

AECOM REF:	ACM_040	THURROCK REF:	60459	SITE NAME:	Rippleside Metalworks, Thames Road, Grays
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FLOOD RISK SUMMARY

The site is located in Grays. The River Thames frontage is approximately 257m southwest of the site.

The majority of the site (94.8%) is located within Flood Zone 3a 'High Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The remainder is located within Flood Zone 2 'Medium Probability of flooding' (5.2%). 100% of the site is indicated to be within future flood zones. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Tidal defences are present along the River Thames frontage.

Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, the site and local area are not shown to be at risk of flooding from overtopping of the defences along the Thames. However, the site is shown to be at residual risk of flooding from the sea in the event of a breach or failure of flood defences. This shows that all of the site is at risk of flooding in the event a breach or failure of flood defences during the 0.5% AEP for the year 2125. There is a large area of 'Extreme Hazard (Danger to All)' to the south of the site and an area of 'significant' hazard (Danger to most) to the north of the site. The maximum water level on site during this event (from breach location TIL001) is 4.4mAOD (from 0-2.5m of flood depth).

Risk of Flooding from Surface Water mapping indicates that the site and local area are susceptible to surface water ponding.

The BGS Susceptibility to Groundwater Flooding dataset indicates this area has 'limited potential for groundwater flooding to occur'.

100% of the site lies within the at risk of flooding from reservoirs in the event of breach or failure when there is also flooding from rivers.

SITE SPECIFIC RECOMMENDATIONS

More Vulnerable development (e.g. residential) is permitted in Flood Zone 2 (5.2% of the site). More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made:

Tidal and Fluvial

- Modelling of the design event (0.5% AEP including upper end climate change allowance) shows that the site and local area are not at risk of flooding through overtopping, so there are no specific requirements on Finished Floor Levels for residential accommodation in relation to the risk of flooding from the sea.
- The site is located within the Flood Warning Area for 'Thames estuary from Grays to Purfleet-on-Thames, including West Thurrock'. Safe access/egress is available for the site during the design event (overtopping) but is not available during a breach event. During a breach event, Thames Road is at Extreme hazard and Argent Street along the northern boundary of the site is at Significant hazard. Developers should ensure Emergency Plans are prepared for occupants of the site detailing the requirement to sign up to Flood Warnings and providing a clear response with respect to safe access routes and places of safety in the event of a Flood Warning or breach event.
- The site is at residual risk of flooding from the River Thames in the event of a breach in flood risk management infrastructure. Therefore, an internally accessible place of safety should be designed within the proposed development above the breach flood level during the *extreme* event (0.1% AEP including climate change), capable of accommodating the likely number of occupants. The maximum water level on the site during the *extreme* flood event from breach location TIL001 is approximately 4.52mAOD.

Surface Water

- Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing.
- Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.

AECOM REF:	ACM_041	THURROCK REF:	60474	SITE NAME:	Car Park, Coronation Road, East Tilbury
FLOOD RISK SUMMARY					
The site is located in West Thurrock. There is a main river approximately 718m east of the site. The River Thames frontage is approximately 1300m east of the site. The majority of the site (66.9%) is defined as Flood Zone 1 'Low Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The remainder (33.1%) is located within Flood Zone 2 'Medium Probability of flooding'. 100% of the site is indicated to be within future flood zones. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Tidal defences are present along the River Thames frontage. Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, the site and local area are not shown to be at risk of flooding from overtopping of the defences along the Thames. However, the site is shown to be at residual risk of flooding from the sea in the event of a breach or failure of flood defences. Part of the site is at risk of flooding in the event of a breach or failure of flood defences during the 0.5% AEP for the year 2125. There is a small area of 'Low' to 'Moderate' Hazard (Caution to danger to some) to the south of the site. The maximum water level on the site during this (from breach location ETIL002) is 5.7 mAOD (from 0-0.5m flood depth). The site is located within Critical Drainage Area AoCD009. Risk of flooding from Surface Water mapping indicates that the site is not susceptible to surface water ponding, but the local area is. The BGS Susceptibility to Groundwater Flooding dataset indicates this area has 'limited potential for groundwater flooding to occur'. The site does not lie within the at risk of flooding from reservoirs in the event of breach or failure when river levels are normal or when there is also flooding from rivers.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable development (e.g. residential) is permitted in Flood Zones 1 and 2 (100% of the site). The following recommendations are made: <u>Tidal and Fluvial</u> - Modelling of the design event (0.5% AEP including upper end climate change allowance) shows that the site and local area are not at risk of flooding through overtopping, so there are no specific requirements on Finished Floor Levels for residential accommodation in relation to the risk of flooding from the sea. - The site is located within the Flood Warning Area for 'Thames estuary from Shellhaven, to and including Tilbury'. Safe access/egress is available for the site during the design event (overtopping) but is not available during a breach event. During a breach event, Princess Ave is at Significant hazard and parts of Coronation Ave (west of the site) are at Significant hazard. Developers should ensure Emergency Plans are prepared for occupants of the site detailing the requirement to sign up to Flood Warnings and providing a clear response with respect to safe access routes and places of safety in the event of a Flood Warning or breach event. - The site is at residual risk of flooding from the River Thames in the event of a breach in flood risk management infrastructure. Therefore, an internally accessible place of safety should be designed within the proposed development above the breach flood level during the <i>extreme</i> event (0.1% AEP including climate change), capable of accommodating the likely number of occupants. The maximum water level on the site during the <i>extreme</i> flood event from breach location ETIL002 is approximately 5.89m AOD. <u>Surface Water</u> - Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.					

AECOM REF:	ACM_049	THURROCK REF:	60844	SITE NAME:	Land South of Aveley
FLOOD RISK SUMMARY					
The site is located south of Aveley. The River Mardyke is approximately 261m to the south of the site, further south (approximately 1600m) is the River Thames frontage. Two small watercourses, tributaries of the River Mardyke, pass through the eastern part of the site and are culverted underneath the A13. The majority of the site (99.5%) is defined as Flood Zone 1 'Low Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The remainder lies in Flood Zone 2 'Medium Probability of Flooding' (0.39%) 3a 'High Probability of Flooding' (0.03%) and Flood Zone 3b 'Functional Floodplain' (0.08%) associated with the Mardyke. 0.8% of the site is indicated to be within future flood zones. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Tidal defences are present along the River Thames frontage. Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, the site and local area are not shown to be at risk of flooding from overtopping of the defences along the Thames. The site is also not shown to be at residual risk of flooding from the sea in the event of a breach or failure of flood defences. The site is located within Critical Drainage Area AoCD001. Risk of Flooding from Surface Water mapping indicates that the site is susceptible to 'some' surface water ponding. The mapping also shows the flowpaths of the small tributaries that pass through the site. The BGS Susceptibility to Groundwater Flooding dataset indicates this site has 'potential for ground water flooding to occur at the surface' (toward the northeast of the site). The rest of the site has mostly 'limited potential for groundwater flooding to occur' but there are also some areas that have 'potential for groundwater flooding of property situated below ground level'. The site does not lie within the at risk of flooding from reservoirs in the event of breach or failure when river levels are normal or when there is also flooding from rivers.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable development (e.g. residential) is permitted in Flood Zones 1 and 2 (99.89% of the site) and the Exception Test is not required. More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Fluvial</u> - Development of the site should take consideration of the ordinary watercourses that pass through the site and a natural floodplain maintained. Modelling of these watercourses may be required to determine the design flood levels in this area. <u>Surface Water</u> - Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.					

AECOM REF:	ACM_050	THURROCK REF:	60847	SITE NAME:	East Tilbury
FLOOD RISK SUMMARY					
The site is located between West Tilbury and East Tilbury. A main river flows east approximately 13m north of the site through Linford. The River Thames frontage is approximately 1150m east of the site. The majority of the site (86.6%) is defined as Flood Zone 1 'Low Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The remainder lies in Flood Zone 2 'Medium Probability of Flooding' (7%) and Flood Zone 3a 'High Probability of Flooding' (6.4%). 44.1% of the site is indicated to be within future flood zones. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Tidal defences are present along the River Thames frontage. Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, the site and local area are not shown to be at risk of flooding from overtopping of the defences along the Thames. However, the site is shown to be at residual risk of flooding from the sea in the event of a breach or failure of flood defences. Part of the site is at risk of flooding in the event of a breach or failure of flood defences during the 0.5% AEP for the year 2125. There is a small area of 'Significant' Hazard (Danger to most) in the southeast of the site. The maximum water level on the site during this event (from breach location ETIL002) is 5.7 mAOD (from 0-1.5m flood depth). The site is located within Critical Drainage Area AoCD009. Risk of flooding from Surface Water mapping indicates that the site is susceptible to 'some' surface water ponding. The BGS Susceptibility to Groundwater Flooding dataset indicates that most of the area has 'limited potential for groundwater flooding to occur', however, there is also a small area toward the middle of the site that has 'potential for ground water flooding of property situated below ground level'. The site does not lie within the at risk of flooding from reservoirs in the event of breach or failure when river levels are normal. However, a small area of the site (0.1%) is at risk of flooding from reservoirs in the event of a breach when there is also flooding from rivers.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable development (e.g. residential) is permitted in Flood Zones 1 and 2 (93.6% of the site). More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Tidal and Fluvial</u> - Modelling of the design event (0.5% AEP including upper end climate change allowance) shows that the site and local area are not at risk of flooding through overtopping, so there are no specific requirements on Finished Floor Levels for residential accommodation in relation to the risk of flooding from the sea. - The site is located within the Flood Warning Area for 'Thames estuary from Shellhaven, to and including Tilbury'. Safe access/egress is available for the site during the design event (overtopping) but is not available during a breach event. During a breach event, Princess Margaret Road, southeast of the site, is at Significant hazard. Developers should ensure Emergency Plans are prepared for occupants of the site detailing the requirement to sign up to Flood Warnings and providing a clear response with respect to safe access routes and places of safety in the event of a Flood Warning or breach event. - The site is at residual risk of flooding from the River Thames in the event of a breach in flood risk management infrastructure. Therefore, an internally accessible place of safety should be designed within the proposed development above the breach flood level during the <i>extreme</i> event (0.1% AEP including climate change), capable of accommodating the likely number of occupants. The maximum water level on the site during the <i>extreme</i> flood event from breach location ETIL002 is approximately 5.89m AOD. <u>Surface Water</u> - Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.					

AECOM REF:	ACM_051	THURROCK REF:	60851	SITE NAME:	East Tilbury 2
FLOOD RISK SUMMARY					
The site is located south of East Tilbury. A main river runs approximately 71m to the west/southwest of the site. The River Thames frontage is approximately 600m southeast of the site. The majority of the site (81.3%) is defined as Flood Zone 1 'Low Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The remainder lies in Flood Zone 2 'Medium Probability of Flooding' (11.9%) and Flood Zone 3a 'High Probability of Flooding' (6.8%). 36% of the site is indicated to be within future flood zones. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Tidal defences are present along the River Thames frontage. Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, the site is shown to have a small area (near Buckland) of 'Extreme' Hazard (Danger to all) and a small area (near Gravelpit Farm) of 'Moderate' Hazard (Caution to danger to some). The maximum water level on site during this event is 6.6 mAOD (from 0-1m flood depth). The local area southeast of the site (near Coalhouse Fort Park) has 'Extreme' Hazard (Danger to all). Additionally, there is 'Significant' Hazard (Danger to most) in the local area west of the site. The edges of the site are also shown to be at residual risk of flooding from the sea in the event of a breach or failure of flood defences. Part of the site is at risk of flooding in the event of a breach or failure of flood defences during the 0.5% AEP for the year 2125. There is a small area of 'Extreme' Hazard (Danger to all) near Buckland, and an additional small area of 'Significant' Hazard (Danger to some) near Gravelpit Farm. The access routes for the wider area through Low Street and through East Tilbury are at Significant hazard. The maximum water level on the site during this event (from breach location ETIL002) is 5.8 mAOD (from 0-2m flood depth). The site is located within Critical Drainage Area AoCD009. Risk of flooding from Surface Water mapping indicates that the site is susceptible to 'some' surface water ponding. The BGS Susceptibility to Groundwater Flooding dataset indicates that there is an area toward the northwest of the site that has 'potential for ground water flooding of property situated below ground level'. The rest of the site (majority) has 'limited potential for groundwater flooding to occur'. The site does not lie within the at risk of flooding from reservoirs in the event of breach or failure when river levels are normal. However, the edge of the site is at risk of flooding from reservoirs in the event of a breach when there is also flooding from rivers.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable development (e.g. residential) is permitted in Flood Zones 1 and 2 (93.2% of the site). More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Tidal and Fluvial</u> - Modelling of the design event (0.5% AEP including upper end climate change allowance) shows that the site and local area are at risk of flooding through overtopping, therefore Finished Floor Levels for residential accommodation must be above the design flood event plus a minimum 300mm freeboard. The maximum water level on site during the overtopping event is approximately 6.6 mAOD. - The site is located within the Flood Warning Area for 'Thames estuary from Shellhaven, to and including Tilbury and the Essex coast at Coalhouse Fort and surrounding marshland'. Safe access/egress is available for the site during the design event (overtopping) but is not available during a breach event. During a breach event, Princess Margaret Road, northeast of the site, is at Significant to Extreme hazard. Developers should ensure Emergency Plans are prepared for occupants of the site detailing the requirement to sign up to Flood Warnings and providing a clear response with respect to safe access routes and places of safety in the event of a Flood Warning or breach event. - The site and surrounding area are at residual risk of flooding from the River Thames in the event of a breach in defences. An internally accessible place of safety should be designed within the proposed development above the breach flood level during the <i>extreme</i> event (0.1% AEP including climate change), capable of accommodating the likely number of occupants. The maximum water level on the site during the <i>extreme</i> flood event from breach location ETIL002 is approximately 6.06m AOD. <u>Surface Water</u> - Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.					

AECOM REF:	ACM_052	THURROCK REF:	60853	SITE NAME:	Land at the Mardyke Valley Golf Club, South Road, South Ockendon
FLOOD RISK SUMMARY					
The site is located between South Ockendon and North Stifford. The River Mardyke flows south west approximately 3m from the southern site boundary and a tributary of the Mardyke flows through the site. The River Thames frontage is approximately 3km south of the site. The majority of the site (91.1%) is defined as Flood Zone 1 'Low Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The remainder lies in Flood Zone 2 'Medium Probability of Flooding' (2.1%), Flood Zone 3a 'High Probability of Flooding' (0.5%) and Flood Zone 3b 'Functional Floodplain' (6.3%). 9.5% of the site is indicated to be within future flood zones. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Risk of flooding from Rivers and Sea defended flood risk mapping including climate change allowances shows that the southern edge of the site is at risk of flooding from the Mardyke. The site is located within Critical Drainage Area AoCD013. Risk of flooding from Surface Water mapping indicates that the site is susceptible to some surface water ponding. The BGS Susceptibility to Groundwater Flooding dataset indicates that the central area of the area has 'limited potential for groundwater flooding to occur', however, there is also a significant area, primarily in the north of the site that has 'potential for ground water flooding of property situated below ground level' and a small area along the River Mardyke and to the northeast of the site has 'potential for groundwater flooding to occur at the surface'. 5% of the site lies within the at risk of flooding from reservoirs in the event of breach or failure when river levels are normal. Additionally, 6.37% of the site is at risk of flooding from reservoirs in the event of a breach when there is also flooding from rivers.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable development (e.g. residential) is permitted in Flood Zones 1 and 2 (93.2% of the site). More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Fluvial</u> • Development is not permitted in Flood Zone 3b. This part of the site (6.3%) should be retained as floodplain and steps taken to restore land to provide a more natural edge of the River Mardyke and on-site watercourse. • An 8m wide undeveloped buffer strip should be retained from top of bank alongside the River Mardyke and opportunities should be explored for riverside restoration. New development within 8m of a main river will require consent from the Environment Agency (guidance available online: Flood risk activities: environmental permits - GOV.UK) • Development should be designed to retain the course of the small watercourses that pass through the site. These should be deculverted and the natural floodplain restored. Development within proximity to these watercourses will require consent from Thurrock Council as the Lead Local Flood Authority. • Finished flood levels should be set above the modelled 1% AEP including climate change for the River Mardyke, including a freeboard allowance. • The site is located within the 'Mardyke from North Stifford to Purfleet-on-Thames' Flood Warning Area. Safe access/egress (i.e. that is dry or 'Low' Hazard during the 1% AEP event including central climate change allowance) is achievable for the site. A dry route is available west along Stifford Road which leads to the B1335. <u>Surface Water</u> • Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. • Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.					

AECOM REF:	ACM_054	THURROCK REF:	60856	SITE NAME:	Land northeast of Corringham
FLOOD RISK SUMMARY					
The site is located northeast of Stanford-le-Hope, between Corringham and Fobbing. Drainage ditches are present on the site which form the upper part of the Stanford Brook catchment. The Manorway Fleet is approximately 755m southeast from the site. The River Thames frontage is approximately 3km southeast of the site. The main risk to the site is therefore river flooding; the site is not at risk of tidal flooding. 98% of the site is defined as Flood Zone 1 'Low Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The remainder is split between Flood Zone 2 'Medium Probability of Flooding' (0.9%) and Flood Zone 3a 'High Probability of Flooding' (1.1%). 2% of the site is indicated to be within future flood zones. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. The Rivers and Sea Flooding modelling shows that during the design flood event (1% AEP Rivers 0.5% AEP Sea Defended Climate Change), 1.1% of the site (in the west part of the site towards Stanford-le-Hope bypass) is at risk of flooding. Risk of flooding from Surface Water mapping indicates that the site is susceptible to surface water ponding. The site is located within Critical Drainage Area AoCD010d. The BGS Susceptibility to Groundwater Flooding dataset indicates that the northwest part of the site has 'potential for groundwater flooding to occur at the surface'. The site does not lie within the at risk of flooding from reservoirs in the event of breach or failure when river levels are normal or when there is also flooding from rivers.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable development (e.g. residential) is permitted in Flood Zones 1 and 2 (98.9% of the site). More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Fluvial and Surface Water</u> • Development proposals for the site should be designed around the natural surface water flowpaths and existing watercourses on the site. Development must be set back from ordinary watercourses and works near these watercourses will require consent from Thurrock Council as the Lead Local Flood Authority. • Due to the location of the site within an Area of Critical Drainage, as identified by Thurrock Council in their SWMP, applicants should work with the Council to determine requirements for surface water management. • Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. • Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.					

AECOM REF:	ACM_057	THURROCK REF:	60882	SITE NAME:	Land Adjacent And To The Rear Of The George And Dragon East Tilbury Road Linford Essex
FLOOD RISK SUMMARY					
The site is located in Linford. The River Thames frontage is approximately 2km east of the site. Gabions Sewer runs west to east along the northern site boundary. More than half of the site (56%) to the north is located in Flood Zone 2 'Medium Probability of Flooding', 39% is located in Flood Zone 1 'Low Probability of Flooding' and 4% is located within Flood Zone 3a 'High Probability of Flooding' and 1% in Flood Zone 3b 'Functional Floodplain'. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Tidal defences are present along the River Thames frontage. Flood defences are present along the Gabions Sewer. The Rivers and Sea Flooding modelling shows that 89% of the entire site is at risk of flooding from sea during the 0.5% AEP flood event including climate change. Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, the site and local area are not shown to be at risk of flooding from overtopping. However, there is a residual risk of flooding from breach in the flood defences leading to flooding at the north of the site with breach flood depths in the range of 0.5 to 1m across the northern half of the site, and up to 2m along the Gabions Sewer. The maximum flood level is 5.46mAOD (from breach location ETIL002). The model shows a hazard rating of Low (Caution) progressing to the north as 'Moderate' (Dangerous for Some) and then a smaller area on the north boundary with a hazard rating of 'Significant' (Dangerous for most people). The Risk of Flooding from Surface Water mapping also highlights the natural floodplain of the Gabions Sewer along the northern boundary of the site. The local area is also shown to be susceptible to surface water ponding both under present day and in for climate change scenarios. The site is within an Area of Critical Drainage AoCD009 as identified in the Thurrock Council SWMP. The BGS Susceptibility to Groundwater Flooding dataset indicates the local area is identified as having 'limited potential for groundwater flooding to occur' and 'potential for groundwater flooding of property situated below ground level'. The site is not shown to be at residual risk of flooding from reservoirs in the event of a breach or failure.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable development (e.g. residential) is permitted in Flood Zones 1 and 2 (majority of the site). More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Tidal and Fluvial</u> • Development is not permitted in Flood Zone 3b. This part of the site (1%) should be retained as floodplain and steps taken to restore land to provide a more natural edge of the watercourse. An 8m wide undeveloped buffer strip should be retained from top of bank of the Main River and opportunities should be explored for riverside restoration. New development within 8m of a main river will require consent from the Environment Agency. • Modelling of the design event (0.5% AEP including upper end climate change allowance) shows that the site and local area are not at risk of flooding through overtopping, so there are no specific requirements on Finished Floor Levels for residential accommodation in relation to the risk of flooding from the sea. • The site is located within the 'Thames estuary from Shellhaven, to and including Tilbury' Flood Warning Area. Safe access/egress is available for the site during the design event (overtopping) and during a breach event. A dry route is available from the west of the site, and west along Muckingford Road. • The northern half of the site is at residual risk of flooding from the River Thames in the event of a breach in flood defences. Therefore, an internally accessible place of safety should be designed within the proposed development above the breach flood level during the <i>extreme</i> event (0.1% AEP including climate change), capable of accommodating the likely number of occupants. The maximum water level on the site during the <i>extreme</i> flood event from breach location ETIL002 is approximately 5.66m AOD. <u>Surface Water</u> • Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. • Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring. • The site, access routes and wider local area are shown to be at significant risk of surface water flooding and are within an Area of Critical Drainage (AoCD) as identified by Thurrock Council in their SWMP. Consideration should be made of requirements for development in this location to contribute to wider strategic flood risk management measures for the AoCD to ensure that the risk of flooding is not increased and where possible is reduced. Consideration should be made of increasing the number of residents reliant on roads and infrastructure already identified at risk of flooding. This should be considered by Emergency Planners prior to allocation and Emergency Plans prepared as appropriate.					

AECOM REF:	ACM_059	THURROCK REF:	60888	SITE NAME:	Land at Wharf Road, Stanford-le-Hope
FLOOD RISK SUMMARY					
The site is to the southeast of Stanford-le-Hope. An ordinary watercourse flows north to south through the centre of the site and is culverted beneath the railway line. This forms part of a main river and discharges into the Thames. The Thames frontage is approximately 272m southeast of the site. The majority of the site (82.4%) is defined as Flood Zone 1 'Low Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The remainder is split between Flood Zone 2 'Medium Probability of Flooding' (6.8%), Flood Zone 3a 'High Probability of Flooding' (4.6%) and Flood Zone 3b 'Functional Floodplain' (6.2%). 17.6% of the site is indicated to be within future flood zones. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Tidal defences are present along the River Thames frontage. The Rivers and Sea Flooding modelling for the 1% AEP Rivers 0.5% AEP Sea Defended Climate Change shows that 10.8% of the site is at risk of flooding. Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, the site is not shown to be at risk of flooding from overtopping of the defences along the Thames. However, the local area (south of site) has an area of 'Extreme' Hazard (Danger to all), with overtopping depth ranging from 0-5+m. The site is not at risk of flooding from the sea in the event of a breach or failure of flood defences. However, the local area southwest to the site shows an 'Extreme' Hazard (Danger to all), with breach depth ranging from 0-3.5m. Risk of flooding from Surface Water mapping indicates that the site is susceptible to surface water ponding (primarily along the centre of the site) along the flow path of the ordinary watercourse. The BGS Susceptibility to Groundwater Flooding dataset indicates the centre of the site has 'potential for groundwater flooding to occur at the surface, the west and east sides of the site have 'potential for groundwater flooding of property situated below ground level'. The site does not lie within the at risk of flooding from reservoirs in the event of breach or failure when river levels are normal or when there is also flooding from rivers.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable development (e.g. residential) is permitted in Flood Zones 1 and 2 (93.8% of the site). More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Fluvial</u> • Development is not permitted in Flood Zone 3b associated with the watercourses passing through the site. This part of the site (6.2%) should be retained as floodplain. Detailed modelling should be undertaken to determine a suitable area to be retained as floodplain and to determine the design flood level for the site. • Development proposals for the site should be designed around the natural surface water flowpaths and existing watercourses on the site. This may impact how much of the site can be developed, and access arrangements for the site outside of those areas at risk of flooding. Development must be set back from ordinary watercourses and works near these watercourses will require consent from Thurrock Council as the Lead Local Flood Authority. • Finished floor levels for residential development should be set above the modelled flood level for the design event (1% AEP plus climate change allowance), including a freeboard allowance. <u>Surface Water</u> • Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. • Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.					

AECOM REF:	ACM_061	THURROCK REF:	60910	SITE NAME:	Land at East Tilbury Road, Linford
FLOOD RISK SUMMARY					
The site is located north of Linford. A Main River runs within the site boundary along the south eastern edge. The River Thames frontage is approximately 1700m east of the site. Over half of the site (62.7%) is defined as Flood Zone 1 'Low Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The remainder is split between Flood Zone 2 'Medium Probability of Flooding' (30%), Flood Zone 3a 'High Probability of Flooding' (1.3%) and Flood Zone 3b 'Functional Floodplain' (6%). 65.3% of the site is indicated to be within future flood zones. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Tidal defences are present along the River Thames frontage. The Rivers and Sea Flooding modelling for the 1% AEP Rivers 0.5% AEP Sea Defended Climate Change scenario show that 59% of the site is at risk of flooding. Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, the site and local area are not shown to be at risk of flooding from overtopping of the defences along the Thames. However, the site is shown to be at residual risk of flooding from the sea in the event of a breach or failure of flood defences. Part of the site is at risk of flooding in the event of a breach or failure of flood defences during the 0.5% AEP for the year 2125. The southern part of the site is at risk, ranging from 'Low' hazard (Caution) to 'Moderate' (Danger to some), to 'Extreme' (Danger to all). (Extreme hazard is along the southern boundary along the river). The maximum water level on the site during this event (from breach location ETIL002) is 5.5 mAOD (from 0-3m flood depth). The site is located within Critical Drainage Area AoCD009. Risk of flooding from Surface Water mapping indicates that the site is susceptible to surface water flooding (primarily along the floodplain of the watercourse along the south eastern edge of the site). The BGS Susceptibility to Groundwater Flooding dataset indicates the southeast of the site has 'potential for groundwater flooding of property situated below ground level', the northwest of the site has 'limited potential for groundwater flooding to occur'. The site does not lie within the at risk of flooding from reservoirs in the event of breach or failure when river levels are normal or when there is also flooding from rivers.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable development (e.g. residential) is permitted in Flood Zones 1 and 2 (94% of the site). More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Tidal and Fluvial</u> • Development is not permitted in Flood Zone 3b. This part of the site (6%) should be retained as floodplain and steps taken to restore land to provide a more natural edge of the river. • Detailed modelling should be undertaken to determine a suitable area to be retained as floodplain and to determine the design flood level for the site • Finished floor levels for residential development should be set above the modelled flood level for the design event (1% AEP plus climate change allowance), including a freeboard allowance. • An 8m wide undeveloped buffer strip should be retained from top of bank alongside the Main River and opportunities should be explored for riverside restoration. New development within 8m of a Main River will require consent from the Environment Agency. • Modelling of the design event for <i>tidal</i> flooding (0.5% AEP including upper end climate change allowance) shows that the site and local area are not at risk of flooding through overtopping, so there are no specific requirements on Finished Floor Levels for residential accommodation in relation to the risk of flooding from the sea. • The site is located within the 'Thames estuary from Shellhaven, to and including Tilbury' Flood Warning Area. Safe access/egress is available for the site during the design event (overtopping) and during a breach event. A dry route is available along East Tilbury Road, going north only towards Buckingham Hill Road. • The site is at residual risk of flooding from the River Thames in the event of a breach in flood risk management infrastructure. Therefore, an internally accessible place of safety should be designed within the proposed development above the breach flood level during the <i>extreme</i> event (0.1% AEP including climate change), capable of accommodating the likely number of occupants. The maximum water level on the site during the <i>extreme</i> flood event from breach location ETIL002 is approximately 5.66m AOD. <u>Surface Water</u> • Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. • Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring. • Access routes to the site are shown to be at risk of surface water flooding and it is an Area of Critical Drainage (AoCD). Consideration should be made of increasing the number of residents reliant on these roads. This should be considered by Emergency Planners prior to allocation and Emergency Plans prepared as appropriate. Consideration should also be made of requirements for development in this location to contribute to wider strategic flood risk management measures for the AoCD.					

AECOM REF:	ACM_062	THURROCK REF:	60911	SITE NAME:	Medebridge Road, South Ockendon
FLOOD RISK SUMMARY					
The site is in South Ockendon, just north of North Stifford. The River Mardyke flows north to south adjacent to the site, passing through the site boundary at one point. Two tributaries of the Mardyke flow through the site, one in the north and one on the south western edge. The majority of the site (95.8%) is defined as Flood Zone 1 'Low Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The remainder lies in Flood Zone 2 'Medium Probability of Flooding' (3.6%), Flood Zone 3a 'High Probability of Flooding' (0.1%) and Flood Zone 3b 'Functional Floodplain' (0.5%). 4.8% of the site is indicated to be within future flood zones. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. The Rivers and Sea Flooding mapping for the 1% AEP Rivers 0.5% AEP Sea Defended Climate Change scenario shows that 0.6% of the site is at risk of flooding. Risk of flooding from Surface Water mapping indicates that the site is susceptible to 'slight' surface water ponding. The BGS Susceptibility to Groundwater Flooding dataset indicates the centre of the site has 'limited potential for groundwater flooding to occur', closer to the site boundary (in the east and west), the site has 'potential for groundwater flooding of property situated below ground level'. Along the southwest boundary, the site has 'potential for groundwater flooding to occur at the surface'. A small portion of the site lies within the at risk of flooding from reservoirs in the event of breach or failure when river levels are normal and when there is also flooding from rivers.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable development (e.g. residential) is permitted in Flood Zones 1 and 2 (99.4% of the site). More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Fluvial</u> - Detailed modelling should be undertaken to determine the risk of flooding from the ordinary watercourses and the design flood levels for the site (1% AEP including climate change). - A sequential approach to site planning should be adopted, to steer development towards those areas at lowest risk of flooding. - An undeveloped buffer strip should be retained alongside the Main River and Ordinary Watercourses and opportunities should be explored for riverside restoration. New development within 8m of a Main River and Ordinary Watercourses will require consent from the Environment Agency or Thurrock Council as the Lead Local Flood Authority. - Finished floor levels for residential development should be set above the modelled flood level for the design event (1% AEP plus climate change allowance), including a freeboard allowance. <u>Surface Water</u> - Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.					

AECOM REF:	ACM_064	THURROCK REF:	60913	SITE NAME:	West Horndon (approximate - see Site Location Plan)
FLOOD RISK SUMMARY					
The site is located between West Horndon and Bulphan. The New Mardyke runs within the site boundary. Over half of the site (54.4%) is defined as Flood Zone 1 'Low Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The remainder is split between Flood Zone 2 'Medium Probability of Flooding' (20%), Flood Zone 3a 'High Probability of Flooding' (8.2%) and Flood Zone 3b 'Functional Floodplain' (17.4%). 50% of the site is indicated to be within future flood zones. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. The Rivers and Sea 1% AEP Rivers 0.5% AEP Sea Defended Climate Change mapping shows that 27.2% of the site is at risk of flooding. The site is located within Critical Drainage Area AoCD011. Risk of flooding from Surface Water mapping indicates that the site is susceptible to 'significant' surface water flooding associated with the upper catchment of the Mardyke. This is considered to be a combination of surface water runoff and fluvial flooding. The BGS Susceptibility to Groundwater Flooding dataset indicates nearly all of the site has 'potential for groundwater flooding to occur at the surface'. 9.3% of the site lies within the at risk of flooding from reservoirs in the event of breach or failure when river levels are normal. Additionally, 17% of the site is at risk of flooding from reservoirs in the event of a breach when there is also flooding from rivers.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable development (e.g. residential) is permitted in Flood Zones 1 and 2 (75.2% of the site). More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made:					
<u>Fluvial</u> - A significant proportion of this development site is at risk of flooding from the upper tributaries of the Mardyke. More Vulnerable development is not permitted in Flood Zone 3b. This part of the site (17.8%) should be retained as floodplain and steps taken to restore land to provide a natural catchment. - An 8m wide undeveloped buffer strip should be retained from top of bank alongside the River Mardyke and opportunities should be explored for riverside restoration. Development within 8m of a Main River or Ordinary Watercourse will require consent from the Environment Agency or Thurrock Council as Lead Local Flood Authority, respectively. - Development should be avoided in Flood Zone 3a and Flood Zone 2 as built development will reduce the capacity of the floodplain to store floodwater. - Should development be proposed in the floodplain, compensation storage will need to be provided to offset any loss of storage. Finished floor levels for residential development will need to be set above the modelled flood level for the design event (1% AEP plus climate change allowance), including a freeboard allowance.					
<u>Surface Water</u> - Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring. - The site and access routes to the site are shown to be at risk of surface water flooding and it is an Area of Critical Drainage (AoCD). Consideration should be made of increasing the number of residents reliant on these roads. This should be considered by Emergency Planners prior to allocation and Emergency Plans prepared as appropriate. Consideration should also be made of requirements for development in this location to contribute to wider strategic flood risk management measures for the AoCD.					

AECOM REF:	ACM_070	THURROCK REF:	60939	SITE NAME:	Gobions Park, East Tilbury
FLOOD RISK SUMMARY					
The site is located to the east of Linford. A main river runs approximately along the northern edge of the site, just outside the boundary. The River Thames frontage is approximately 1100m east of the site. 35.7% of the site is defined as Flood Zone 1 'Low Probability of Flooding' on the Flood Map for Planning (Rivers and Sea) and 38% of the site is defined as Flood Zone 2 'Medium Probability of Flooding'. The remainder lies in Flood Zone 3a 'High Probability of Flooding' (25.9%) and Flood Zone 3b 'Functional Floodplain' (0.4%). 98.2% of the site is indicated to be within future flood zones. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Tidal defences are present along the River Thames frontage. The Rivers and Sea Flooding mapping for the 1% AEP Rivers 0.5% AEP Sea Defended Climate Change scenario shows that 93.7% of the site is at risk of flooding. Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, the site and local area are not shown to be at risk of flooding from overtopping of the defences along the Thames. However, the site is shown to be at residual risk of flooding from the sea in the event of a breach or failure of flood defences. Part of the site is at risk of flooding in the event of a breach or failure of flood defences during the 0.5% AEP for the year 2125. The north half of the site is at risk, ranging from 'Low' Hazard (Caution to danger to some) to 'Extreme' Hazard (Danger to all) (Extreme danger is a large area on the boundary along the river). The maximum water level on the site during this event (from breach location ETIL002) is 5.6 mAOD (from 0-3.5m flood depth). The site is located within Critical Drainage Area AOCD009. Risk of flooding from Surface Water mapping indicates that the site is susceptible to 'slight surface water ponding'. The BGS Susceptibility to Groundwater Flooding dataset indicates the majority of the site (northeast) has 'potential for groundwater flooding of property situated below ground level'. The remainder of the site (southwest) has 'limited potential for groundwater flooding to occur'. The site does not lie within the at risk of flooding from reservoirs in the event of breach or failure when river levels are normal or when there is also flooding from rivers.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable development (e.g. residential) is permitted in Flood Zones 1 and 2 (75.6% of the site). More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Tidal and Fluvial</u> - Detailed modelling should be undertaken to determine the risk of flooding from the Main River and the design flood levels for the site (1% AEP including climate change). - A sequential approach to site planning should be adopted, to steer development towards those areas at lowest risk of flooding. - An undeveloped buffer strip should be retained alongside the Main River opportunities should be explored for riverside restoration. Development within 8m of a Main River will require consent from the Environment Agency. - Finished floor levels for residential development should be set above the modelled flood level for the design event (1% AEP plus climate change allowance), including a freeboard allowance. - Modelling of the <i>tidal</i> design event (0.5% AEP including upper end climate change allowance) shows that the site and local area are not at risk of flooding through overtopping, so there are no specific requirements on Finished Floor Levels for residential accommodation in relation to the risk of flooding from the sea. - The site is located within the 'Thames estuary from Shellhaven, to and including Tilbury' Flood Warning Area. Safe access/egress is available for the site during the design event (overtopping) and during a breach event. A dry route is available to the west along Muckingford Road, towards Chadwell St Mary. - The site is at residual risk of flooding from the River Thames in the event of a breach in flood risk management infrastructure. Therefore, an internally accessible place of safety should be designed within the proposed development above the breach flood level during the <i>extreme</i> event (0.1% AEP including climate change), capable of accommodating the likely number of occupants. The maximum water level on the site during the <i>extreme</i> flood event from breach location ETIL002 is approximately 5.86m AOD. <u>Surface Water</u> - Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.					

AECOM REF:	ACM_071	THURROCK REF:	60940	SITE NAME:	Land north of Stanford-le-Hope
FLOOD RISK SUMMARY					
The site is located northwest of Stanford-le-Hope. The Hassen Brook (Main River) runs through the site and is culverted under the Stanford-le-Hope bypass. Several ordinary watercourses also drain the site towards the bypass. The majority of the site (84%) is defined as Flood Zone 1 'Low Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The remainder lies in Flood Zone 2 'Medium Probability of Flooding' (5.3%), Flood Zone 3a 'High Probability of Flooding' (3.1%) and Flood Zone 3b 'Functional Floodplain' (7.6%). 17.1% of the site is indicated to be within future flood zones. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. The Rivers and Sea Flooding mapping for the '1% AEP Rivers 0.5% AEP Sea Defended Climate Change' scenario show that 11.4% of the site is at risk of flooding. The site is located within Critical Drainage Area AOCD010d. Risk of Flooding from Surface Water mapping indicates that the site is susceptible to moderate surface water ponding along the floodplains of the watercourses identified. The BGS Susceptibility to Groundwater Flooding dataset indicates multiple parts of the site have 'potential for groundwater flooding to occur at the surface'. There is an area toward the centre of the site with 'potential for groundwater flooding of property situated below ground level'. The site does not lie within the at risk of flooding from reservoirs in the event of breach or failure when river levels are normal or when there is also flooding from rivers.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable development (e.g. residential) is permitted in Flood Zones 1 and 2 (92.4% of the site). More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Tidal and Fluvial</u> - Detailed modelling should be undertaken to determine the risk of flooding from the Main River and associated ordinary watercourses and the design flood levels for the site (1% AEP including climate change). - A sequential approach to site planning should be adopted, to steer development towards those areas at lowest risk of flooding. - Development is not permitted in Flood Zone 3b. This part of the site (7.6%) should be retained as floodplain and steps taken to restore land to provide a more natural edge of the Hassen Brook and on-site watercourse. - An 8m wide undeveloped buffer strip should be retained from top of bank alongside the River Mardyke and opportunities should be explored for riverside restoration. Development within 8m of a Main River or Ordinary Watercourse will require consent from the Environment Agency or Thurrock Council as Lead Local Authority, respectively. - Finished floor levels for residential development should be set above the modelled flood level for the design event (1% AEP plus climate change allowance), including a freeboard allowance. <u>Surface Water</u> - Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring. - The site, access routes and wider local area (Stanford le Hope) are shown to be at significant risk of surface water flooding, and it is an Area of Critical Drainage (AoCD). Consideration should be made of requirements for development in this location to contribute to wider strategic flood risk management measures for the AoCD to ensure that the risk of flooding is not increased and where possible is reduced. Consideration should be made of increasing the number of residents reliant on roads and infrastructure already identified at risk of flooding. This should be considered by Emergency Planners prior to allocation and Emergency Plans prepared as appropriate.					

AECOM REF:	ACM_083	THURROCK REF:	61011	SITE NAME:	Land at Manor Road
FLOOD RISK SUMMARY					
The site is located to the southeast of Grays, in between Broadway and Manor Road. The Chadwell New Cross Sewer (Main River) flows west approximately 68m southeast from the site boundary. The River Thames frontage is approximately 860m south west of the site. Just under half of the site (48%) is defined as Flood Zone 1 'Low Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The remainder lies in Flood Zone 2 'Medium Probability of Flooding' (17%) and Flood Zone 3a 'High Probability of Flooding' (35%). The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Tidal defences are present along the River Thames frontage. The Rivers and Sea Flooding modelling shows that during '1% AEP Rivers 0.5% AEP Sea Defended Climate Change scenario' 98.9% of the site is at risk of flooding. Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, the site and local area are not shown to be at risk of flooding from overtopping of the defences along the Thames. The site is also shown to not be at residual risk of flooding from the sea in the event of a breach or failure of flood defences. However, the local area (to the south of the site) has 'Low' to 'Significant' hazard rating during a breach or failure of flood defences. Risk of flooding from Surface Water mapping indicates that the site and local area is susceptible to 'significant' surface water ponding. The BGS Susceptibility to Groundwater Flooding dataset indicates that the site has 'limited potential for groundwater flooding to occur'. The site does not lie within the at risk of flooding from reservoirs in the event of breach or failure when river levels are normal. However, 51.3% of the site is at risk of flooding from reservoirs in the event of a breach when there is also flooding from rivers.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable development (e.g. residential) is permitted in Flood Zones 1 and 2 (65% of the site). More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Tidal and Fluvial</u> - The site is shown to be partially within Flood Zone 3a. However, modelling of the design event (0.5% AEP including upper end climate change allowance) shows that the site and local area are not at risk of flooding through overtopping, so there are no specific requirements on Finished Floor Levels for residential accommodation in relation to the risk of flooding from the sea. - Modelling of the design event (0.5% AEP including upper end climate change allowance) shows that the site and local area are not at risk of flooding in the event of a breach in flood risk management infrastructure, therefore there are no specific requirements on internally accessible places of safety for residential accommodation in relation to risk of flooding from the sea. - The site is located within the 'Thames estuary from Grays to Purfleet-on-Thames, including West Thurrock' Flood Warning Area. Safe access/egress is available for the site during the design event (overtopping). A dry route is available along Broadway (north of site) going west toward East Thurrock Road. <u>Surface Water</u> - Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.					

AECOM REF:	ACM_093	THURROCK REF:	61059	SITE NAME:	Tilbury Football Club, Chadfields, Tilbury RM18 8NL
FLOOD RISK SUMMARY					
The site is located in Tilbury. The River Thames frontage is approximately 2.2km south of the site. The Chadwell Cross Sewer runs 141m south of the site culverted below Raphael Avenue. Approximately half of the site in the north is located in the Tilbury West FSA. This area was engineered to store water in times of flooding and is therefore defined as Flood Zone 3b. It is also registered under the Reservoirs Act (1975) and will be maintained and operated as a category C Reservoir and Flood Storage Area (FSA) with capacity to store surface water floodwaters during a 0.1% AEP (1 in 1000 year) event. The Level 1 SFRA states that this area should be safeguarded as a flood storage area. The remainder (49%) of the site is located in Flood Zone 3a 'High Probability of Flooding'. Tidal defences are present along the River Thames frontage. The AIMS Spatial Flood Defences data shows flood defences around the West FSA from the north to west. The Rivers and Sea Flooding modelling shows that during '1% AEP Rivers 0.5% AEP Sea Defended Climate Change scenario' the entire site is at risk of flooding. Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, there is no risk of flooding from overtopping to the site itself. However, the site and local area are at residual risk of flooding in the event of a breach or failure of flood defences during the 0.5% AEP event for the year 2125. The site is at Significant hazard (Danger for Most). The maximum water level on the site during this event (from breach location TIL003) is 2.15m AOD (corresponding to depths of up to 2m). Risk of Flooding from Surface Water mapping indicates the site and surrounding area are susceptible to surface water ponding. The BGS Susceptibility to Groundwater Flooding dataset indicates the entire site has 'potential for groundwater flooding of property situated below ground level'. The site does not lie within the at risk of flooding from reservoirs in the event of breach or failure when river levels are normal. However, 54% of the site is at risk of flooding from reservoirs in the event of a breach when there is also flooding from rivers.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable development is not permitted in Flood Zone 3b. More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Tidal and Fluvial</u> - Development is not permitted in Flood Zone 3b. This part of the site (51%) should be safeguarded for flood storage. - Modelling of the design event (0.5% AEP including upper end climate change allowance) shows that the site is not at risk of flooding through overtopping, so there are no specific requirements on Finished Floor Levels for residential accommodation in relation to the risk of flooding from the sea. - The site is located within the 'Thames estuary from Shellhaven, to and including Tilbury' Flood Warning Area. Safe access/egress is available during the design (overtopping) event. Safe access is not available during the breach event; St Chad's Road on the eastern boundary of the site is at significant hazard. Developers should ensure Emergency Plans are prepared for occupants of the site detailing the requirement to sign up to Flood Warnings and providing a clear response with respect to safe access routes and places of safety in the event of a Flood Warning or breach event. - The site is at residual risk of flooding from the Thames in the event of a breach in flood risk management infrastructure. Therefore, an internally accessible place of safety should be defined within the proposed development above the <i>extreme</i> flood level (0.1% AEP including climate change), capable of accommodating the likely number of occupants. The maximum water level on the site during the <i>extreme</i> flood event from breach location TIL003 is approximately 2.44m AOD. <u>Surface Water</u> - Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. Development should be sequentially located away from the surface water flow path where possible. - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring. - The site, access routes and wider local area are shown to be at significant risk of surface water flooding, and it is an Area of Critical Drainage (AoCD). Consideration should be made of requirements for development in this location to contribute to wider strategic flood risk management measures for the AoCD to ensure that the risk of flooding is not increased and where possible is reduced. Consideration should be made of increasing the number of residents reliant on roads and infrastructure already identified at risk of flooding. This should be considered by Emergency Planners prior to allocation and Emergency Plans prepared as appropriate.					

AECOM REF:	ACM_101	THURROCK REF:	61093	SITE NAME:	Crown Court, Newton Road, Tilbury
FLOOD RISK SUMMARY					
The site is located in Tilbury. The River Thames frontage is approximately 900m south of the site. The East Tilbury Dock Sewer runs 228m southwest of the site parallel to the railway line. The entire site is located in Flood Zone 3a 'High Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Tidal defences are present along the River Thames frontage. Flood defences are present along the East Tilbury Dock Sewer. The Rivers and Sea Flooding modelling shows that during '1% AEP Rivers 0.5% AEP Sea Defended Climate Change scenario' the entire site is at risk of flooding. Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, there is no risk of flooding from overtopping to the site itself. However, the site and local area are at residual risk of flooding in the event of a breach or failure of flood defences during the 0.5% AEO event for the year 2125. The site is at Significant hazard (Danger for Most). The maximum water level on the site during this event (from breach location TIL003) is 2.15m AOD (corresponding to depths of up to 1.5m). The site is located in Area of Critical Drainage AoCD008 and the Risk of Flooding from Surface Water mapping indicates that most of the site and local area are susceptible to surface water flooding. The BGS Susceptibility to Groundwater Flooding dataset indicates the local area to the south of designated as 'limited potential for groundwater flooding to occur', and to the north as 'potential for groundwater flooding of property situated below ground level'. A large part of the site (67%) is shown to be at residual risk of flooding from reservoirs when river levels are normal.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable (residential) development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Tidal and Fluvial</u> - Modelling of the design event (0.5% AEP including upper end climate change allowance) shows that the site is not at risk of flooding through overtopping, so there are no specific requirements on Finished Floor Levels for residential accommodation in relation to the risk of flooding from the sea. - The site is located within the 'Thames estuary from Shellhaven, to and including Tilbury' Flood Warning Area. Safe access/egress is available during the design (overtopping) event, but not during a breach event. During a breach event, Newton Road on the western boundary of the site is at Significant hazard. Developers should ensure Emergency Plans are prepared for occupants of the site detailing the requirement to sign up to Flood Warnings and providing a clear response with respect to safe access routes and places of safety in the event of a Flood Warning or breach event. - As the site is at residual risk of flooding from the Thames in the event of a breach in defences, an internally accessible place of safety should be defined within the proposed development above the <i>extreme</i> flood level (0.1% AEP including climate change), capable of accommodating the likely number of occupants. The maximum water level on the site during the <i>extreme</i> flood event from breach location TIL003 is approximately 2.44m AOD. <u>Surface Water</u> - Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. Development should be sequentially located away from the surface water flow path where possible. - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring. - The site, access routes and wider local area are shown to be at significant risk of surface water flooding, and it is an Area of Critical Drainage (AoCD). Consideration should be made of requirements for development in this location to contribute to wider strategic flood risk management measures for the AoCD to ensure that the risk of flooding is not increased and where possible is reduced. Consideration should be made of increasing the number of residents reliant on roads and infrastructure already identified at risk of flooding. This should be considered by Emergency Planners prior to allocation and Emergency Plans prepared as appropriate.					

AECOM REF:	ACM_102	THURROCK REF:	61094	SITE NAME:	Land rear of 2 North View Avenue, Tilbury
FLOOD RISK SUMMARY					
The site is located in Tilbury. The River Thames frontage is approximately 1.3km south of the site. The East Tilbury Dock Sewer runs 220m southwest of the site parallel to the railway line. The West Flood Storage Area (FSA) is 263m north of the site. The entire site is located in Flood Zone 3a 'High Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Tidal defences are present along the River Thames frontage. Flood defences are present along the East Tilbury Dock Sewer and the West FSA. The Rivers and Sea Flooding modelling shows that during '1% AEP Rivers 0.5% AEP Sea Defended Climate Change scenario' the entire site is at risk of flooding. Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, there is no risk of flooding from overtopping. However, the site and local area are at residual risk of flooding in the event of a breach or failure of flood defences during the 0.5% AEP event for the year 2125. The site is at Significant hazard (Danger for Most). The maximum water level on the site during this event (from breach location TIL003) is 2.15m AOD (corresponding to depths of up to 1.5m). The site is located in Area of Critical Drainage AoCD008 and the Risk of Flooding from Surface Water mapping indicates that most of the site and local area are susceptible to surface water flooding. The BGS Susceptibility to Groundwater Flooding dataset indicates the local area has 'potential for groundwater flooding of property situated below ground level'. The site is at residual risk of flooding from reservoirs in the event of a breach when river levels are normal.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable (residential) development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Tidal and Fluvial</u> - Modelling of the design event (0.5% AEP including upper end climate change allowance) shows that the site is not at risk of flooding through overtopping, so there are no specific requirements on Finished Floor Levels for residential accommodation in relation to the risk of flooding from the sea. - The site is located within the 'Thames estuary from Shellhaven, to and including Tilbury' Flood Warning Area. Safe access/egress is available during the design (overtopping) event, but not during a breach event. During a breach event, North View Avenue on the western boundary of the site is at Significant hazard. Developers should ensure Emergency Plans are prepared for occupants of the site detailing the requirement to sign up to Flood Warnings and providing a clear response with respect to safe access routes and places of safety in the event of a Flood Warning or breach event. - As the site is at residual risk of flooding from the Thames in the event of a breach in the defences, an internally accessible place of safety should be defined within the proposed development above the <i>extreme</i> flood level (0.1% AEP including climate change), capable of accommodating the likely number of occupants. The maximum water level on the site during the <i>extreme</i> flood event from breach location TIL003 is approximately 2.44m AOD. <u>Surface Water</u> - Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. Development should be sequentially located away from the surface water flow path where possible. - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring. - The site, access routes and wider local area are shown to be at significant risk of surface water flooding, and it is an Area of Critical Drainage (AoCD). Consideration should be made of requirements for development in this location to contribute to wider strategic flood risk management measures for the AoCD to ensure that the risk of flooding is not increased and where possible is reduced. Consideration should be made of increasing the number of residents reliant on roads and infrastructure already identified at risk of flooding. This should be considered by Emergency Planners prior to allocation and Emergency Plans prepared as appropriate.					

AECOM REF:	ACM_103	THURROCK REF:	61097	SITE NAME:	Alexandra Court Sheltered Housing complex, Alexandra Road, Tilbury
FLOOD RISK SUMMARY					
The site is located in Tilbury. The River Thames frontage is approximately 1.3km south of the site. The East Tilbury Dock Sewer runs 189m southwest of the site parallel to the railway line. The entire site is located in Flood Zone 3a 'High Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Tidal defences are present along the River Thames frontage. Flood defences are present along the East Tilbury Dock Sewer. The Rivers and Sea Flooding modelling shows that during '1% AEP Rivers 0.5% AEP Sea Defended Climate Change scenario' the entire site is at risk of flooding. Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, there is no risk of flooding from overtopping. However, the site and local area are at residual risk of flooding in the event of a breach or failure of flood defences during the 0.5% AEP event for the year 2125. The site is at Significant hazard (Danger for Most) and Extreme hazard (Danger to All). The maximum water level on the site during this event (from breach location TIL003) is 2.15m AOD (corresponding to depths of up to 1.5m). The site is located in Area of Critical Drainage AoCD008 and the Risk of Flooding from Surface Water mapping indicates that the site and local area are susceptible to surface water flooding. The BGS Susceptibility to Groundwater Flooding dataset indicates the site is located in an area with 'limited potential for groundwater flooding to occur'. The site is at residual risk of flooding from reservoirs in the event of a breach when river levels are normal.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable (residential) development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Tidal and Fluvial</u> - Modelling of the design event (0.5% AEP including upper end climate change allowance) shows that the site is not at risk of flooding through overtopping, so there are no specific requirements on Finished Floor Levels for residential accommodation in relation to the risk of flooding from the sea. - The site is located within the 'Thames estuary from Shellhaven, to and including Tilbury' Flood Warning Area. Safe access/egress is available during the design flood event (overtopping). However, during a breach event, Alexandra Road on the western boundary of the site is at Extreme hazard north of the site and at Significant hazard south of the site. Developers should ensure Emergency Plans are prepared for occupants of the site detailing the requirement to sign up to Flood Warnings and providing a clear response with respect to safe access routes and places of safety in the event of a Flood Warning or breach event. - As the site is at residual risk of flooding from the Thames in the event of a breach in defences, an internally accessible place of safety should be defined within the proposed development above the <i>extreme</i> flood level (0.1% AEP including climate change), capable of accommodating the likely number of occupants. The maximum water level on the site during the <i>extreme</i> flood event from breach location TIL003 is approximately 2.44m AOD. <u>Surface Water</u> - Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. Development should be sequentially located away from the surface water flow path where possible. - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring. - The site, access routes and wider local area are shown to be at significant risk of surface water flooding, and it is an Area of Critical Drainage (AoCD). Consideration should be made of requirements for development in this location to contribute to wider strategic flood risk management measures for the AoCD to ensure that the risk of flooding is not increased and where possible is reduced. Consideration should be made of increasing the number of residents reliant on roads and infrastructure already identified at risk of flooding. This should be considered by Emergency Planners prior to allocation and Emergency Plans prepared as appropriate.					

AECOM REF:	ACM_109	THURROCK REF:	61106	SITE NAME:	Alexandra Court sheltered housing complex
FLOOD RISK SUMMARY					
The site is located in Tilbury. The River Thames frontage is approximately 1.3km south of the site. The East Tilbury Dock Sewer runs 160m southwest of the site parallel to the railway line. The entire site is located in Flood Zone 3a 'High Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Tidal defences are present along the River Thames frontage. Flood defences are present along the East Tilbury Dock Sewer. The Rivers and Sea Flooding modelling shows that during '1% AEP Rivers 0.5% AEP Sea Defended Climate Change scenario' the entire site is at risk of flooding. Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, there is no risk of flooding from overtopping. However, the site and local area are at residual risk of flooding in the event of a breach or failure of flood defences during the 0.5% AEP event for the year 2125. The site is at Significant hazard (Danger for Most) and Extreme hazard (Danger to All). The maximum water level on the site during this event (from breach location TIL003) is 2.15m AOD (corresponding to depths of up to 1.5m). The site is located in Area of Critical Drainage AoCD008 and the Risk of Flooding from Surface Water mapping indicates that the site and local area are susceptible to surface water flooding. The BGS Susceptibility to Groundwater Flooding dataset indicates the site is located in an area with 'limited potential for groundwater flooding to occur'. The site is at residual risk of flooding from reservoirs in the event of a breach when river levels are normal.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable (residential) development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Tidal and Fluvial</u> - Modelling of the design event (0.5% AEP including upper end climate change allowance) shows that the site is not at risk of flooding through overtopping, so there are no specific requirements on Finished Floor Levels for residential accommodation in relation to the risk of flooding from the sea. - The site is located within the 'Thames estuary from Shellhaven, to and including Tilbury' Flood Warning Area. Safe access/egress is not available during both the design and breach event. During a breach event, Dunlop Road on the western boundary of the site and Alexandra Road on the south boundary are both at Extreme hazard. Developers should ensure Emergency Plans are prepared for occupants of the site detailing the requirement to sign up to Flood Warnings and providing a clear response with respect to safe access routes and places of safety in the event of a Flood Warning or breach event. - As the site is at residual risk of flooding from the Thames in the event of a breach in defences, an internally accessible place of safety should be defined within the proposed development above the <i>extreme</i> flood level (0.1% AEP including climate change), capable of accommodating the likely number of occupants. The maximum water level on the site during the <i>extreme</i> flood event from breach location TIL003 is approximately 2.44m AOD. <u>Surface Water</u> - Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. Development should be sequentially located away from the surface water flow path where possible. - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring. - The site, access routes and wider local area are shown to be at significant risk of surface water flooding, and it is an Area of Critical Drainage (AoCD). Consideration should be made of requirements for development in this location to contribute to wider strategic flood risk management measures for the AoCD to ensure that the risk of flooding is not increased and where possible is reduced. Consideration should be made of increasing the number of residents reliant on roads and infrastructure already identified at risk of flooding. This should be considered by Emergency Planners prior to allocation and Emergency Plans prepared as appropriate.					

AECOM REF:	ACM_119	THURROCK REF:	61124	SITE NAME:	Whitwell Court, Fairview Chase, Stanford le Hope
FLOOD RISK SUMMARY					
The site is located in Stanford le Hope. The Stanford Brook is approximately 11m to the south of the site. The Thames frontage is approximately 2km south east of the site. The majority (94%) of the site is located in Flood Zone 1 'Low Probability of Flooding' on the Flood Map for Planning (Rivers and Sea) whereas the remainder on the southern boundary is split across Flood Zone 2 (1%), Flood Zone 3a (3%) and 2% in Flood Zone 3b 'Functional Floodplain'. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. The Rivers and Sea Flooding mapping shows that during '1% AEP Rivers 0.5% AEP Sea Defended Climate Change scenario', 9% of the site is at risk of flooding from the Stanford Brook. Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, there is no risk of flooding from overtopping to this area. However, the floodplain of the Stanford Brook is at residual risk of flooding in the event of a breach or failure of flood defences during the 0.5% AEP event for the year 2125. The edge of the site is at Significant hazard (Danger for Most) and Extreme hazard (Danger to All). The maximum water level on the site during this event (from breach location MUC001) is 5.92m AOD (corresponding to depths of up to 2.5m). The Risk of Flooding from Surface Water mapping indicates the site and local area are highly susceptible to surface water flooding. The Level 1 SFRA reports records of surface water flooding in Stanford le Hope town. The BGS Susceptibility to Groundwater Flooding dataset indicates the local area has 'potential for groundwater flooding of property situated below ground level' and a 'limited potential for groundwater flooding to occur'. The site is not shown to be at residual risk of flooding from reservoirs in the event of a breach or failure.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable (residential) development is permitted in Flood Zones 1 and 2. More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Tidal and Fluvial</u> • Development is not permitted in Flood Zone 3b. This part of the site should be retained as floodplain and steps taken to restore land to provide a more natural edge of the on-site watercourse. Development should be set back from the Stanford Brook. Any development or works within 8m of the Main River will require consent from the Environment Agency. • Development should be avoided in Flood Zone 3a and Flood Zone 2, as built development will reduce the capacity of the floodplain to store floodwater. • Should development be proposed in the floodplain, compensation storage will need to be provided to offset any loss of storage. Finished floor levels for residential development will need to be set above the modelled flood level for the design event (1% AEP plus climate change allowance), including a freeboard allowance. • Modelling of the <i>tidal</i> design event (0.5% AEP including upper end climate change allowance) shows that the site is not at risk of flooding through overtopping, so there are no specific requirements on Finished Floor Levels for residential accommodation in relation to the risk of flooding from the sea. • The site is located within the 'Thames estuary from Shellhaven, to and including Tilbury' Flood Warning Area. Safe access/egress is available during both the design (overtopping) and breach event. During a breach event, Fairview Chase on the northern boundary of the site is not at risk of flooding and will therefore provide a safe access route. Developers should ensure Emergency Plans are prepared for occupants of the site detailing the requirement to sign up to Flood Warnings and providing a clear response with respect to safe access routes and places of safety in the event of a Flood Warning or breach event. • As the site is at residual risk of flooding from the Thames estuary in the event of a breach in flood defences, an internally accessible place of safety should be defined within the proposed development above the <i>extreme</i> flood level (0.1% AEP including climate change), capable of accommodating the likely number of occupants. The maximum water level on the site during the <i>extreme</i> flood event from breach location MUC001 is approximately 6.27m AOD. <u>Surface Water</u> • Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. Development should be sequentially located away from the surface water flow path where possible. • Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.					

AECOM REF:	ACM_124	THURROCK REF:	61143	SITE NAME:	Land Adjacent 94, Fobbing Road, Corringham, Essex
FLOOD RISK SUMMARY					
The site is located between Corringham and Fobbing. The Fobbing Common Sewer/Manorway Fleet flows south parallel to the eastern boundary of the site. The River Thames frontage is approximately 2.9km south of the site. Most of the site (96%) is located within Flood Zone 2 'Medium Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The remainder (4%) lies in Flood Zone 3a 'High Probability of Flooding'. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Tidal defences are present along the River Thames frontage. Natural high ground is present along the Manorway Fleet frontage southeast of the site. The Rivers and Sea Flooding mapping shows that during '1% AEP Rivers 0.5% AEP Sea Defended Climate Change scenario', the entire site is at risk of flooding. Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, there is no risk of flooding from overtopping to this area. However, the floodplain of the Manorway Fleet just to the south of the site is shown to be at residual risk of flooding in the event of a breach or failure of flood defences during the 0.5% AEP event for the year 2125. The area to the south east of the site is at Low and Moderate hazard (Danger to Some). The Risk of Flooding from Surface Water mapping indicates the site and local area including Fobbing Road to the north are highly susceptible to surface water flooding. There is a key flow path that corresponds to the route of the watercourse. The BGS Susceptibility to Groundwater Flooding dataset indicates the local area has 'potential for groundwater flooding to occur at surface'. The site is not shown to be at residual risk of flooding from reservoirs in the event of a breach or failure.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable (residential) development is permitted in Flood Zones 1 and 2. More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Tidal and Fluvial</u> - Detailed modelling should be undertaken to determine a suitable area to be retained as floodplain along the Fobbing Common Sewer / Manorway Fleet, and to determine the design flood level for the site. Development should be avoided in the <i>fluvial</i> design flood extent (1% AEP including climate change allowance). - Modelling of the <i>tidal</i> flooding design event (0.5% AEP including upper end climate change allowance) shows that the site is not at risk of flooding through overtopping, so there are no specific requirements on Finished Floor Levels for residential accommodation in relation to the risk of flooding from the sea. - Modelling of the design event (0.5% AEP including upper end climate change allowance) shows that the site and local area are not at risk of flooding in the event of a breach in flood risk management infrastructure, therefore there are no specific requirements on internally accessible places of safety for residential accommodation in relation to risk of flooding from the sea. <u>Surface Water</u> - The risk of surface water flooding is closely linked to fluvial flooding in this location. Consideration should be made of the surface water flowpaths into the Fobbing Common Sewer / Manorway Fleet during the site planning to avoid placing development in areas at risk of surface water and fluvial flood risk. - Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. Development should be sequentially located away from the surface water flow path where possible. - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.					

AECOM REF:	ACM_126	THURROCK REF:	61147	SITE NAME:	Land Adjoining, Tamarisk Road, South Ockendon, Essex
FLOOD RISK SUMMARY					
The site is located in Ockendon. The River Thames frontage is approximately 5.6km south of the site, the River Mardyke is approximately 2.2km south of the site. There is a culverted watercourse that runs south of the site parallel to the railway line before draining into the River Mardyke. Most of the site (79%) is located in Flood Zone 1 'Low Probability of Flooding' on the Flood Map for Planning (Rivers and Sea) with the remainder (21%) south of the site is in Flood Zone 2 'Medium Probability of Flooding' associated with fluvial flooding. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. The Rivers and Sea Flooding Modelling shows that during the extreme flood event (0.1% AEP), the southern and western edge of the site are at risk of flooding. The site is not at risk of tidal flooding from the Thames, either from overtopping or as a result of a breach in defences. Risk of Flooding from Surface Water mapping indicates surface water ponds against the railway on the western edge of the site. The local area is also susceptible to surface water flooding. The site is within an Area of Critical Drainage as defined by the Council in their SWMP, AoCD013. The BGS Susceptibility to Groundwater Flooding dataset indicates the local area has 'potential for groundwater flooding to occur at surface'. The site is not shown to be at residual risk of flooding from reservoirs in the event of a breach or failure.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable (residential) development is permitted in Flood Zones 1 and 2. More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Fluvial and Surface Water</u> • Development proposals for the site should be designed around the natural surface water flowpaths on the site. • Due to the location of the site within an Area of Critical Drainage, as identified by Thurrock Council in their SWMP, applicants should work with the Council to determine requirements for surface water management. • Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. • Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.					

AECOM REF:	ACM_128	THURROCK REF:	61151	SITE NAME:	Portland Lodge, Brentwood Road, Bulphan
FLOOD RISK SUMMARY					
The site is located in Bulphan in the upper catchment of the River Mardyke. There is a small watercourse 325m south of the site which is one of the tributaries of the Mardyke. The River Thames frontage is approximately 7.62km southeast of the site. The site is not at risk of tidal flooding from the Thames, either from overtopping or as a result of a breach in defences. The Flood Map for Planning (Rivers and Sea) shows 39% of the site is located in Flood Zone 1 'Low Probability of Flooding', 8% in Flood Zone 2 'Medium Probability of Flooding' and more than half (53%) located in Flood Zone 3a 'High Probability of Flooding'. The dataset also shows more than half (61%) of the site is in the combined future flood zone. The Rivers and Sea Flooding mapping shows that during the '1% AEP Rivers 0.5% AEP Sea Defended Climate Change scenario', 53% of the site is at risk of flooding from rivers. Risk of Flooding from Surface Water mapping indicates most of the site and local area are susceptible to surface water ponding both under present day and in for climate change scenarios for a 3.3% AEP event. The site is within an Area of Critical Drainage as defined by the Council in their SWMP, AoCD011. The BGS Susceptibility to Groundwater Flooding dataset indicates the area has 'potential for groundwater flooding to occur at surface'. The site is not shown to be at residual risk of flooding from reservoirs in the event of a breach or failure.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable (residential) development is permitted in Flood Zones 1 and 2. More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Fluvial and Surface Water</u> - Detailed modelling will be required for the Mardyke to determine the design flood level for the site (1% AEP including climate change). In order that proposed development does not increase the risk of flooding to surrounding area, the footprint of the building should be similar to that already in place. Any increase in built footprint within the modelled flood extent would require floodplain compensation storage to be provided on a level for level and volume for volume basis, which is unlikely to be feasible within a site of this size. - Finished floor levels for residential development will need to be set above the fluvial design flood level (1% AEP including climate change). - Development proposals for the site should be designed around the natural surface water flowpaths on the site. - The site, access routes and wider local area are shown to be at significant risk of surface water flooding and are within an Area of Critical Drainage (AoCD) as identified by Thurrock Council in their SWMP. Consideration should be made of requirements for development in this location to contribute to wider strategic flood risk management measures for the AoCD to ensure that the risk of flooding is not increased and where possible is reduced. Consideration should be made of increasing the number of residents reliant on roads and infrastructure already identified at risk of flooding. This should be considered by Emergency Planners prior to allocation and Emergency Plans prepared as appropriate. - Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.					

AECOM REF:	ACM_129	THURROCK REF:	61152	SITE NAME:	Judds Farm, Harrow Lane, Bulphan
FLOOD RISK SUMMARY					
The site is located in Bulphan in the upper catchment of the River Mardyke. This area is low lying marshland with a network of drainage channels or fens that are used to drain the land to enable agriculture. There is an unnamed ordinary watercourse which flows adjacent to the access route to the site and is culverted in sections. A tributary of the Mardyke is located to the north and flows west. The River Thames frontage is approximately 9.37km southeast of the site. Half of the site (51%) is located in Flood Zone 1 'Low Probability of Flooding' on the Flood Map for Planning (Rivers and Sea), and the remainder (48%) is in Flood Zone 2 'Medium Probability of Flooding' and 2% in Flood Zone 3a 'High Probability of Flooding'. The Rivers and Sea Flooding Modelling shows that 3% of the site is at risk of flooding from Rivers and/or Sea (0.1% AEP +Climate Change). Half of the site (50%) is indicated to be within future Flood Zones. Risk of Flooding from Surface Water mapping does not identify any significant surface water ponding on the site itself, however the mapping shows ponds along the drainage ditches and adjacent to the roads in the surrounding area. The BGS Susceptibility to Groundwater Flooding dataset indicates most of the area has 'potential for groundwater flooding to occur at surface' with a small area northeast of the site with 'potential for groundwater flooding of property situated below ground level'. The site access route and surrounding area are shown to be at residual risk of flooding from reservoirs in the event of a breach or failure when there is also flooding from rivers.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable (residential) development is permitted in Flood Zones 1 and 2. More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Fluvial and Surface Water</u> • The site is shown to be within Flood Zones 2 and 3 in the future as a result of the impacts of climate change. Detailed modelling will be required for the Mardyke to determine the design flood level for the site (1% AEP including climate change). • Finished floor levels for residential development will need to be set above the fluvial design flood level (1% AEP including climate change). • In order that proposed development does not increase the risk of flooding to surrounding area, the footprint of any buildings proposed in the floodplain will need to be similar (or ideally less than) that already in place. Any increase in built footprint within the modelled flood extent would require floodplain compensation storage to be provided on a level for level and volume for volume basis. • The site is not within a Flood Warning Area, however the local area including access routes to the site are at risk of flooding from the Mardyke and its tributaries. It is recommended that occupants of the site register with the Flood Warning Service and have a Flood Response Plan in place. • Development proposals for the site should be designed around the natural surface water flowpaths on the site. • Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. • Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.					

AECOM REF:	ACM_134	THURROCK REF:	61169	SITE NAME:	Land Part Of Little Thurrock Marshes, Thurrock Park Way, Tilbury, Essex
FLOOD RISK SUMMARY					
The site is located in Thurrock Park. The River Thames frontage is approximately 820m south west of the site. The Chadwell New Cross Sewer flows within the site along the northern to western boundary before draining into the River Thames. There is a drain from the Tilbury West Flood Storage Area (FSA) that flows along the eastern boundary. The majority of the site (94%) is located in Flood Zone 3a 'High Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The remainder (6%) is in Flood Zone 3b 'Functional Floodplain'. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Tidal defences are present along the River Thames frontage. Natural high ground is present either side of the Chadwell New Cross Sewer. The Rivers and Sea Flooding modelling shows that the entire site is at risk of flooding from sea during the 0.5% AEP. Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, there is no risk of flooding from overtopping to this area. However, the area is at residual risk of flooding in the event of a breach or failure of flood defences during the 0.5% AEP event for the year 2125. The site and wider area are at Significant (Danger to Most) and Extreme (Danger to All) hazard ratings. The maximum flood level is approximately 2.15m AOD (from breach location TIL003) leading to depths on the site of up to 2m. Risk of Flooding from Surface Water mapping indicates that most of site and local area are susceptible to surface water ponding both under present day and in for climate change scenarios and the site is located in an Area of Critical Drainage AoCD007 (as defined in the Thurrock Council SWMP). The BGS Susceptibility to Groundwater Flooding dataset indicates most of the area has 'limited potential for groundwater flooding to occur' with a small area of 'potential for groundwater flooding of property situated below ground level. The site and local area are shown to be at residual risk of flooding from reservoirs in the event of a breach or failure.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable (residential) development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Tidal</u> - Modelling of the design event (0.5% AEP including upper end climate change allowance) shows that the site is not at risk of flooding through overtopping, so there are no specific requirements on Finished Floor Levels for residential accommodation in relation to the risk of flooding from the sea. - The site is located within the 'Thames estuary from Shellhaven, to and including Tilbury and the Thames estuary from Grays to Purfleet-on-Thames, including West Thurrock' Flood Warning Area. Safe access/egress is available during the design (overtopping) event. However, safe access is not available during a breach event. Thurrock Park Way on the southern side of the site is at Extreme hazard. Developers should ensure Emergency Plans are prepared for occupants of the site detailing the requirement to sign up to Flood Warnings and providing a clear response with respect to safe access routes and places of safety in the event of a Flood Warning or breach event. - As the site is at residual risk of flooding from the Thames in the event of a breach in defences, an internally accessible place of safety should be defined within the proposed development above the <i>extreme</i> flood level (0.1% AEP including climate change), capable of accommodating the likely number of occupants. The maximum water level on the site during the <i>extreme</i> flood event from breach location TIL003 is approximately 2.44m AOD. <u>Fluvial and Surface Water</u> - Development is not permitted in Flood Zone 3b. The course of the Chadwell New Sewer through the site should be retained and safeguarded and steps taken to restore land to provide a more natural watercourse and floodplain. - An 8m wide undeveloped buffer strip should be retained from top of bank alongside the Main Rivers and Ordinary Watercourses and opportunities should be explored for riverside restoration. Development within 8m of a Main River or Ordinary Watercourse will require consent from the Environment Agency or Thurrock Council as Lead Local Flood Authority, respectively. - Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. Development should be sequentially located away from the surface water flow path where possible. - The site, access routes and wider local area are shown to be at significant risk of surface water flooding and are within an Area of Critical Drainage (AoCD) as identified by Thurrock Council in their SWMP. Consideration should be made of requirements for development in this location to contribute to wider strategic flood risk management measures for the AoCD to ensure that the risk of flooding is not increased and where possible is reduced. Consideration should be made of increasing the number of residents reliant on roads and infrastructure already identified at risk of flooding. This should be considered by Emergency Planners prior to allocation and Emergency Plans prepared as appropriate. - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.					

AECOM REF:	ACM_135	THURROCK REF:	61171	SITE NAME:	Grays Shopping Centre, High Street, Grays
FLOOD RISK SUMMARY					
The site is located in Grays. The River Thames frontage is approximately 717m south of the site. There are no other watercourses within close proximity to the site. The majority of the site (94%) is located in Flood Zone 1 'Low Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The remainder (6%) is in Flood Zone 2 'Medium Probability of Flooding'. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Tidal defences are present along the River Thames frontage. The Rivers and Sea Flooding modelling shows that 86% of the site is at risk of flooding from sea during the 0.5% AEP flood event. Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, there is no risk of flooding from overtopping to this area. However, there is a residual risk of flooding from breach in the flood defences leading to flooding at the north of the site with breach flood depths in the range of 0.5 to 1m. The maximum flood level is 4.97mAOD (from breach location GRY003). The model shows a hazard rating of Low (Caution) progressing to the north as 'Moderate' (Dangerous for some) and then a smaller area on the north boundary with a hazard rating of 'Significant' (Dangerous for most people). The Risk of Flooding from Surface Water mapping indicates that most of site and local area are susceptible to surface water ponding both under present day and in for climate change scenarios. The site is within an Area of Critical Drainage AoCD005 as identified in the Thurrock Council SWMP. The BGS Susceptibility to Groundwater Flooding dataset indicates more than half of the area has 'limited potential for groundwater flooding to occur' with the remainder not susceptible to groundwater flooding. The northern part of the site and local area are shown to be at residual risk of flooding from reservoirs in the event of a breach or failure when there is also flooding from rivers.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable development types, such as residential, are permitted in Flood Zones 1 and 2 and the Exception Test is not required. The majority of the site is shown to be within Flood Zones 2 or 3 in the future due to the impacts of climate change. A site-specific FRA will be required. The following recommendations are made: <u>Tidal</u> - Modelling of the design event (0.5% AEP including upper end climate change allowance) shows that the site is not at risk of flooding through overtopping, so there are no specific requirements on Finished Floor Levels for residential accommodation in relation to the risk of flooding from the sea. - The site is located within the 'Thames estuary from Grays to Purfleet-on-Thames, including West Thurrock' Flood Warning Area. Safe access/egress is available during the design event (overtopping) but is not available during a breach event. During a breach event, Clarence Road on the northern boundary of the site is at Low to Significant hazard rating (Danger for Most). Developers should ensure Emergency Plans are prepared for occupants of the site detailing the requirement to sign up to Flood Warnings and providing a clear response with respect to safe access routes and places of safety in the event of a Flood Warning or breach event. - As the site is at residual risk of flooding from the Thames in the event of a breach in defences, an internally accessible place of safety should be defined within the proposed development above the <i>extreme</i> flood level (0.1% AEP including climate change), capable of accommodating the likely number of occupants. The maximum water level on the site during the <i>extreme</i> flood event from breach location GRY004 is approximately 5.32m AOD. <u>Surface Water</u> - Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. Development should be sequentially located away from the surface water flow path where possible. - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring. - The site, access routes and wider local area are shown to be at significant risk of surface water flooding and are within an Area of Critical Drainage (AoCD) as identified by Thurrock Council in their SWMP. Consideration should be made of requirements for development in this location to contribute to wider strategic flood risk management measures for the AoCD to ensure that the risk of flooding is not increased and where possible is reduced. Consideration should be made of increasing the number of residents reliant on roads and infrastructure already identified at risk of flooding. This should be considered by Emergency Planners prior to allocation and Emergency Plans prepared as appropriate.					

AECOM REF:	ACM_136	THURROCK REF:	61172	SITE NAME:	Car Parks Crown Road And Darnley Road, Grays
FLOOD RISK SUMMARY					
The site is located in Grays. The River Thames frontage is approximately 639m south of the site, there is no watercourse within the vicinity of the site. The entire site is located in Flood Zone 1 'Low Probability of Flooding' on the Flood Map for Planning (Rivers and Sea). The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Tidal defences are present along the River Thames frontage. The Rivers and Sea Flooding modelling shows that 29% of the entire site is at risk of flooding from sea during the 0.5% AEP flood event including climate change. Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. The site itself is not shown to be at risk of flooding during the overtopping or breach event for 0.5% event (2125). The access routes and local area to the west of the site are shown to be at residual risk of flooding in the event of a breach in the tidal flood defences during the 0.5% AEP event (2125) with hazard ratings of Low to Significant (Danger to Most). The Risk of Flooding from Surface Water mapping indicates that the western side of the site and local area are susceptible to surface water ponding both under present day and in for climate change scenarios. The site is within an Area of Critical Drainage AoCD005 as identified in the Thurrock Council SWMP. The BGS Susceptibility to Groundwater Flooding dataset indicates most of the area has 'limited potential for groundwater flooding to occur'. To the north of the site, the local area is shown to be at residual risk of flooding from reservoirs in the event of a breach or failure when there is also flooding from rivers.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable development, such as residential, is permitted in Flood Zone 1 and the Exception Test is not required. In the future, approximately 30% of the site is shown to be within Flood Zones 2 or 3, and therefore it is recommended a site-specific FRA is prepared for the site. The following recommendations are made for this site: <u>Tidal and Fluvial</u> - Modelling of the design event (0.5% AEP including upper end climate change allowance) shows that the site is not at risk of flooding through overtopping, so there are no specific requirements on Finished Floor Levels for residential accommodation in relation to the risk of flooding from the sea. - Modelling shows that the site is not at residual risk of tidal flooding from the Thames (during the 0.5 AEP including upper end climate change allowance), however, the local area to the north and west is at risk and this should be considered when developing proposals for the site. Developers should ensure Emergency Plans are prepared for occupants of the site detailing the requirement to sign up to Flood Warnings and providing a clear response with respect to safe access routes and places of safety in the event of a Flood Warning or breach event. <u>Surface Water</u> - Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. Development should be sequentially located away from the surface water flow path where possible. - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring. - The site, access routes and wider local area are shown to be at significant risk of surface water flooding and are within an Area of Critical Drainage (AoCD) as identified by Thurrock Council in their SWMP. Consideration should be made of requirements for development in this location to contribute to wider strategic flood risk management measures for the AoCD to ensure that the risk of flooding is not increased and where possible is reduced. Consideration should be made of increasing the number of residents reliant on roads and infrastructure already identified at risk of flooding. This should be considered by Emergency Planners prior to allocation and Emergency Plans prepared as appropriate.					

AECOM REF:	ACM_138	THURROCK REF:	61187	SITE NAME:	Land adjacent and rear of George and Dragon Public House
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FLOOD RISK SUMMARY

The site is located in Linford. The River Thames frontage is approximately 2km east of the site. Gabions Sewer runs west to east along the northern site boundary. More than half of the site (56%) to the north is located in Flood Zone 2 'Medium Probability of Flooding', 39% is located in Flood Zone 1 'Low Probability of Flooding' and 4% is located within Flood Zone 3a 'High Probability of Flooding' and 1% in Flood Zone 3b 'Functional Floodplain'. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Tidal defences are present along the River Thames frontage. Flood defences are present along the Gabions Sewer.

The Rivers and Sea Flooding modelling shows that 89% of the entire site is at risk of flooding from sea during the 0.5% AEP flood event including climate change.

Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, the site and local area are not shown to be at risk of flooding from overtopping. However, there is a residual risk of flooding from breach in the flood defences leading to flooding at the north of the site with breach flood depths in the range of 0.5 to 1m across the northern half of the site, and up to 2m along the Gabions Sewer. The maximum flood level is 5.46mAOD (from breach location ETIL002). The model shows a hazard rating of Low (Caution) progressing to the north as 'Moderate' (Dangerous for Some) and then a smaller area on the north boundary with a hazard rating of 'Significant' (Dangerous for most people).

The Risk of Flooding from Surface Water mapping also highlights the natural floodplain of the Gabions Sewer along the northern boundary of the site. The local area is also shown to be susceptible to surface water ponding both under present day and in for climate change scenarios. The site is within an Area of Critical Drainage AoCD009 as identified in the Thurrock Council SWMP.

The BGS Susceptibility to Groundwater Flooding dataset indicates the local area is identified as having 'limited potential for groundwater flooding to occur' and 'potential for groundwater flooding of property situated below ground level'.

The site is not shown to be at residual risk of flooding from reservoirs in the event of a breach or failure.

SITE SPECIFIC RECOMMENDATIONS

More Vulnerable development (e.g. residential) is permitted in Flood Zones 1 and 2 (majority of the site). More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made:

- Tidal and Fluvial
- Development is not permitted in Flood Zone 3b. This part of the site (1%) should be retained as floodplain and steps taken to restore land to provide a more natural edge of the watercourse. An 8m wide undeveloped buffer strip should be retained from top of bank of the Main River and opportunities should be explored for riverside restoration. New development within 8m of a main river will require consent from the Environment Agency.
 - Modelling of the design event (0.5% AEP including upper end climate change allowance) shows that the site and local area are not at risk of flooding through overtopping, so there are no specific requirements on Finished Floor Levels for residential accommodation in relation to the risk of flooding from the sea.
 - The site is located within the 'Thames estuary from Shellhaven, to and including Tilbury' Flood Warning Area. Safe access/egress is available for the site during the design event (overtopping) and during a breach event. A dry route is available from the west of the site, and west along Muckingford Road.
 - The northern half of the site is at residual risk of flooding from the River Thames in the event of a breach in flood defences. Therefore, an internally accessible place of safety should be designed within the proposed development above the breach flood level during the *extreme* event (0.1% AEP including climate change), capable of accommodating the likely number of occupants. The maximum water level on the site during the *extreme* flood event from breach location ETIL002 is approximately 5.66m AOD.
- Surface Water
- Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing.
 - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring.
 - The site, access routes and wider local area are shown to be at significant risk of surface water flooding and are within an Area of Critical Drainage (AoCD) as identified by Thurrock Council in their SWMP. Consideration should be made of requirements for development in this location to contribute to wider strategic flood risk management measures for the AoCD to ensure that the risk of flooding is not increased and where possible is reduced. Consideration should be made of increasing the number of residents reliant on roads and infrastructure already identified at risk of flooding. This should be considered by Emergency Planners prior to allocation and Emergency Plans prepared as appropriate.

AECOM REF:	ACM_142	THURROCK REF:	61209	SITE NAME:	Development Land East Of Caspian Way And North And South Of London Road, Purfleet, Essex
FLOOD RISK SUMMARY					
The site is located in Purfleet on the River Thames frontage. The River Mardyke flows east to west approximately 315m north of the site and flows into the River Thames to the north west of the site. Approximately half of the site (48%) is located within Flood Zone 3a 'High Probability of Flooding', 32% is located in Flood Zone 2 'Medium Probability of Flooding' and 17% is located in Flood Zone 1 'Low Probability of Flooding'. The remainder (2%) to the south of the site comprises a jetty within the tidal Thames. The Flood Map for Planning (Rivers and Sea) does not take into account the presence of defences. Tidal defences are present along the River Thames frontage. The Rivers and Sea Flooding modelling shows that 88% of the site is at risk of flooding from sea during the 0.5% AEP event including climate change. Modelling has been undertaken to understand the risk of flooding from (1) overtopping of the tidal defences and (2) that associated with a breach in the tidal defences. During the design event (0.5% AEP including upper end climate change allowance) for the year 2125, there is a risk of flooding as a result of overtopping in the eastern part of the site where ground levels are low lying. Defences in the area to the south east of the site are shown to overtop, and floodwaters flow through the local area and pond on the site. There is a Low to Moderate hazard rating and flood level of approximately 1.17m AOD. The defences adjacent to the site itself are not shown to overtop. Most of the site is shown to be at residual risk of flooding from the sea in the event of a breach or failure of flood defences. This shows that over half of the site is at risk of flooding during the 0.5% AEP for the year 2125. There is a large area of 'Extreme' hazard (Danger to All) in the south of the site with maximum breach flood depth in the range 4 to 4.5m and a smaller area of 'Significant' hazard (Danger to most). The maximum flood level during this event is 6.84mAOD during a breach from location PUR001 adjacent to the site. Risk of Flooding from Surface Water mapping indicates that the site and local area are susceptible to surface water ponding both under present day and in for climate change scenarios. The site is within an Area of Critical Drainage AoCD002 as identified in the Thurrock Council SWMP. The BGS Susceptibility to Groundwater Flooding dataset indicates most of the area has 'limited potential for groundwater flooding to occur'. A small area central of the site has 'potential for groundwater flooding of property situated below ground level'. The site is not shown to be at residual risk of flooding from reservoirs in the event of a breach or failure.					
SITE SPECIFIC RECOMMENDATIONS					
More Vulnerable development (e.g. residential) is permitted in Flood Zones 1 and 2. More Vulnerable development is only permitted in Flood Zone 3a where it can be demonstrated that the Exception Test is satisfied i.e. (1) that the proposed development will provide wider sustainability benefits to the community that outweigh the flood risk, and (2) that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce the flood risk overall. A site-specific FRA will be required. The following recommendations are made: <u>Tidal and Fluvial</u> - Modelling of the design event (0.5% AEP including upper end climate change allowance) shows that parts of the site and local area are at risk of flooding through overtopping of defences further to the southern east of the site. Floodwater then makes its way through the local area and ponds on the site. (The defences on the site itself are not shown to overtop). The flood level on the site is approximately 1.17m AOD. Finished Floor Levels for residential accommodation should be set above the modelled flood level including a freeboard. - The site is located within the 'Thames estuary from Grays to Purfleet-on-Thames, including West Thurrock' Flood Warning Area. Safe access/egress is available during both the design and breach event to the west along Arterial Road Purfleet A1306 and then north. During a breach event, London Road is shown to be at Significant to Extreme hazard along parts of its routes (both to the east and the west). Developers should ensure Emergency Plans are prepared for occupants of the site detailing the requirement to sign up to Flood Warnings and providing a clear response with respect to safe access routes and places of safety in the event of a Flood Warning or breach event. - The site is at residual risk of flooding from the Thames in the event of a breach in flood risk management infrastructure. Therefore, an internally accessible place of safety should be defined within the proposed development above the <i>extreme</i> flood level (0.1% AEP including climate change), capable of accommodating the likely number of occupants. The maximum water level on the site during the <i>extreme</i> flood event from breach location PUR001 is approximately 7.06m AOD. <u>Surface Water</u> - Development proposals for the site should seek to restrict surface water runoff rates to greenfield rates; demonstrate sustainable approaches to the management of surface water in accordance with the drainage hierarchy; make use of SuDS (including green/blue roofs, permeable paving, downpipe planters, attenuating tree pits, rain gardens and other innovative technologies); and incorporate soft landscaping, planting and permeable surfacing. Development should be sequentially located away from the surface water flow path where possible. - Finished Floor Levels of any new buildings should be raised by a minimum of 300mm above the surrounding ground level to address the surface water flood risk and the residual risk of exceedance events or blockages to the surface water system occurring. - The site, access routes and wider local area are shown to be at significant risk of surface water flooding and are within an Area of Critical Drainage (AoCD) as identified by Thurrock Council in their SWMP. Consideration should be made of requirements for development in this location to contribute to wider strategic flood risk management measures for the AoCD to ensure that the risk of flooding is not increased and where possible is reduced. Consideration should be made of increasing the number of residents reliant on roads and infrastructure already identified at risk of flooding. This should be considered by Emergency Planners prior to allocation and Emergency Plans prepared as appropriate.					

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