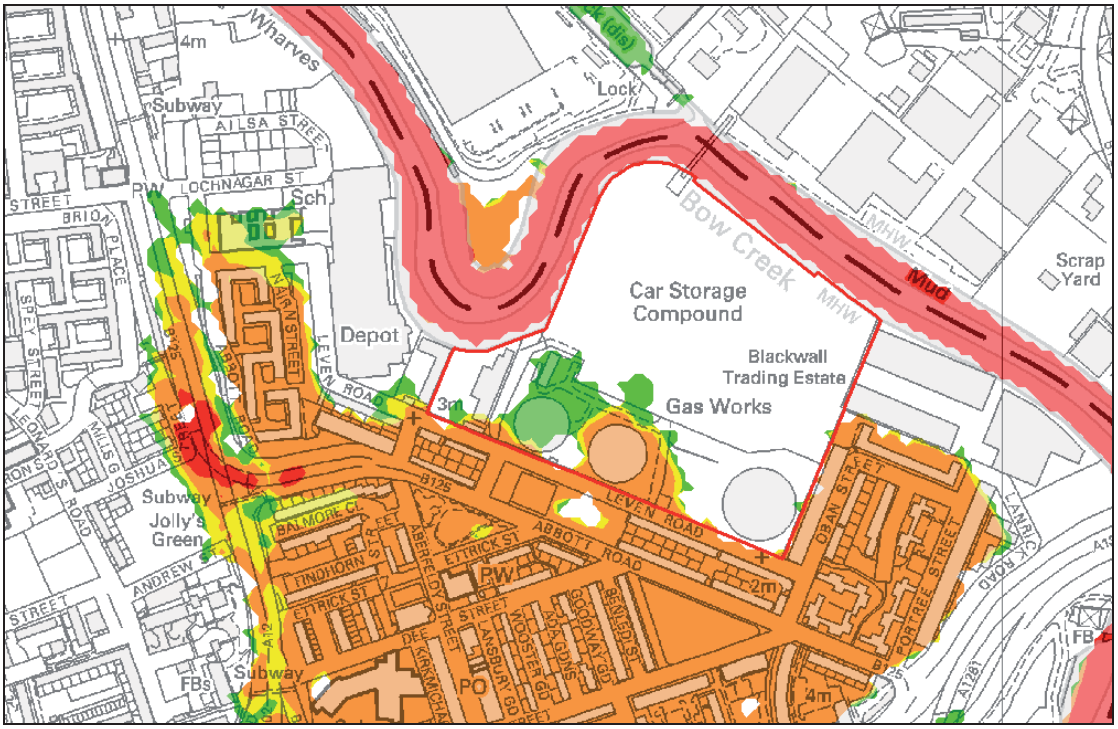

Figure 21-3 Blackwall Breach Extent at the Leven Road Gas Works Site

21.3.2 FLUVIAL

Actual Risk

The site is located outside of the 1% AEP event with inclusion of climate change flood extent of the River Lee. The site is defended by the River Lee fluvial defences. The site is concluded as being at a low risk of actual fluvial flooding.

Residual Risk

The site is located outside of the 0.1% AEP event flood extent of the River Lee.

Breach assessments carried out as part of the Level 1 SFRA, show that a breach in the defences on site (Breach 1 – Bromley) results in the inundation of the majority of the site. The hazard is assessed to be mainly 'significant' with some parts of the site with a rating of 'extreme'. Depths of water are predicted to reach 1.5m. A breach in the fluvial defences on site is likely to have catastrophic consequences due to rapid inundation of the site.

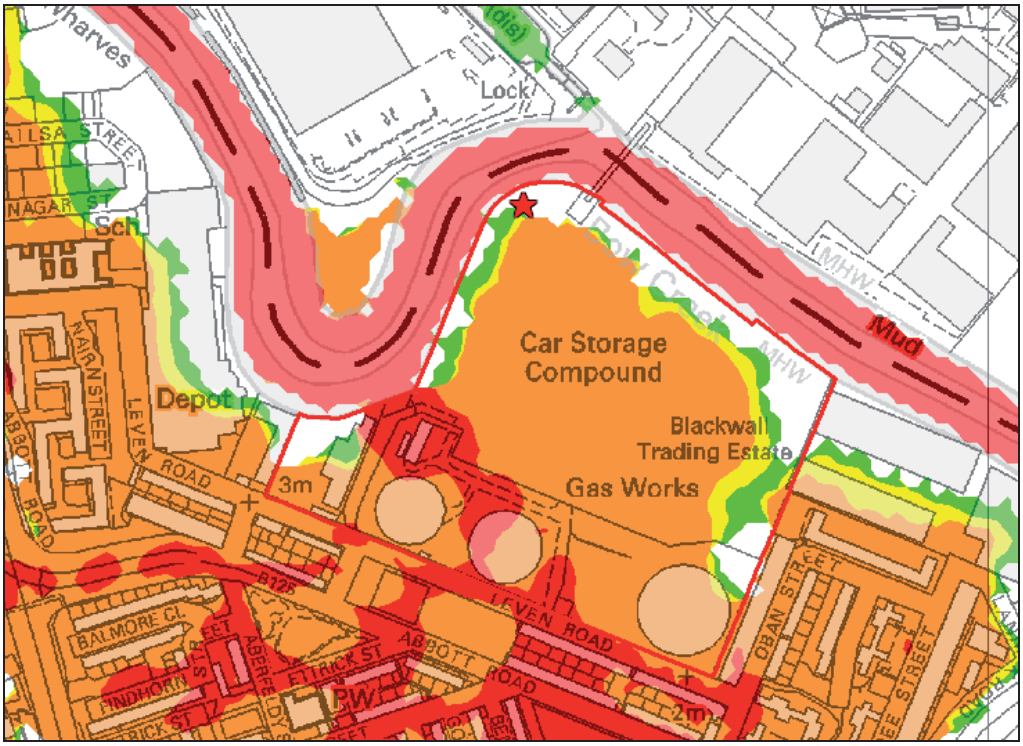

Figure 21-4 Bromley Breach Extent at the Leven Road Gas Works Site

21.3.3 *Surface Water/Sewer*

The site is shown to have a low risk of surface water flooding. Small, isolated areas of flooding are observed in the model results, however these are likely to be a result of inaccuracies in the LiDAR or assumptions in the modelling.

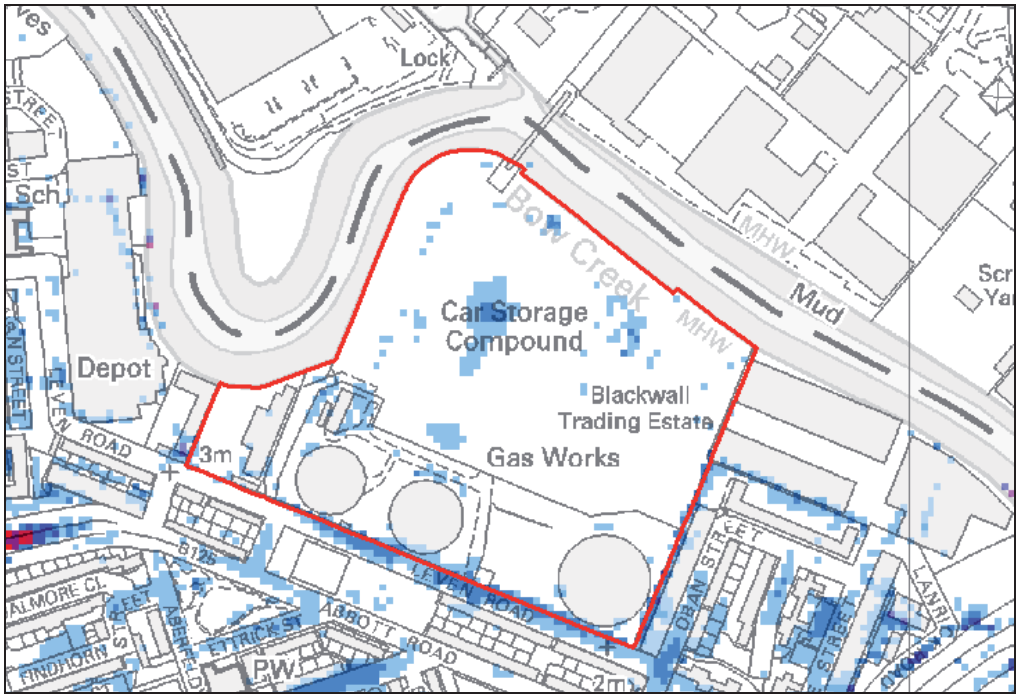

Figure 21-5 Maximum Depth of Surface Water in a 1% AEP Rainfall Event at the Leven Road Gas Works Site

21.3.4 GROUNDWATER

The site is shown to have an increased potential of elevated groundwater. Development proposals will need to consider site ground conditions and groundwater levels over the lifetime of the development. In particular the design of any underground structures or services and foundations.

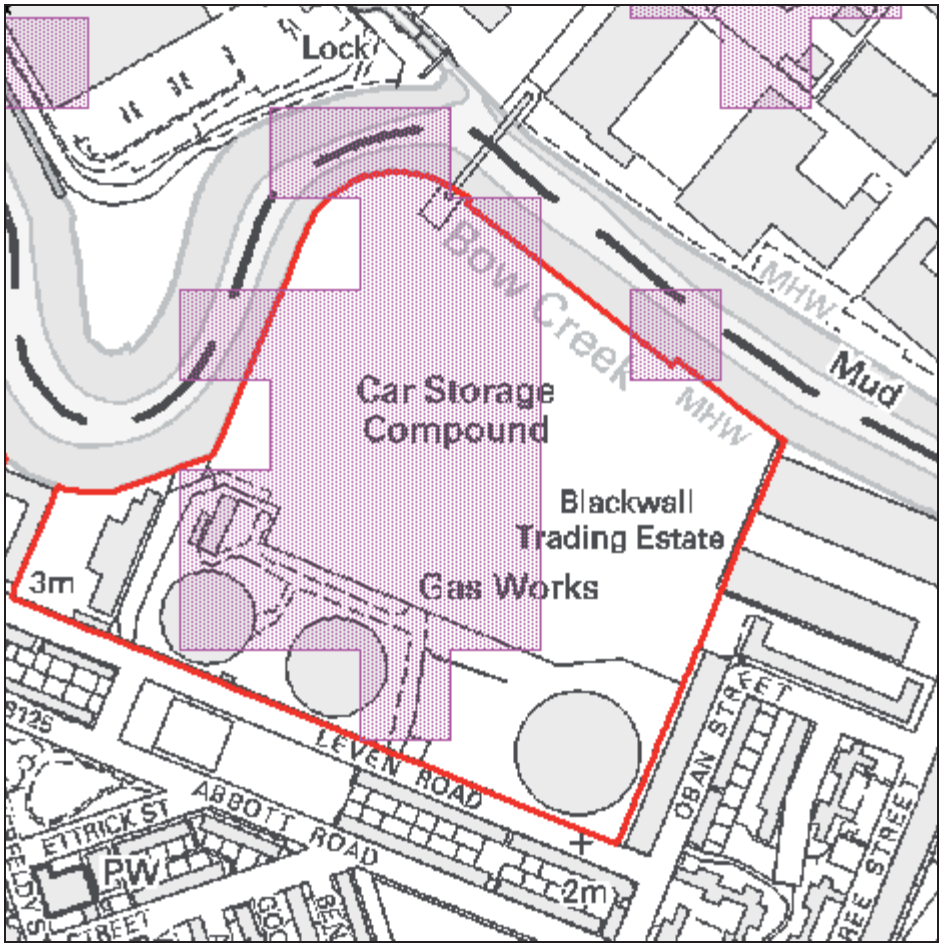

Figure 21-6 Increased Potential of Elevated Groundwater at the Leven Road Gas Works Site

21.3.5 ARTIFICIAL SOURCES

The Leven Road Gas Works site is shown to be at risk of flooding from reservoir breach. A breach in either of the William Girling or King George V reservoirs located in the LB of Enfield is predicted to affect the western portion of the site. No information was provided from the Environment Agency on the rate of onset of flooding nor the hazard associated with the event, however a breach of either of these large reservoirs is likely to result in catastrophic consequences due to fast, deep flowing water. The site is located 14km away from the closest reservoir, hence it is likely that adequate warning could be provided to site users in the event of a breach. Development should consider the impacts for a reservoir breach and consult the Environment Agency to determine the most appropriate response.

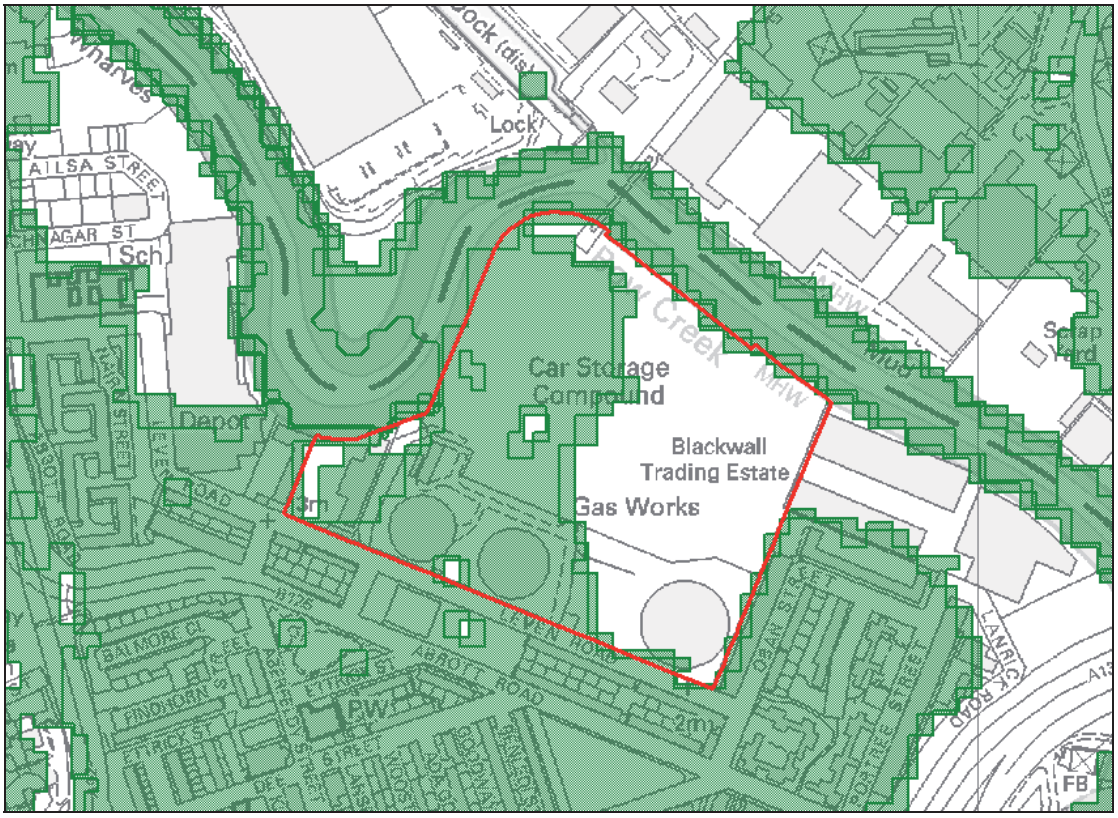

Figure 21-7 Reservoir Inundation Map at the Leven Road Gas Works Site

21.4 General Flood Risk Management

The entirety of the site is located within Flood Zone 3. All of the proposed uses are permitted within this flood zone. 'More vulnerable' uses, such as the housing development, will be subject to the Sequential and Exception Tests.

The sequential approach should be adopted when considering development layout, locating higher vulnerability uses away from the central portion of the site where ground levels are lowest.

The site is shown to be at risk of flooding from a breach in the tidal or fluvial defences or as a result of a breach in the reservoirs located in the LB of Enfield. A site specific assessment of a breach in the fluvial defences has been carried out as part of the Level 1 SFRA. It is recommended that advice be sought from the Environment Agency to determine if this represents the worst case scenario for the site.

Finished flood levels for sleeping accommodation should be 300mm above the 0.5% AEP breach level. As the breach level is predicted to be 4.55mAOD, all sleeping accommodation must be located on the first or upper floors. Where possible, 'less vulnerable' uses should be located on the ground floor.

Future development should be made safe by consideration of safe access and egress during a breach event. Where possible, safe access routes into areas of high ground should be established. The Leven Road Gas Works site is located on and surrounded by low-lying ground. Access to and from the site may be difficult as surrounding roads are likely to be flooded should a breach occur. The construction of a bridge to convey site users to high ground on the eastern bank of the River Lee may be feasible. Some high ground is also available adjacent to the River Lee defences, particularly on the site immediately to the east.

The difficulty in establishing a safe access route highlights the importance of providing safe refuge for all occupants within the development. Consideration should be given to the duration at which the site is inundated, as this could be significant given the nature of the topography. This could have a considerable impact on the provision of safe refuge, evacuation routes, and safe access / egress.

Depths of water in a 0.5% AEP breach event are predicted to exceed 1m in low-lying areas of the site. It is recommended that flood resilience measures are incorporated into buildings to withstand the hydrostatic forces associated with deep water. Where possible, electrical fittings and appliances should be raised above the flood level.

All site users are to receive an 'information pack' from developers identifying, as a minimum, the risk of flooding, how this is being managed on site, actions site users should take in the event of a flood, appropriate emergency contact details.

A site specific flood emergency plan should be prepared, in consultation with Council emergency planners, emergency services, and with reference to Multi Agency Flood Plan to evacuate site users out of the floodplain in an 'emergency' flood event.

At source' control measures such as green roofs, rainwater harvesting and water butts should be included in the design. Permeable paving should be incorporated within carparking and hard landscape areas. Public gardens and open space should consider benefits of including swales, wetlands, ponds and 'rain gardens' for both surface water management and biodiversity.

The site is potentially at risk from elevated groundwater levels. It is recommended that groundwater levels are monitored as part of a geo-environmental site investigation to determine the depth to groundwater. Depending on the results of the groundwater monitoring, any underground structures in the development may require mitigation using impermeable materials.

The Environment Agency may impose a 16m buffer zone around the River Lee requiring developments to be set back from the River Lee defences. In addition, the defences may require upgrading.

The Environment Agency has stated that the site may be contaminated. Remediation may be required.

Will development increase flood risk elsewhere?
• Unlikely. Development layout must consider surface water flow routes and manage runoff on site sustainably with a target to achieve Greenfield runoff rates.
How can development reduce flood risk overall?
• Include 'at source' SUDS control measures to reduce existing site runoff in accordance with London Plan and local policy. • Maintain and/or improve the standard of protection provided by the defences on site, in accordance with EA strategy. Consider opportunities through development to make defence length on site 'unbreachable'.
How can the development be made safe?
• Floor levels of all sleeping accommodation to be raised 300mm above flood level, i.e. located on the first or upper floors • Consideration of safe access / egress from the site and safe refuge. • Implementation of a flood emergency plan. • Incorporation of flood resistance / resilience measures up to the flood level.
Is there a reasonable prospect of compliance with part c of the Exception Test?
Yes, subject to appropriate site layout adopting a sequential approach, raising ground flood levels above the 0.5%AEP event tidal breach level and agreeing emergency access arrangements.

22.0 Sorrel Lane

Site Number:	21
Site Location:	Sorel Lane / East India Dock Road / Leamouth Road
Grid Reference:	538860, 181110

Figure 22-1 Sorrel Lane Site

22.1 Site Description

The site occupies an area of 1.01ha and is bisected by Sorrel Lane which connects Coriander Avenue with the north bound carriageway of Leamouth Road. To the south of site East India Dock tunnel passes within a few metres of the surface. The River Lee is located 100m east of the site. Ground levels on site are approximate 6.5mAOD apart from Sorrel Lane where ground levels are at 5mAOD. The site is currently open space, vacant land. The proposed uses of the site include a primary school and a district heating facility

In accordance with Table D2 of PPS 25, the classifications of the proposed uses are as follows:

Proposed Land Use	Vulnerability Classification
Primary School	More vulnerable
District Heating facility	Less vulnerable

22.2 SUMMARY OF FLOOD RISK

22.2.1 FLOOD ZONE MAPS

The entirety of the site is located within Flood Zone 3. All proposed land uses are permitted within this flood zone, however 'more vulnerable' land uses will be subject to the Sequential and Exception Tests.

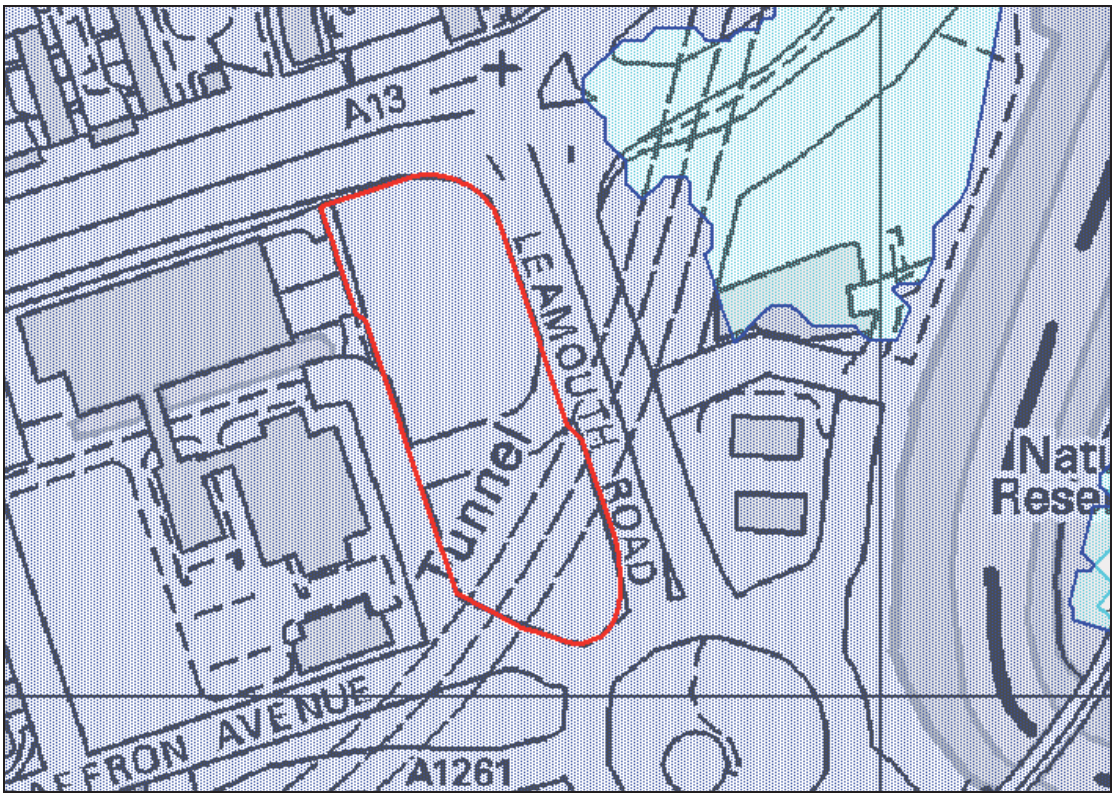

Figure 22-2 PPS25 Flood Zones at the Sorrel Lane Site

22.3 SOURCES OF FLOODING

22.3.1 TIDAL

Actual Risk

The site is defended from tidal inundation during the 0.5% AEP tidal event by the existing Thames Tidal Flood Defences (including the Thames Barrier) for the lifetime of the development. The site is considered to be at low risk of tidal flooding.

Residual Risk

There is a residual risk of tidal flooding from an extreme surge event. The site is defended against inundation from the River Thames during a 0.1% AEP tidal event and is considered as having a low probability of the defences overtopping.

The site is located 300m from the River Thames Tidal Defences. The assessment of a breach in the defences at Blackwall (Breach 2), carried out as part of the Level 1 SFRA, does not result in inundation of the site. Examination of the ground levels between the site and the defences shows that the area is generally built up, with ground levels in the vicinity of 5-6mAOD. The tidal peak in the River Thames in a 0.5% AEP event for the year 2107 is 4.8mAOD. Consequently, the risk of tidal breach is considered low.

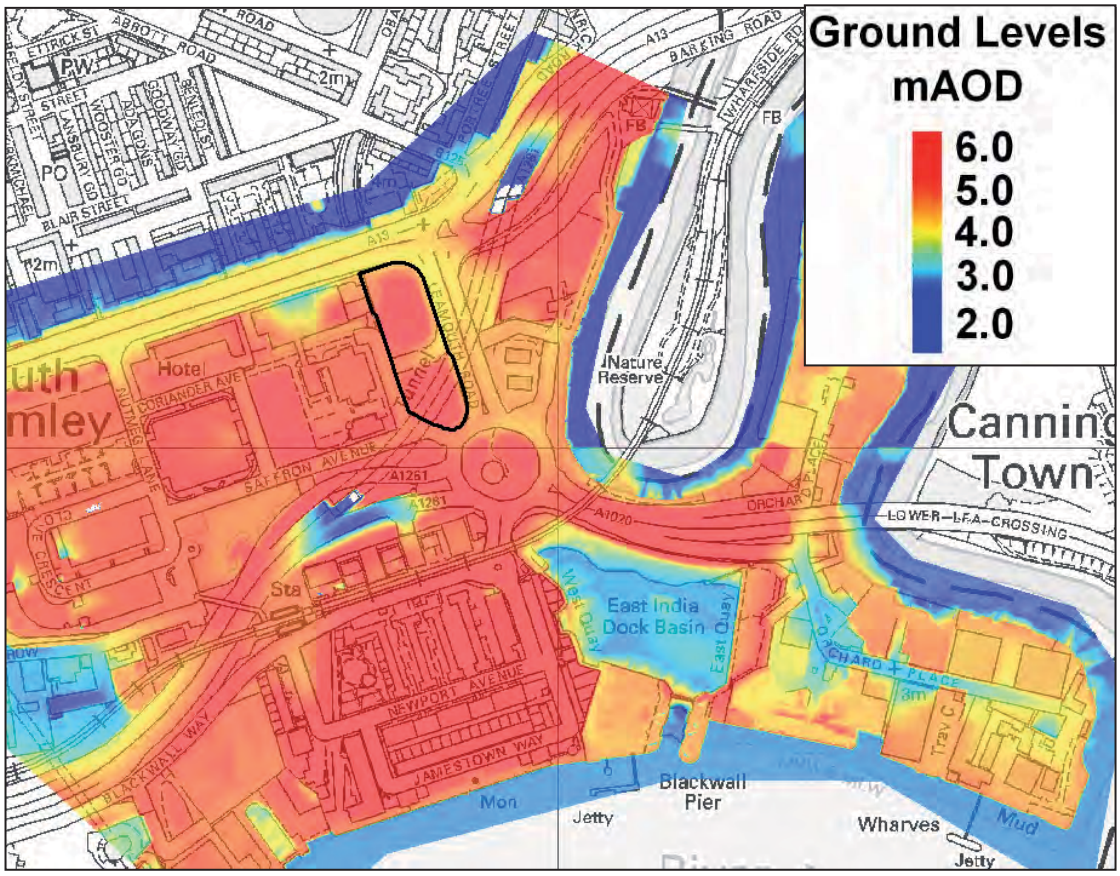

Figure 22-3 PPS25 Ground Levels at the Sorrel Lane Site

22.3.2 FLUVIAL

Actual Risk

The site is located outside of the 1% AEP event with inclusion of climate change flood extent of the River Lee. The site is defended by the River Lee defences. The site is concluded as being at a low risk of actual fluvial flooding.

Residual Risk

The site is located outside of the 0.1% AEP event flood extent of the River Lee.

The site is located within 100m of the River Lee and there is a residual risk that a breach in the defences could result in flooding of the site. The assessment of a breach in the defences at Bromley (Breach 1), carried out as part of the Level 1 SFRA, does not result in inundation of the site. The flood extent is confined to the low-lying area to the north of the site. A site specific breach assessment to is unlikely to result in inundation of the site due to high ground levels as shown in Figure 22-3. The site is concluded to be at low risk of residual fluvial flooding.

22.3.3 SURFACE WATER/SEWER

Small, isolated areas of ponding water are predicted across the site in a 1% AEP event. These are likely to be a result of inaccuracies in the LiDAR or assumptions in the modelling. The site is considered to have a low risk of surface water flooding.

22.3.4 GROUNDWATER

The site is not shown to have an increased potential risk of elevated groundwater.

22.3.5 ARTIFICIAL SOURCES

The East India Dock Basin is located 200m to the south east of the site. The basin is not raised above ground level and the area surrounding the basin has been built up. The risk of breach is therefore assessed as low. Should the locks used to maintain the water level fail in a tidal surge event, there is a low probably of flooding on site as the A1020 is raised and acts as a barrier, preventing the propagation of flood waters.

22.4 GENERAL FLOOD RISK MANAGEMENT

The entirety of the site is located within Flood Zone 3. All proposed land uses are permitted within this flood zone, however 'more vulnerable' land uses will be subject to the Sequential and Exception Tests.

The sequential approach should be adopted when considering development layout, locating higher vulnerability uses where ground levels are highest and lower vulnerability uses elsewhere on site.

At source' control measures such as green roofs, rainwater harvesting and water butts should be included in the design. Permeable paving should be incorporated within carparking and hard landscape areas. Public gardens and open space should consider benefits of including swales, wetlands, ponds and 'rain gardens' for both surface water management and biodiversity.

Will development increase flood risk elsewhere?
• Unlikely. Development layout must consider surface water flow routes and manage runoff on site sustainably with a target to achieve Greenfield runoff rates.
How can development reduce flood risk overall?
• Include 'at source' SUDS control measures to reduce existing site runoff in accordance with London Plan and local policy.
How can the development be made safe?
• Adoption of the sequential approach.
Is there a reasonable prospect of compliance with part c of the Exception Test?
Yes, for reasons above.

23.0 Leamouth Peninsula

Site Number:	22
Site Location:	Orchard Place
Grid Reference:	539300, 181170

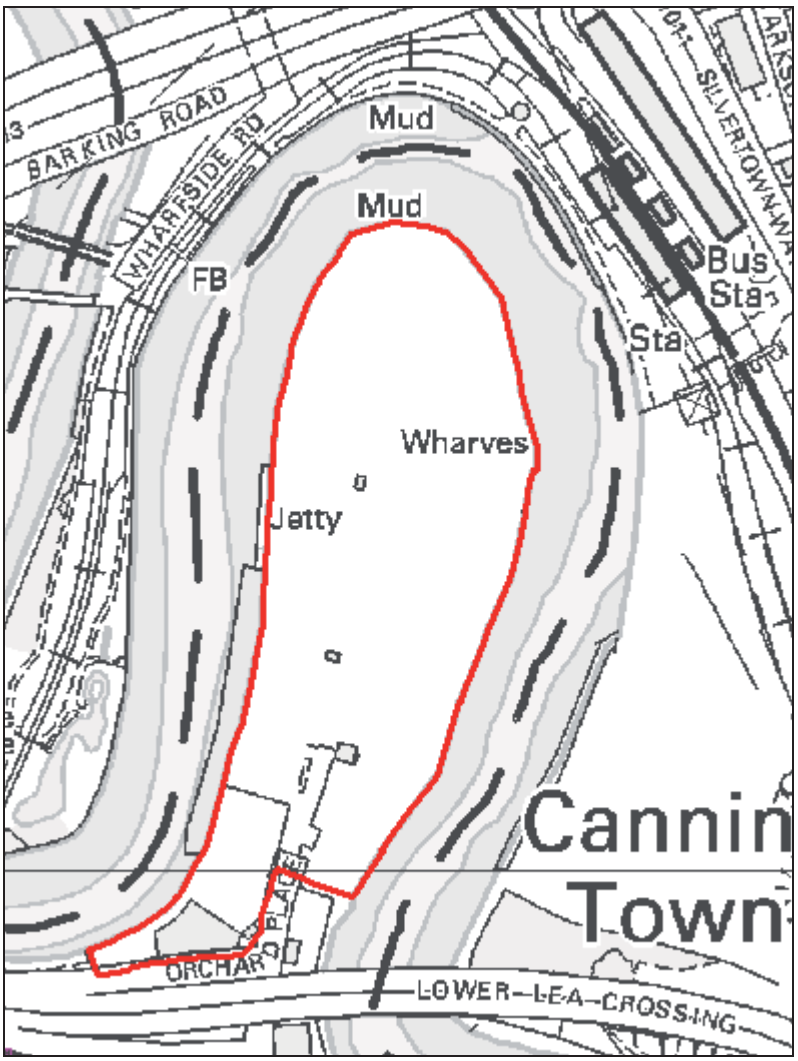

Figure 23-1 Leamouth Peninsula Site

23.1 Site Description

The Leamouth Peninsula site is situated within a bend of the River Lee in the southeast corner of the borough. The site is accessed through Orchard Place, off the Lower Lee Crossing (A1020). Ground levels on site are generally highest along the boundary with the River Lee. Ground levels in the centre of the site are as low as 4mAOD. The site is currently vacant land. The proposed uses of the site include a large-scale housing development and a district heating facility. These uses will form part of a larger mixed use development to include commercial uses and open space.

In accordance with Table D2 of PPS 25, the classifications of the proposed uses are as follows:

Proposed Land Use	Vulnerability Classification
Large scale housing development	More vulnerable
District Heating facility	Less vulnerable

23.2 Summary of Flood Risk

23.2.1 Flood Zone Maps

The entirety of the site is located within Flood Zone 3. All proposed land uses are permitted within this flood zone, however 'more vulnerable' land uses will be subject to the Sequential and Exception Tests.

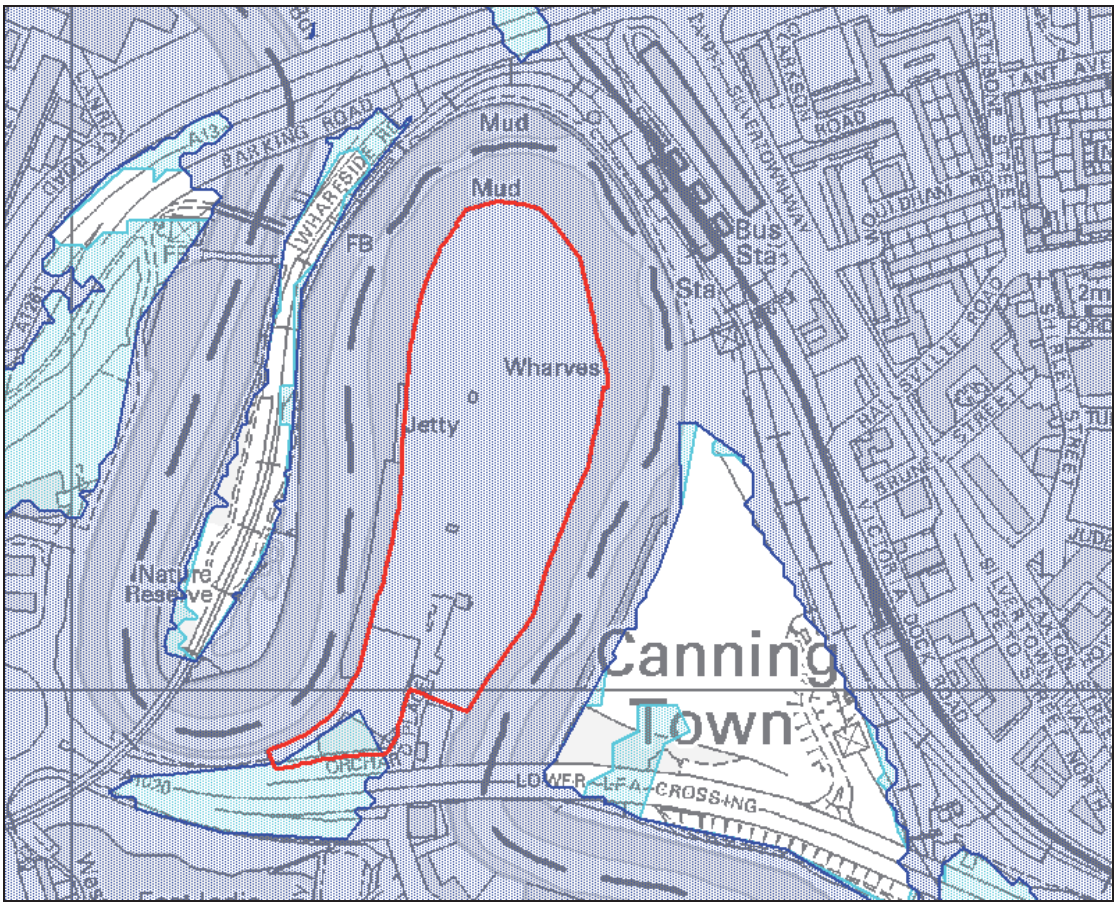

Figure 23-2 PPS25 Flood Zones at the Leamouth Peninsula Site

23.3 Sources of Flooding

23.3.1 Tidal

Actual Risk

The site is defended from tidal inundation during the 0.5% AEP tidal event by the existing Thames Tidal Flood Defences (including the Thames Barrier) for the lifetime of the development. The site is considered to be at low risk of tidal flooding.

Residual Risk

There is a residual risk of tidal flooding from an extreme surge event. The site is defended against inundation from the River Thames during a 0.1% AEP tidal event and is considered as having a low probability of the defences overtopping.

The site is located less than 300m from the River Thames Tidal defences. The breach assessments carried out as part of the Level 1 SFRA do not predict inundation of the site. A breach in the Thames Tidal defences in the vicinity of the site may result in flooding of low-lying areas. A site specific breach assessment may be required to inform site specific flood risk management measures.

23.3.2 FLUVIAL

Actual Risk

The site is located outside of the 1% AEP event with inclusion of climate change flood extent of the River Lee. The site is defended by the River Lee defences. The site is concluded as being at a low risk of actual fluvial flooding.

Residual Risk

The site is located outside of the 0.1% AEP event flood extent of the River Lee.

There is a residual risk of a breach in the River Lee defences that could result in the rapid inundation of flood waters on site. A site specific breach assessment is likely to be required to inform site specific flood risk measures. The stretch of the River Lee adjacent to the site is tidally influenced. Hence the peak breach level is likely to be similar to the 0.5% AEP tidal peak (year 2107) of 4.8mAOD. In such a scenario, the centre of the site and the access to Orchard Place may be flooded up to 0.8m.

A breach in the fluvial defences on site is likely to have catastrophic consequences due to rapid inundation of the site. Development must consider safe access / egress for site users and emergency services as well as safe refuge.

23.3.3 SURFACE WATER/SEWER

A small area of the site near to Orchard Place is shown to be at risk from surface water flooding during a 1% AEP rainfall event. Depths of water are typically around 0.3m.

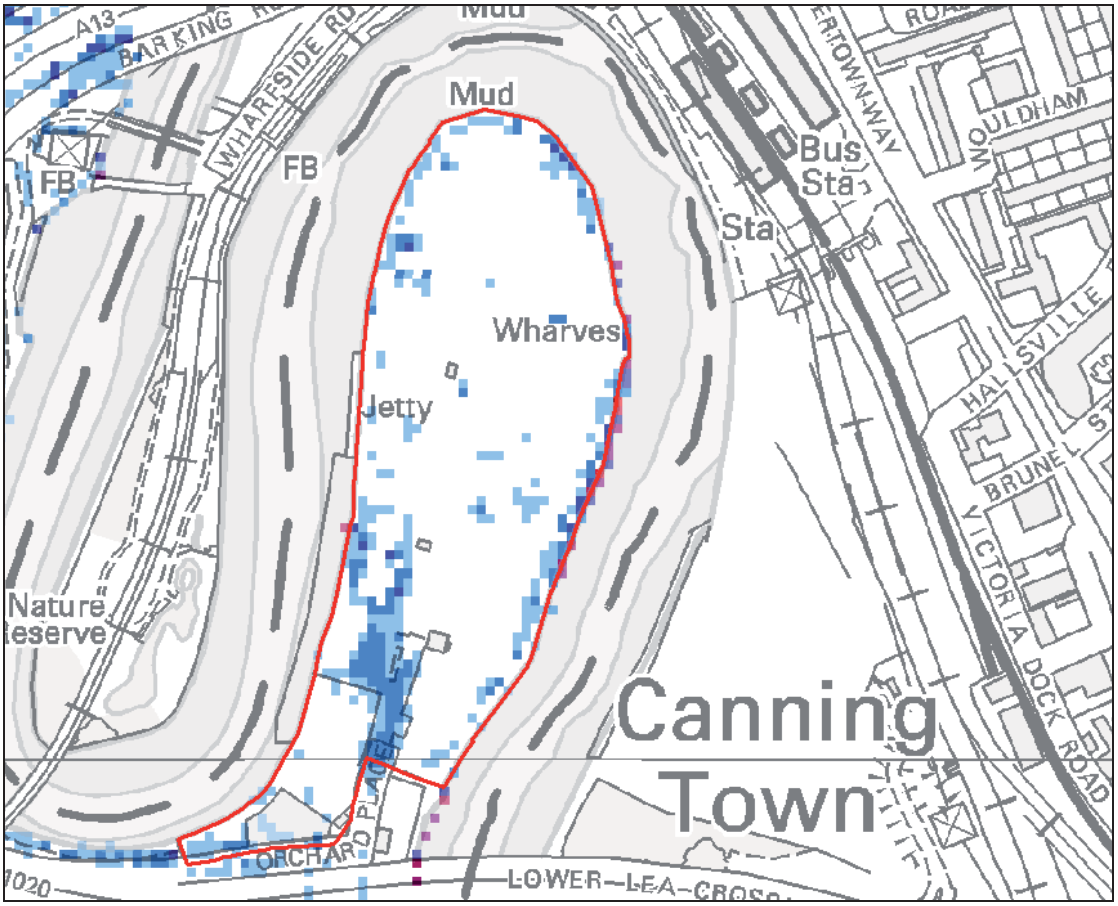

Figure 23-3 Maximum Depth of Surface Water in a 1% AEP Rainfall Event at the Leamouth Peninsula Site

23.3.4 GROUNDWATER

The site is not shown to have an increased potential risk of elevated groundwater.

23.3.5 ARTIFICIAL SOURCES

The East India Dock Basin is located less than 200m to the south west of the site. The basin is not raised above ground level and the area surrounding the basin has been built up. The risk of breach or failure of the lock gates resulting in flooding on site is therefore assessed as low.

23.4 GENERAL FLOOD RISK MANAGEMENT

The entirety of the site is located within Flood Zone 3. All proposed land uses are permitted within this flood zone, however 'more vulnerable' land uses will be subject to the Sequential and Exception Tests.

The Sequential Approach should be adopted in the development layout. Ground levels are naturally higher along the northern tip of the site. Higher vulnerability land uses should be located here with lower vulnerability and water compatible uses located in the centre of the site.

A site specific breach assessment may be required to ascertain the risk of tidal and fluvial breach. The results of the assessment are to be used in the development of site specific flood risk management measures.

Finished floor levels for sleeping accommodation should be 300mm above the 0.5% AEP breach level.

Alternatively, 'less vulnerable' uses to be located on the ground floor with 'more vulnerable' uses located on the first or upper floors.

Future development must be made safe by consideration of safe access and egress during a breach event. Where possible, safe access routes into areas of high ground should be established. Orchard Place is currently the only access road into and out of the site. This road leads to higher ground westbound along the A1020. The current levels of the road suggest it may flood in the event of a breach. A detailed assessment of flooding mechanisms will need to be carried out to confirm feasibility. It may be necessary to consider other routes such as the construction of a bridge to convey site users to high ground on the eastern bank of the River Lee.

Where appropriate 'less vulnerable' uses on ground floors to incorporate flood resilience or resistance measures.

All site users are to receive an 'information pack' from developers identifying, as a minimum, the risk of flooding, how this is being managed on site, actions site users should take in the event of a flood, appropriate emergency contact details.

A site specific flood emergency plan should be prepared, in consultation with Council emergency planners, emergency services, and with reference to Multi Agency Flood Plan to evacuate site users out of the floodplain in an 'emergency' flood event.

At source' control measures such as green roofs, rainwater harvesting and water butts should be included in the design. Permeable paving should be incorporated within carparking and hard landscape areas. Public gardens and open space should consider benefits of including swales, wetlands, ponds and 'rain gardens' for both surface water management and biodiversity.

The Environment Agency has stated that the flood defences in this are being upgraded and setback. A 16m buffer zone may be required around the River Lee, setting back developments from the defences. As part of development in this area, an assessment of the existing defences and their current condition should be made as part of the FRA. Any vulnerable points should be identified and proposals made to improve these to a standard agreed with the Environment Agency as part of the development process.

Will development increase flood risk elsewhere?
• Unlikely. Development layout must consider surface water flow routes and manage runoff on site sustainably with a target to achieve Greenfield runoff rates.
How can development reduce flood risk overall?
• Include 'at source' SUDS control measures to reduce existing site runoff in accordance with London Plan and local policy. • Maintain and/or improve the standard of protection provided by the defences on site, in accordance with EA strategy. Consider opportunities through development to make defence length on site 'unbreachable'.
How can the development be made safe?
• Adoption of Sequential Approach to development layout • Floor levels of all sleeping accommodation to be raised 300mm above flood level or the location of 'less vulnerable' uses on the ground flood with 'more vulnerable' uses on the first or upper floors. • Consideration of safe access / egress from the site and safe refuge. • Implementation of a flood emergency plan.

• Incorporation of flood resistance / resilience measures up to the flood level.
Is there a reasonable prospect of compliance with part c of the Exception Test?
Yes, for reasons above.

24.0 Reuters LTD

Site Number:	23
Site Location:	Paul Julius Close
Grid Reference:	538684, 180674

Figure 24-1 Reuters LTD Site

24.1 Site Description

The Reuters LTD site is bounded by Blackwall Way to the north, the River Thames to the south and is located just east of the Blackwall Tunnel. The site occupies 1.89Ha of land and is currently used as a car park and ancillary uses for the adjacent Reuters LTD offices. It contains a Grade II listed dock and a small listed pump house adjacent to the graving dock. The site is relatively flat, with the topography varying between 5-6mAOD (excluding the dock area). The proposed use of the site is a large scale housing development and a district heating facility.

In accordance with Table D2 of PPS 25, the classifications of the proposed uses are as follows:

Proposed Land Use	Vulnerability Classification
Large scale housing development	More vulnerable
District Heating facility	Less vulnerable

24.2 SUMMARY OF FLOOD RISK

24.2.1 FLOOD ZONE MAPS

The entirety of the site is located within Flood Zone 3. All proposed land uses are permitted within this flood zone, however 'more vulnerable' land uses will be subject to the Sequential and Exception Tests.

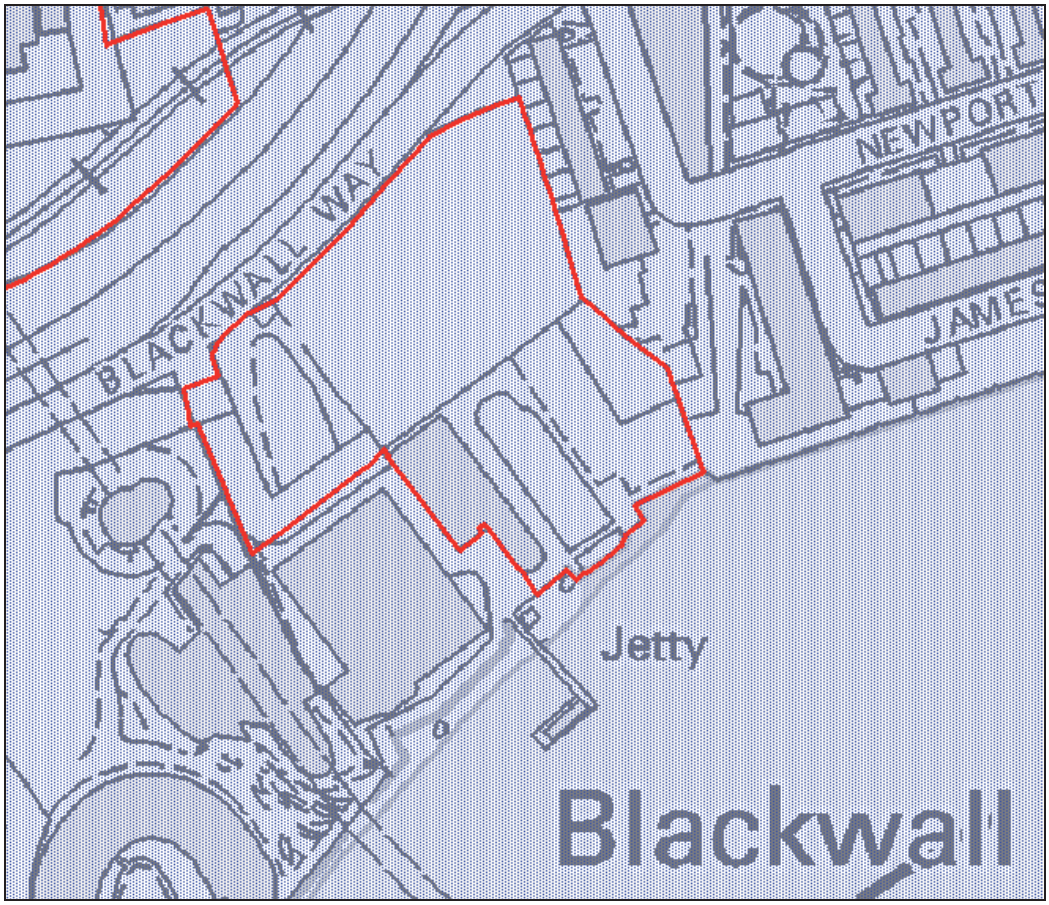

Figure 24-2 PPS25 Flood Zones at the Reuters LTD Site

24.3 SOURCES OF FLOODING

24.3.1 TIDAL

Actual Risk

The site is defended from tidal inundation during the 0.5% AEP tidal event by the existing Thames Tidal Flood Defences (including the Thames Barrier) for the lifetime of the development. The site is considered to be at low actual risk of tidal flooding.

Residual Risk

There is a residual risk of tidal flooding from an extreme surge event. The site is defended against inundation from the River Thames during a 0.1% AEP tidal event and is considered as having a low probability of the defences overtopping.

The proximity of the site to the River Thames tidal defences means that a breach in the defences could have catastrophic consequences on site. However, an examination of the tidal peak of the 0.5% AEP event for the year 2107 (4.8mAOD), show that ground levels on site are much higher with lowest levels being 5.3mAOD. A breach assessment for this flood event is therefore unlikely to result in inundation of the site. The site is concluded as having a low residual risk of tidal flooding.

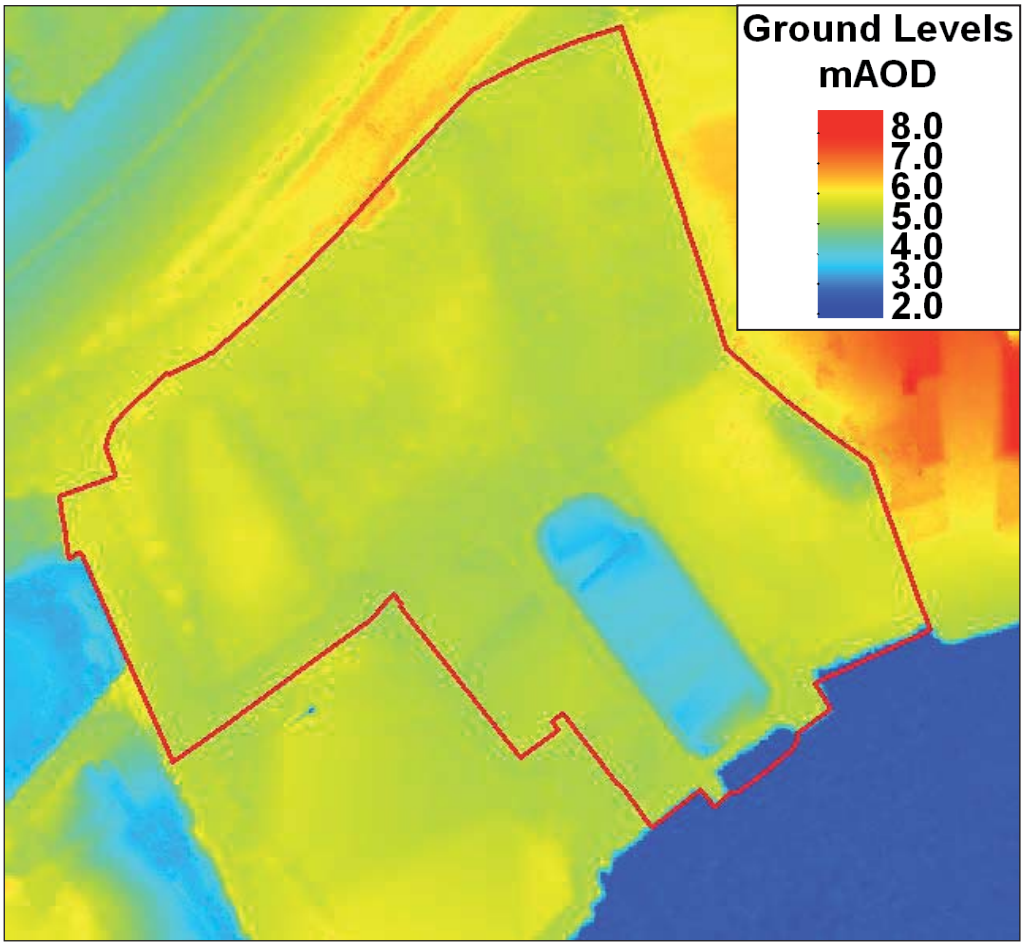

Figure 24-3 Ground Levels at the Reuters LTD Site

24.3.2 FLUVIAL

Actual Risk

The site is located outside of the 1% AEP event with inclusion of climate change flood extent of the River Lee. The site is defended by the River Lee defences and is concluded as having a low actual risk of fluvial flooding.

Residual Risk

The site is located outside of the 0.1% AEP event flood extent of the River Lee.

The risk of a breach in the fluvial defences of the River Lee is unlikely to result in inundation of the site. The

A1020 is located between the River Lee and the site. The road is raised and is likely to act as a barrier preventing flood waters from entering the site. The site is concluded as having a low residual risk of fluvial flooding.

24.3.3 Surface Water/Sewer

The site is not shown to be at risk or surface water flooding. Some accumulation of water is predicted however this is confined to the Dock.

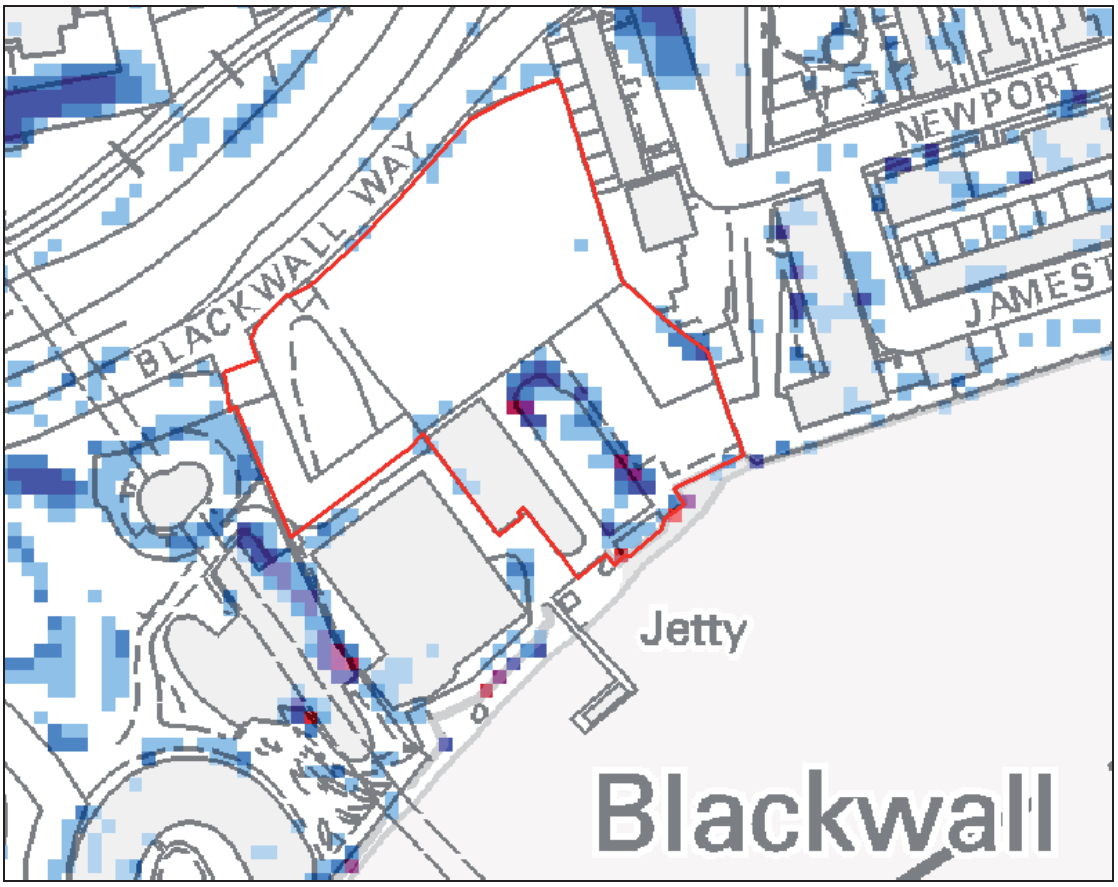

Figure 24-4 Maximum Depth of Surface Water in a 1% AEP Rainfall Event at the Reuters LTD Site

24.3.4 Groundwater

The site is not shown to be at an increased potential risk of elevated groundwater.

24.3.5 Artificial Sources

The East India Dock Basin is located 300m to the east of the site. The basin is not raised above ground level and the area surrounding the basin has been built up. The risk of breach or failure of the lock gates resulting in flooding on site is therefore assessed as low.

The Poplar Dock is located 300m to the west of the site. A breach or failure of the lock gates is likely to result in flooding of the low-lying area between the Docks and the site. Ground levels on site are sufficiently high such that the risk of inundation is assessed as low.

A small graving dock is located within the site boundary. Ground levels immediately adjacent to the site are approximately 5.3mAOD, 0.5m above the 0.5% AEP tidal peak for the year 2107. Breach or failure of the lock gates is unlikely to result in flooding of the site.

24.4 General Flood Risk Management

The entirety of the site is located within Flood Zone 3. 'More vulnerable' land uses are permitted within this zone however will be subject to the Sequential and Exception Test.

The site is shown to be defended from actual risk of tidal or fluvial flooding. The existing ground levels on site have been found to be above the 0.5% AEP with climate change tidal peak hence, a breach in the tidal defences is unlikely to result in inundation of the site.

The sequential approach should be adopted when considering development layout, locating higher vulnerability uses where ground levels are highest and lower vulnerability uses elsewhere on site.

The Environment Agency is likely to require a setback distance from the River Thames defences i.e. no development to be within a specified distance of the flood defence. In addition the Environment Agency has stated that flood defences in this area will require upgrading and possibly setting back from the existing line.

At source' control measures such as green roofs, rainwater harvesting and water butts should be included in the design. Permeable paving should be incorporated within carparking and hard landscape areas. Public gardens and open space should consider benefits of including swales, wetlands, ponds and 'rain gardens' for both surface water management and biodiversity.

Will development increase flood risk elsewhere?
• Unlikely. Development layout must consider surface water flow routes and manage runoff on site sustainably with a target to achieve Greenfield runoff rates.
How can development reduce flood risk overall?
• Include 'at source' SUDS control measures to reduce existing site runoff in accordance with London Plan and local policy. • Maintain and/or improve the standard of protection provided by the defences on site, in accordance with EA strategy. Consider opportunities through development to make defence length on site 'unbreachable'.
How can the development be made safe?
• Adoption of the Sequential Approach in development layout.
Is there a reasonable prospect of compliance with part c of the Exception Test?
• Yes, for reasons above..

25.0 Blackwall Reach Regeneration Project

Site Number:	24
Site Location:	Cotton Street / Robin Hood Lane
Grid Reference:	538248, 180829

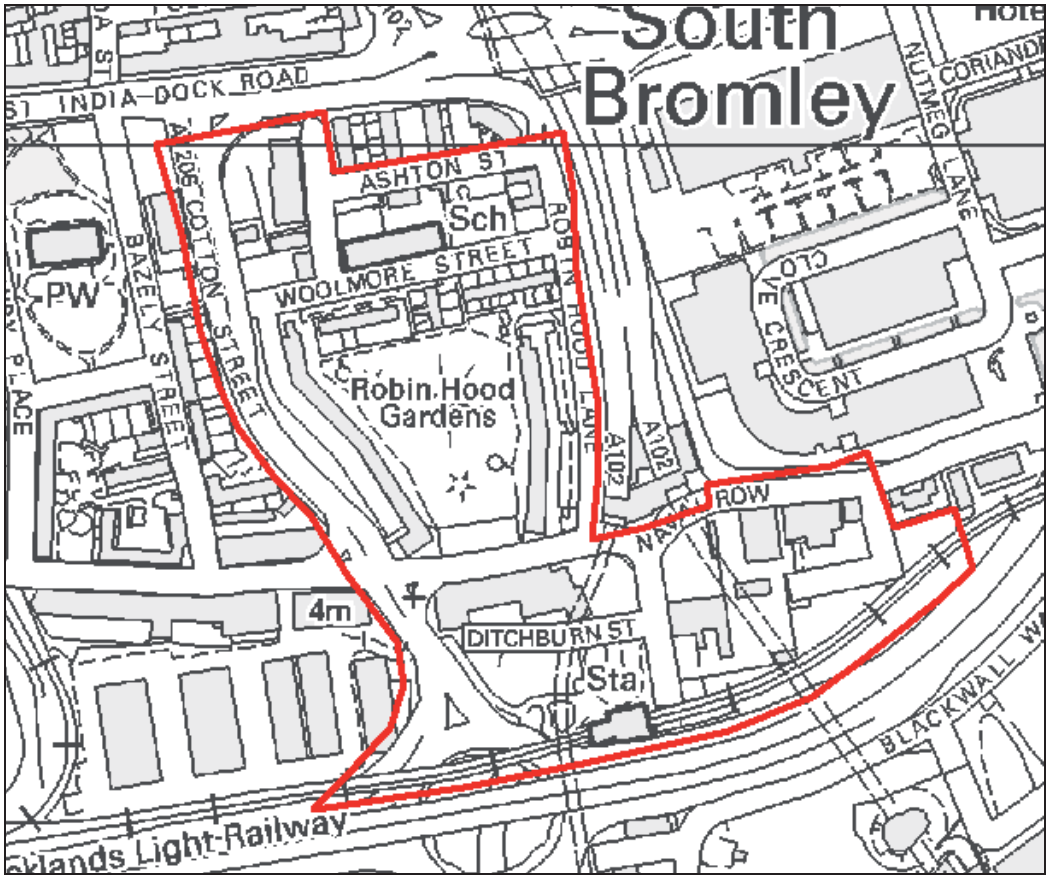

Figure 25-1 Blackwall Reach Regeneration Project Site

25.1 Site Description

The Blackwall Reach Regeneration Project site occupies 8.47Ha of land and is bordered by the Blackwall Tunnel Northern Approach to the east, Cotton Street to the west, East India Dock Road to the north and the Dockland Light Railway to the south of the site. The site currently comprises of a primary School, the Robin Hood Garden Estate housing blocks and the buildings adjoining Blackwall DLR Station comprising workshops, garages and car parking.

Ground levels vary considerably across the site due to the tunnel approach road to the east, the split level junction to the South and the raised ground in the centre of Robin Hood Gardens. Levels within the site are generally between 2 and 5mAOD with higher levels generally towards the north of the site and the lowest levels in the south. The proposed site use is for a large scale housing development, primary school and a district heating facility.

In accordance with Table D2 of PPS 25, the classifications of the proposed uses are as follows:

Proposed Land Use	Vulnerability Classification
Large scale housing development	More vulnerable
Primary School	More vulnerable
District Heating facility	Less vulnerable

25.2 SUMMARY OF FLOOD RISK

25.2.1 FLOOD ZONE MAPS

The majority site is located within Flood Zone 3. All proposed land uses are permitted within this flood zone however 'more Vulnerable' uses will be subject to the Sequential and Exception Tests.

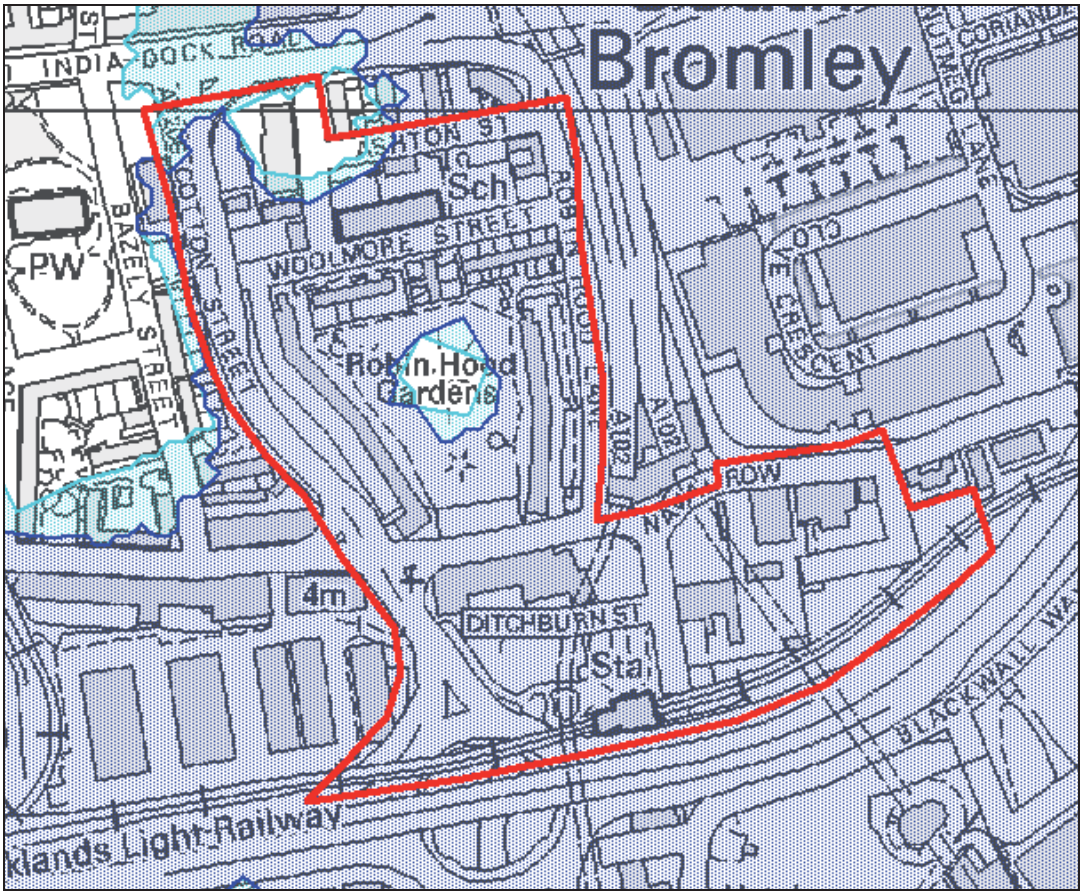

Figure 25-2 PPS25 Flood Zones at the Blackwall Reach Regeneration Project Site

25.3 SOURCES OF FLOODING

25.3.1 TIDAL

Actual Risk

The site is defended from tidal inundation during the 0.5% AEP tidal event by the existing Thames Tidal Flood Defences (including the Thames Barrier) for the lifetime of the development. The site is considered to be at low actual risk of tidal flooding.

Residual Risk

There is a residual risk of tidal flooding from an extreme surge event. The site is defended against inundation from the River Thames during a 0.1% AEP tidal event and is considered as having a low probability of the defences overtopping.

The assessment of a breach in the defences at Blackwall (Breach 2) carried out as part of the Level 1 SFRA, shows that the southern and eastern parts of the site are inundated in a 0.5% AEP tidal event. The resulting hazard is assessed to be largely 'significant' with the area to the north of Blackwall DLR station experiencing an 'extreme' hazard. Depths of water at this location exceed 2m.

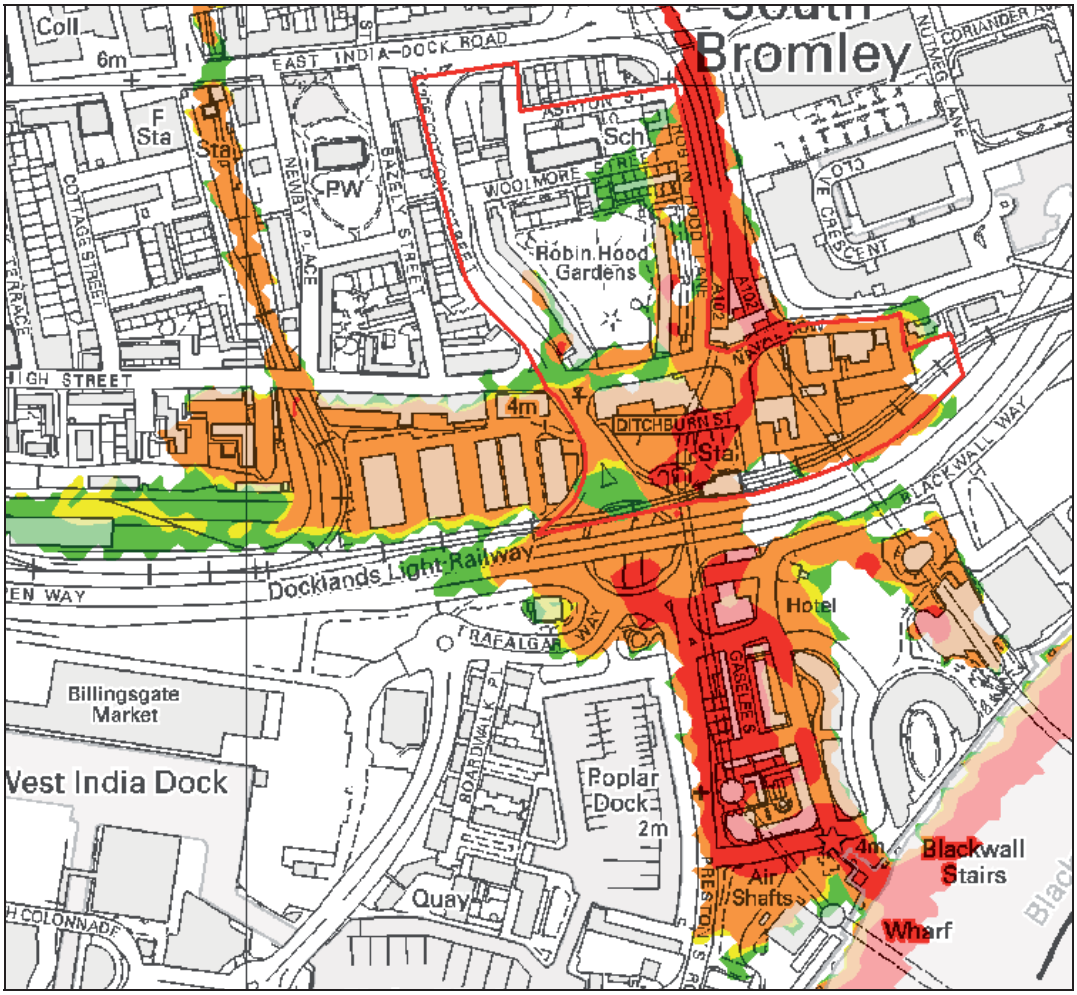

Figure 25-3 Blackwall Breach Extent at the Blackwall Reach Regeneration Project Site

25.3.2 FLUVIAL

Actual Risk

The site is located outside of the 1% AEP event with inclusion of climate change flood extent of the River Lee. The site is defended by the River Lee defences and is concluded as having a low risk of actual fluvial flooding.

Residual Risk

The site is located outside of the 0.1% AEP event flood extent of the River Lee.

The assessment of a breach in the defences at Bromley (Breach 1) carried out as part of the Level 1 SFRA,

shows that the majority of the site is inundated in a 0.5% AEP tidal event. The resulting hazard is assessed to be largely 'significant' with the area to the north of Blackwall DLR station experiencing an 'extreme' hazard. Depths of water at this location reach up to 2m.

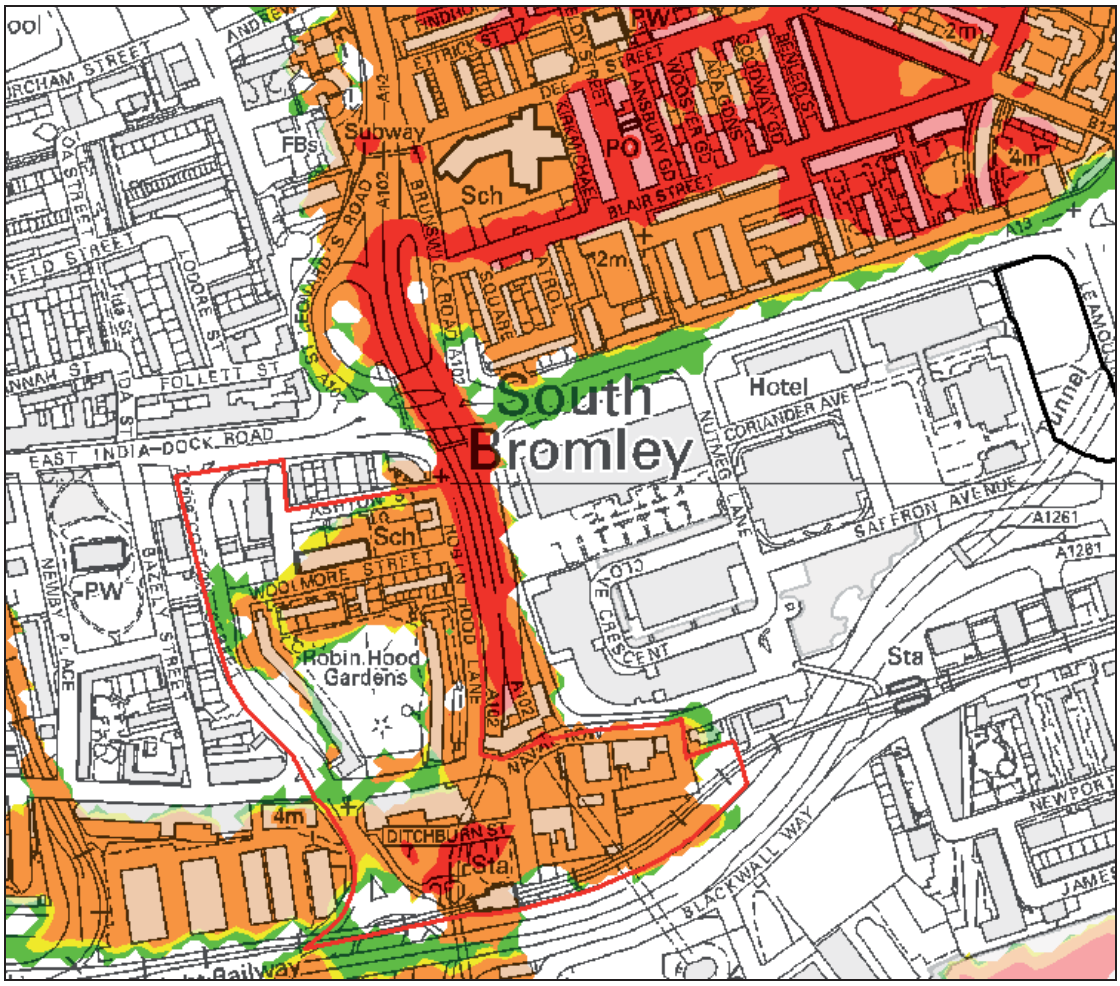

Figure 25-4 Bromley Breach Extent at the Blackwall Reach Regeneration Project Site

25.3.3 *Surface Water/Sewer*

Surface water is predicted to pond the low-lying areas on site particularly to the east and west of Robin Hood Gardens. Depths of water are predicted to reach between 0.5m and 1m. Some ponding water up to 0.7m in depth is also observed along Scouler Street off Navel Row in the southeast of the site.

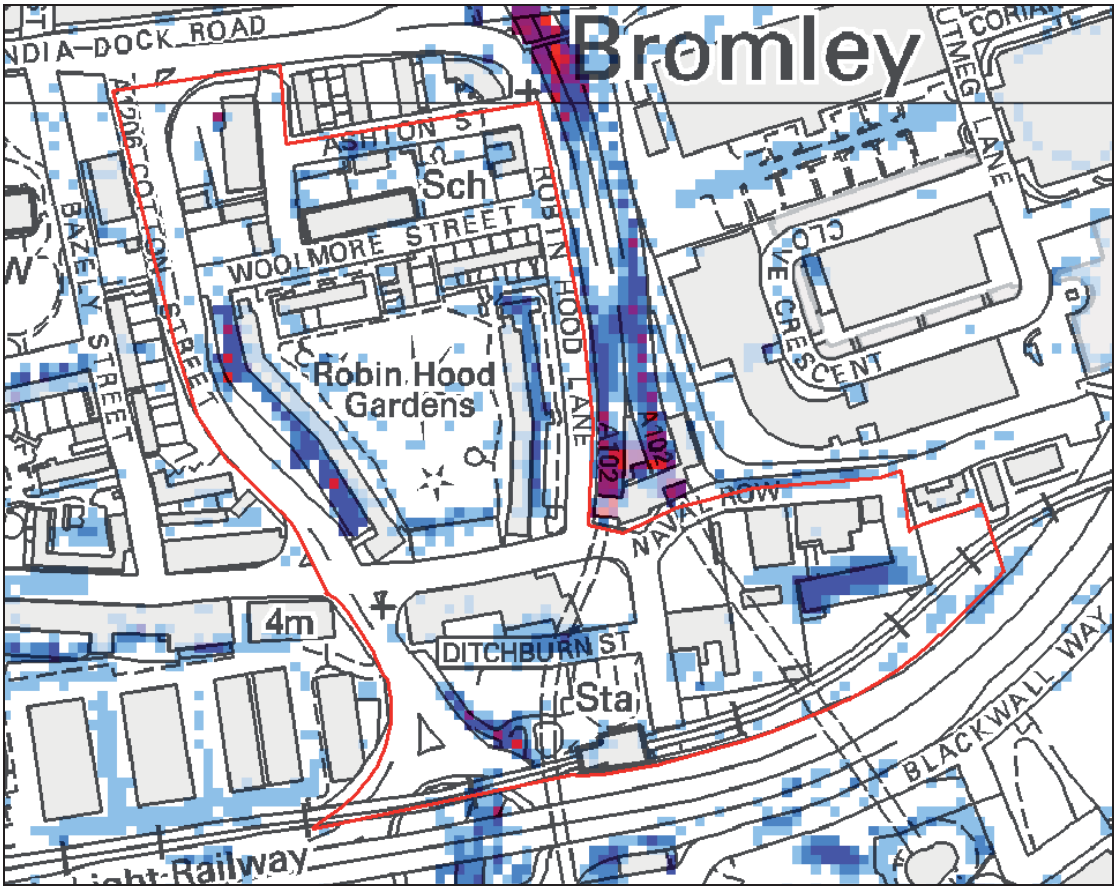

Figure 25-5 Maximum Depth of Surface Water in a 1% AEP Rainfall Event at the Blackwall Reach Regeneration Project Site

25.3.4 GROUNDWATER

A small proportion of the site is located in an area shown to have an increased potential of elevated groundwater. It is recommended that the susceptibility of the site to groundwater flooding is verified. If the site or parts of the site are shown to be at risk, development proposals will need to consider site ground conditions and groundwater levels over the lifetime of the development. In particular the design of any underground structures or services and foundations.

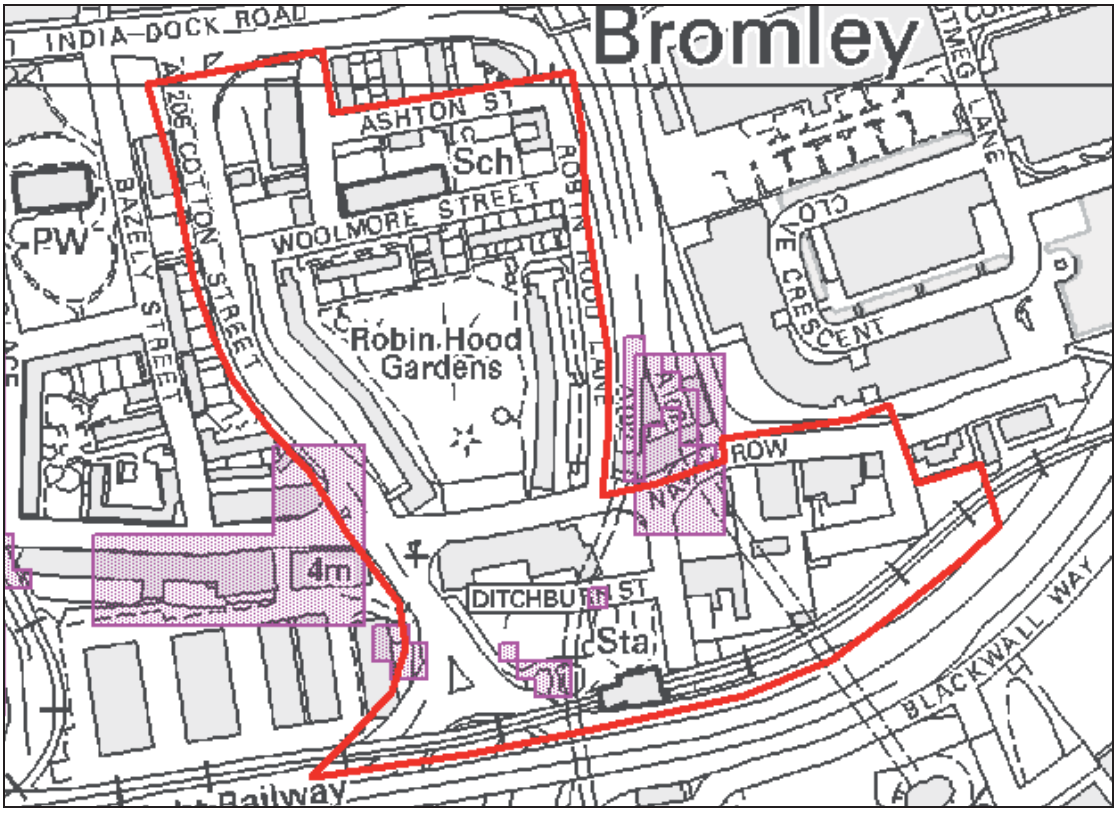

Figure 25-6 Increased Potential of Elevated Groundwater at the Blackwall Reach Regeneration Project Site

25.3.5 ARTIFICIAL SOURCES

The East India Dock Basin is located 400m to the east of the site. The basin is not raised above ground level and the area surrounding the basin has been built up. The risk of breach or failure of the lock gates resulting in flooding on site is therefore assessed as low.

The Poplar Dock is located 300m to the west of the site. A breach or failure of the lock gates is likely to result in flooding of the low-lying area between the Docks and the site. Ground levels on site are sufficiently high such that the risk of inundation is assessed as low.

25.3.6 GENERAL FLOOD RISK MANAGEMENT

The majority site is located within Flood Zone 3. 'More Vulnerable' uses are permitted within this flood zone however will be subject to the Sequential and Exception Tests.

The Sequential Approach should be adopted in the development layout. Ground levels are naturally higher along the northern boundary of the site. Higher vulnerability land uses should be located here with lower vulnerability and water compatible uses located in the southern and eastern parts of the site adjacent to the Blackwall DLR station.

Breach assessments carried out as part of the Level 1 SFRA show that the site is at risk of a breach in the tidal and fluvial defences. A site specific breach assessment may need to be carried out to determine the worst case scenario for the site and also to aid in the development of site specific flood risk management measures.

Finished floor levels for sleeping accommodation should be 300mm above the 0.5% AEP breach level. Alternatively, 'less vulnerable' uses to be located on the ground floor with 'more vulnerable' uses located on

the first or upper floors. Where appropriate 'less vulnerable' uses on ground floors to incorporate flood resilience or resistance measures and buildings designed to withstand the hydrostatic forces from a breach.

Future development must be made safe by consideration of safe access and egress during a flood event. A suitable evacuation route could include East India Dock Road, however this needs to be verified following confirmation of flooding mechanisms. Safe refuge could be provided in the north of the site and in the centre (Robin Hood Gardens) where ground levels are highest. A primary school has been included in the proposed develops and could be designed as a refuge centre in times of flood.

It may be difficult to provide safe access/egress to parts of the site, in particular the low-lying areas south of Navel Row near Blackwall DLR station. Consequently, it is vital that floor levels of all habitable residences in these areas are above the 0.5% AEP plus climate change breach level. In addition, safe refuge for all occupants within the development needs to be provided above the 0.5% AEP plus climate change breach level. Consideration should also be given to the duration at which these areas are inundated, as this could be significant given the nature of the topography. This could have a considerable impact on the provision of safe refuge, evacuation routes, and safe access / egress.

All site users are to receive an 'information pack' from developers identifying, as a minimum, the risk of flooding, how this is being managed on site, actions site users should take in the event of a flood, appropriate emergency contact details.

A site specific flood emergency plan should be prepared, in consultation with Council emergency planners, emergency services, and with reference to Multi Agency Flood Plan to evacuate site users out of the floodplain in an 'emergency' flood event.

'At source' control measures such as green roofs, rainwater harvesting and water butts should be included in the design. Permeable paving should be incorporated within carparking and hard landscape areas.

Will development increase flood risk elsewhere?
• Unlikely. Development layout must consider surface water flow routes and manage runoff on site sustainably with a target to achieve Greenfield runoff rates.
How can development reduce flood risk overall?
• Include 'at source' SUDS control measures to reduce existing site runoff in accordance with London Plan and local policy. • Flood resilience and resistance measures in new buildings where appropriate.
How can the development be made safe?
• Application of the sequential approach at site level • Finished floor levels should be 300mm above the 0.5% AEP breach level for all sleeping accommodation. • Consideration of safe access / egress from the site and safe refuge. • Implementation of a flood emergency plan. • Incorporation of flood resistance / resilience measures up to the flood level.
Is there a reasonable prospect of compliance with part c of the Exception Test?
Yes, subject to appropriate site layout adopting a sequential approach, raising ground flood levels above the 0.5%AEP event tidal breach level and agreeing emergency access arrangements.