Dartford Borough Level 1 and 2 Strategic Flood Risk Assessment

Appendices (Part 2)

February 2021

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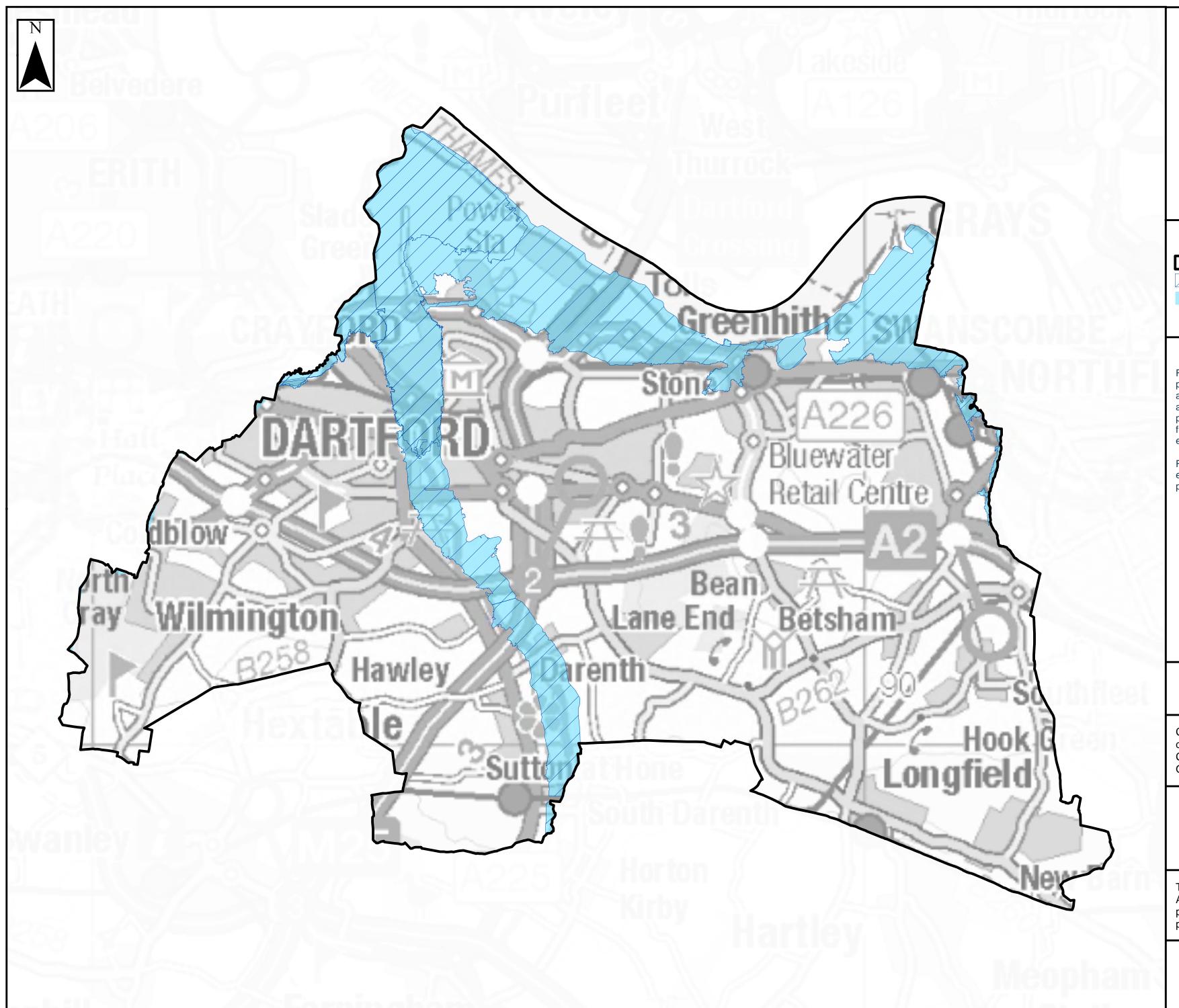
Dartford Borough Council



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SFRA: APPENDIX J.1 **ENVIRONMENT AGENCY FLOOD ALERTS AND FLOOD** WARNINGS





Legend

Dartford Borough
Flood Warning Areas
Flood Alert

Notes

Flood Alerts are used by the Environment Agency to warn people of the possibility of flooding and encourage them to be alert, stay vigilant and make early preparations. Flood Alerts are issued earlier than a flood warning to give notice of the possibility of flooding but before the Environment Agency are fully confident that flooding in Flood Warning Areas is expected.

Flood Warnings warn people of expected flooding and encourage them to take action to protect themselves and their property.

0 1.25 2.5 Kilometres

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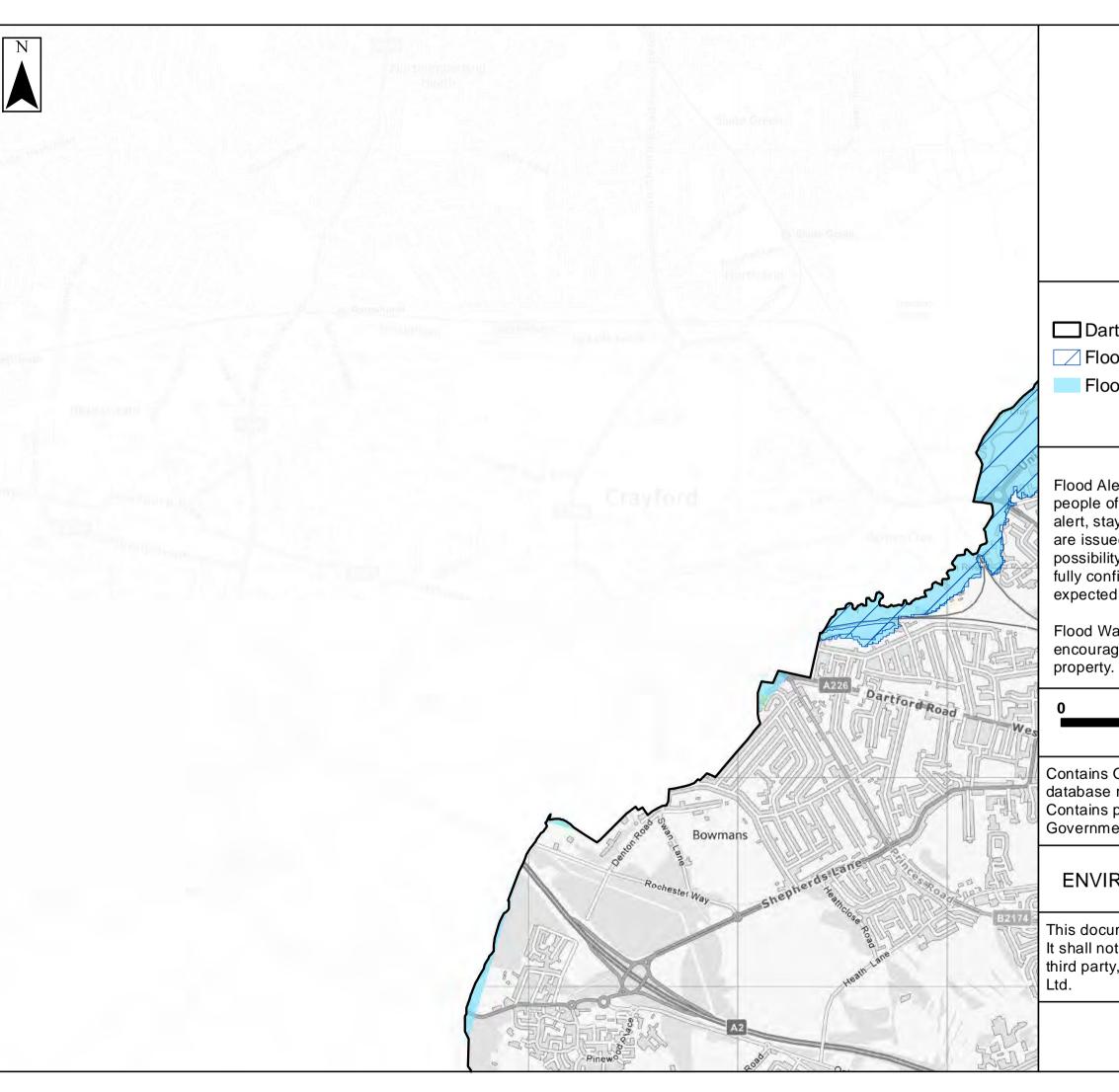
Dartford Borough Council SFRA: APPENDIX J.1 ENVIRONMENT AGENCY FLOOD ALERTS AND FLOOD WARNINGS

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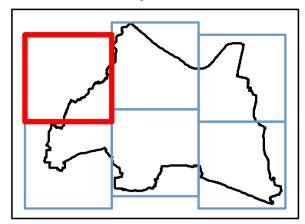




SFRA: APPENDIX J.2 **ENVIRONMENT AGENCY FLOOD ALERTS AND FLOOD** WARNING AREAS



Key Plan



Legend

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Flood Alert

Notes

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Kilometres

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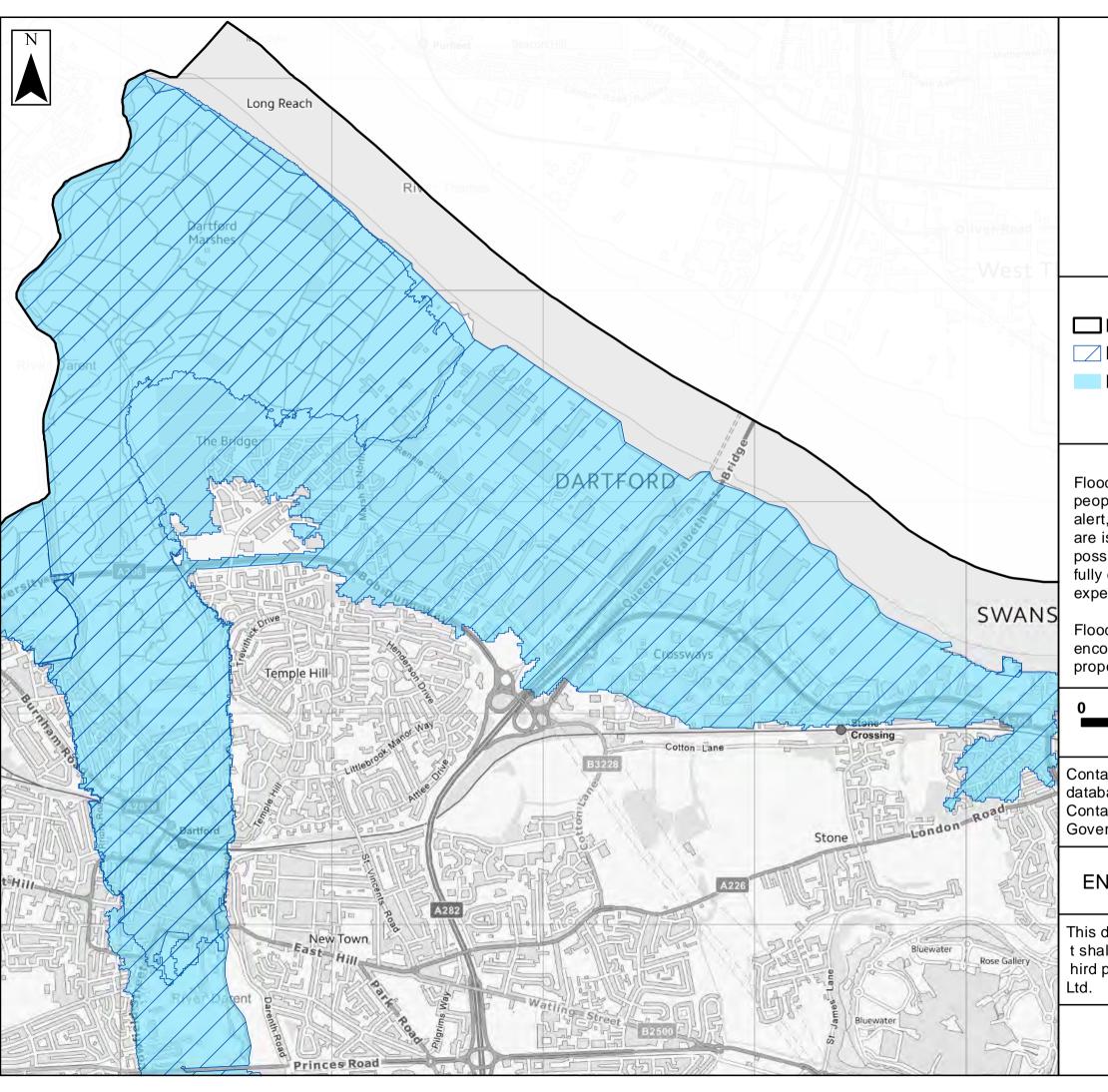
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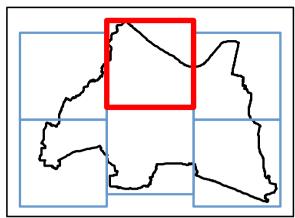
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Legend

☐ Dartford Borough

Flood Alert

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0 1 2 Kilometres

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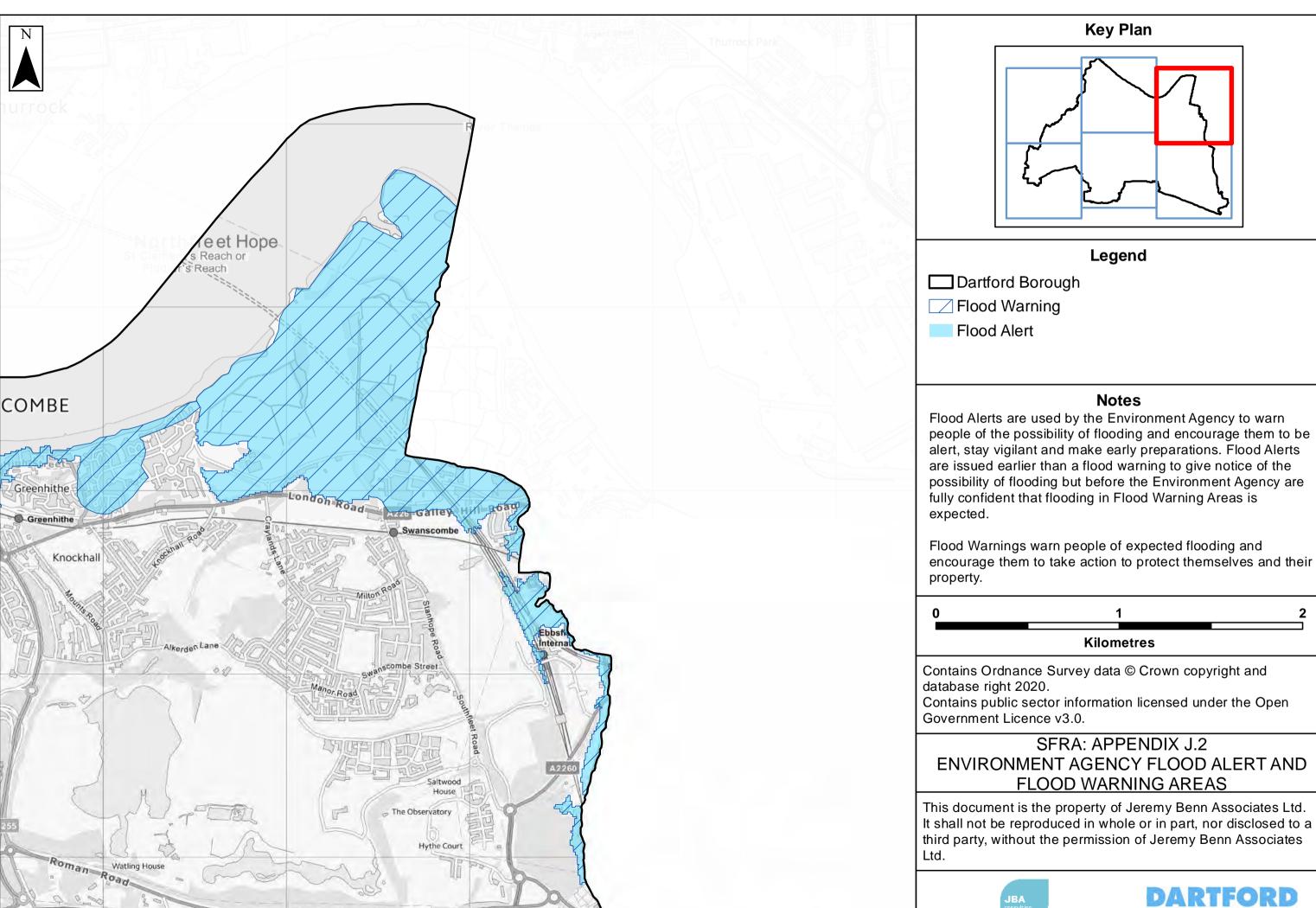
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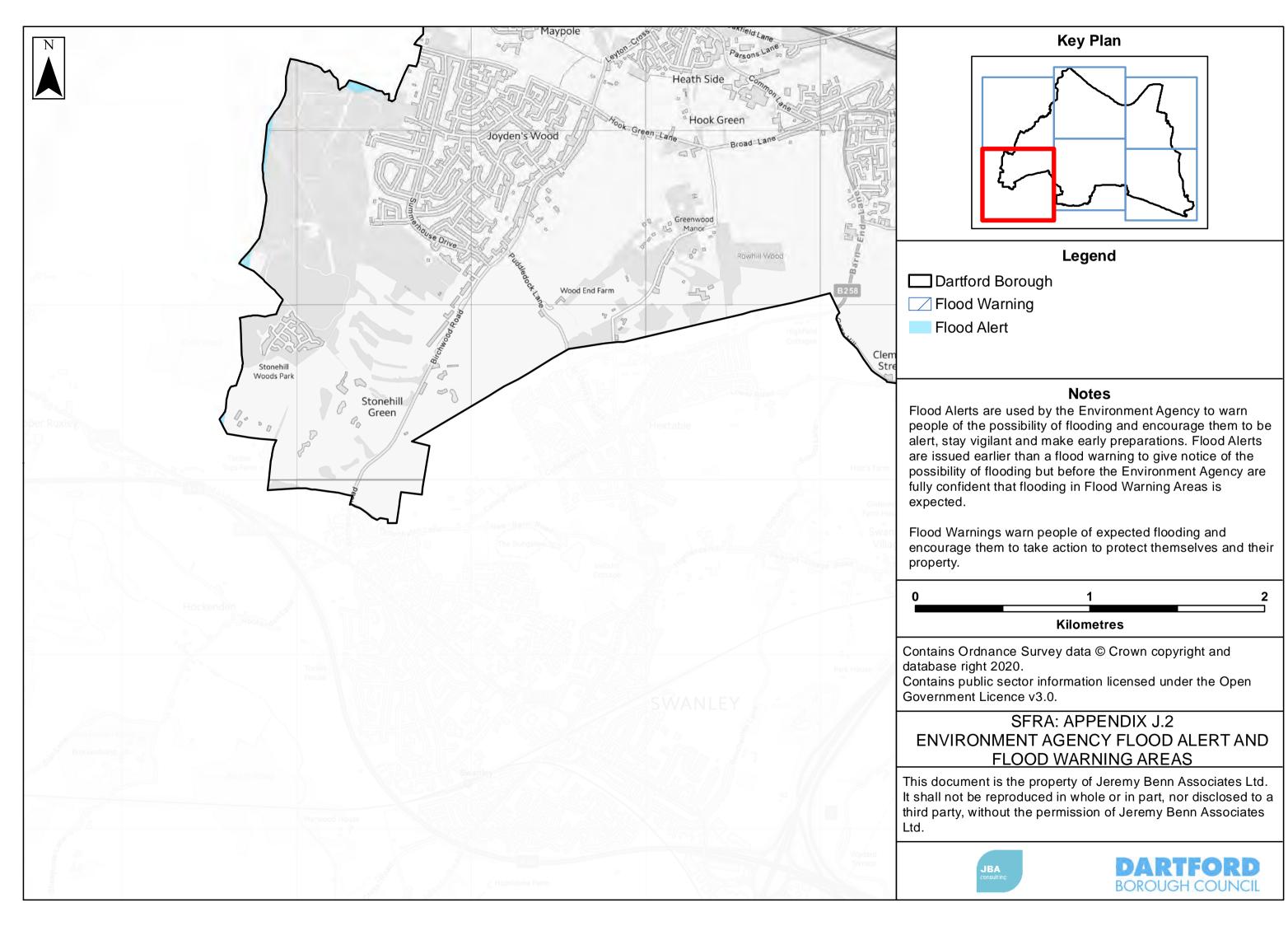


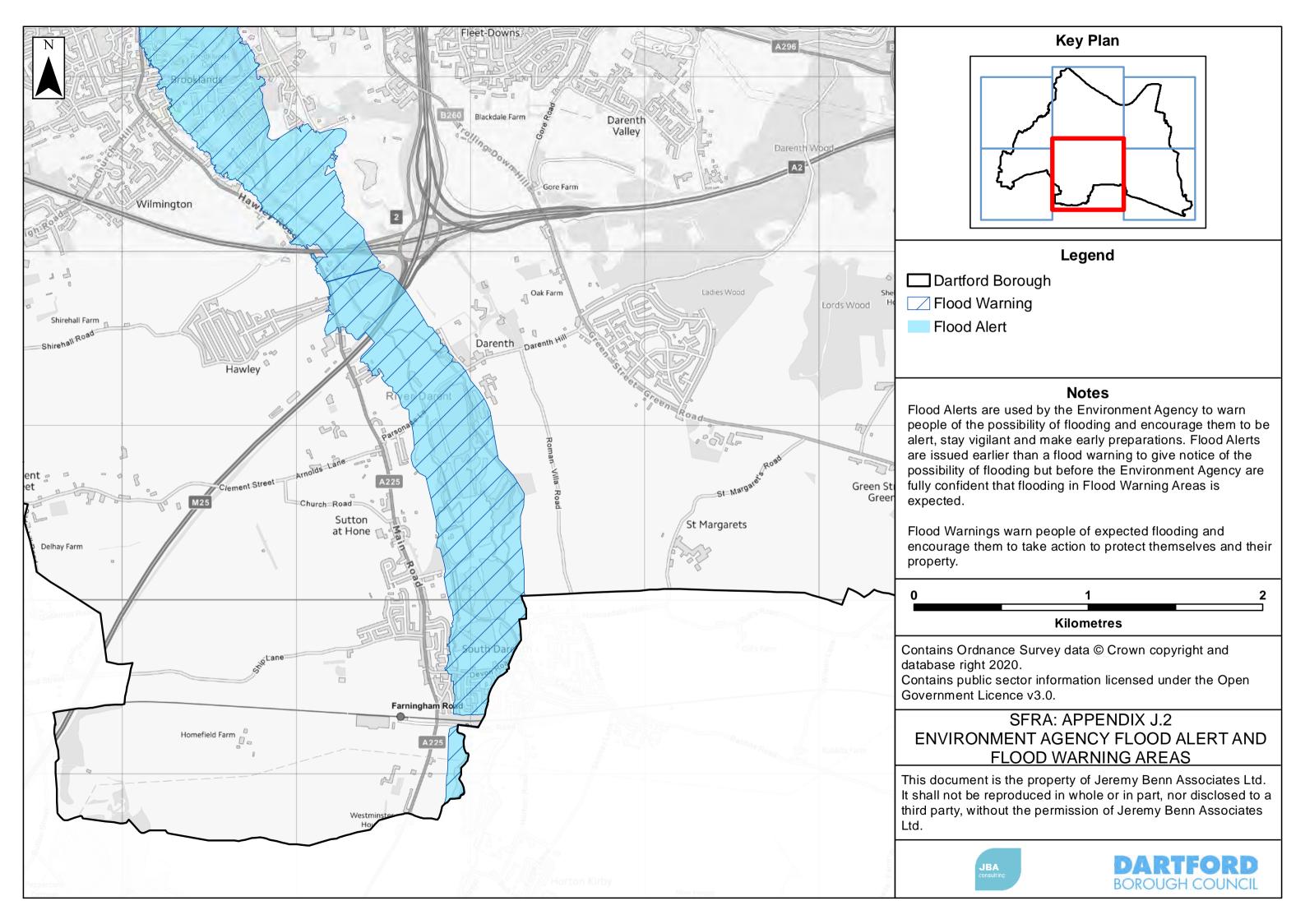
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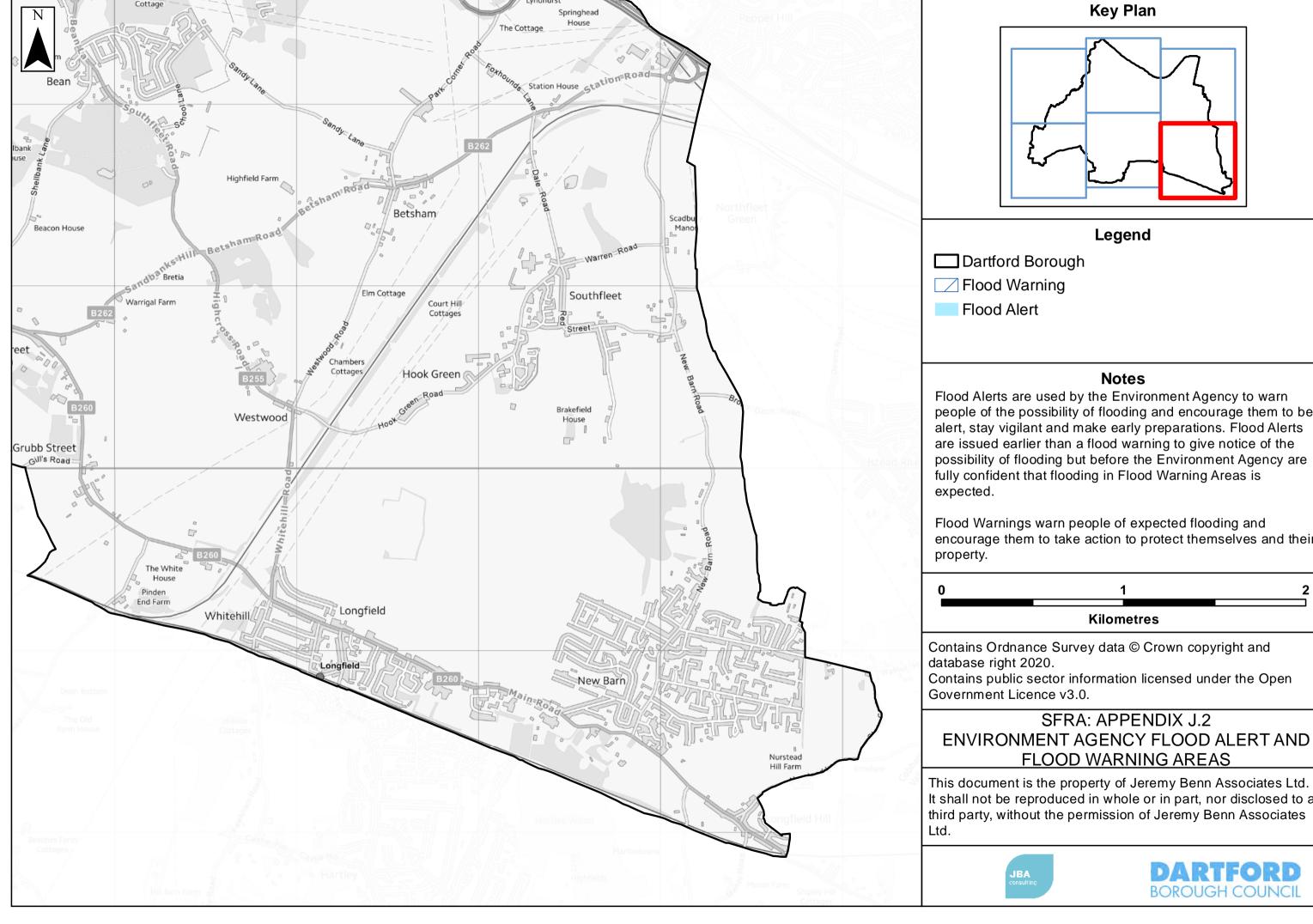


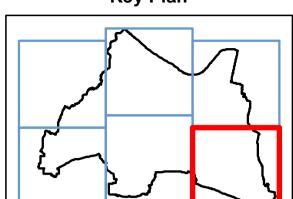
A2 = Watling Street

BOROUGH COUNCIL









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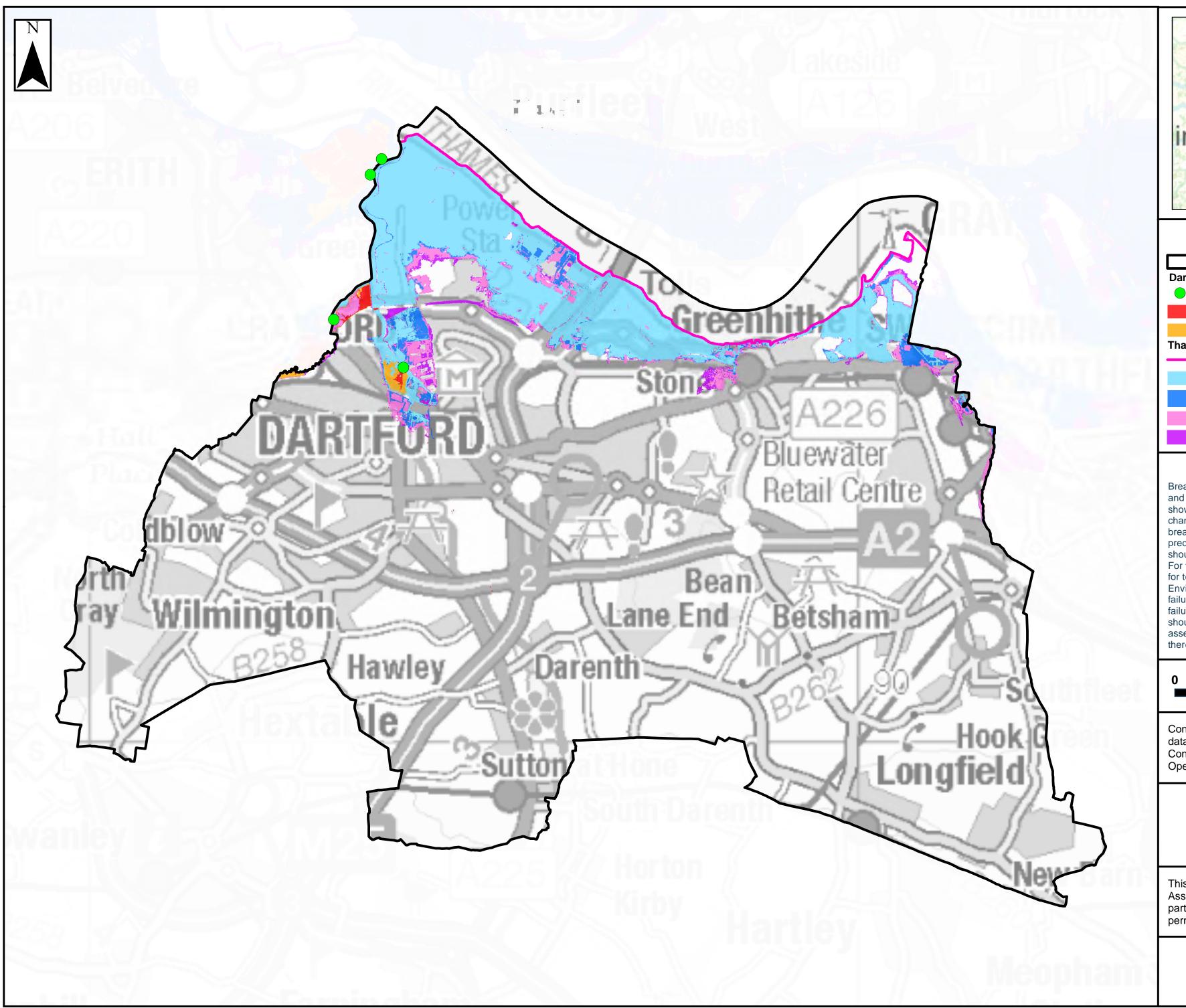
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SFRA: APPENDIX K.1 MODELLED BREACH EXTENTS





Legend

Dartford Borough

Dartford and Crayford breach modelling (2020)

Darent and Cray modelled breach

Modelled breach extents (0.5% AEP - Present day)

Modelled breach extents (0.5% AEP - 2115)

Thames tidal defence breach modelling (2018)

Modelled breaches along Thames tidal defences
 Modelled breach extents (0.5% AEP - Present Day)

Modelled breach extents (0.1% AEP - Present Day)

Modelled breach extents (0.5% AEP - 2115)

Modelled breach extents (0.1% AEP - 2115)

Notes

Breaches modelled as part of the Thames tidal breach (2018) and Dartford and Crayford (2020) modelling studies are shown, with the present day risk and future risk due to climate change mapped. The total area predicted to be impacted by breach events are shown. For further information on the predicted extents for individual breaches the modelling studies should be referred to.

For the Dartford and Crayford modelling, locations selected for testing of breach failure were based on where the Environment Agency had identified area where a defence failure could have a high impact. The possibility of breach failure at other locations is plausible and further analysis should be undertaken as part of site-specific flood risk assessments where defences are present and sites may therefore be at risk of a breach event.

0 1.25 2.5 Kilometres

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Dartford Borough Council

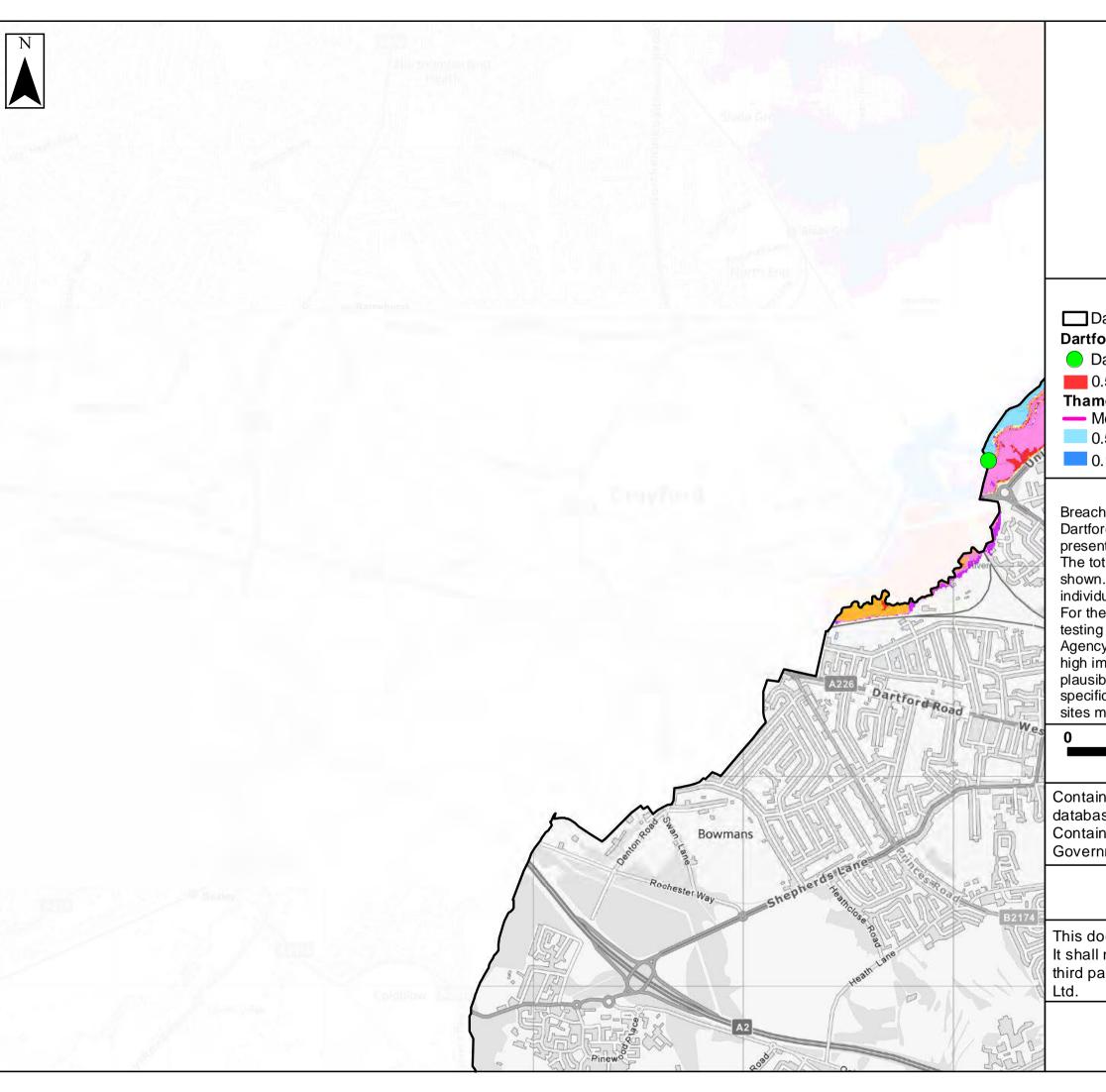
SFRA: APPENDIX K.1 MODELLED BREACH EXTENTS

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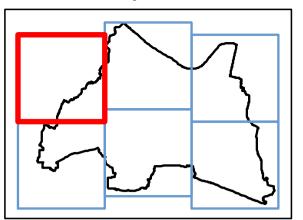




SFRA: APPENDIX K.2 BREACH EXTENTS



Key Plan



Legend

☐ Dartford Borough

Dartford and Crayford breach model extents (2020)

Darent and Cray modelled breach locations

0.5% AEP - Present day 0.5% AEP - 2115

Thames tidal defence breach model extents (2018)

Modelled breaches along Thames tidal defences

0.5% AEP - Present Day 0.5% AEP - 2115

0.1% AEP - Present Day 0.1% AEP - 2115

Notes

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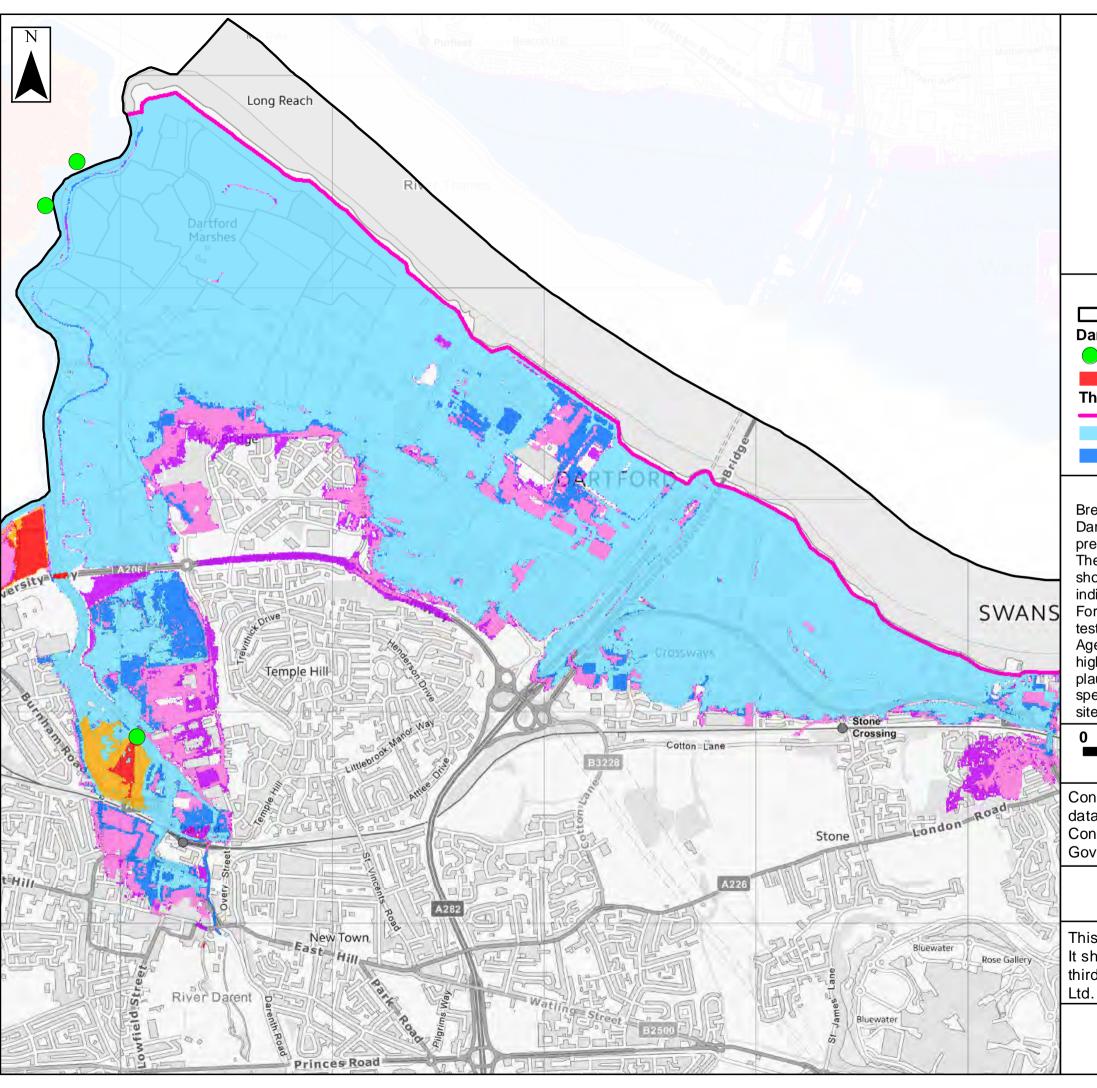
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SFRA: APPENDIX K.2 BREACH EXTENTS

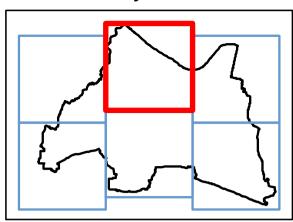
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DARTFORD BOROUGH COUNCIL



Key Plan



Legend

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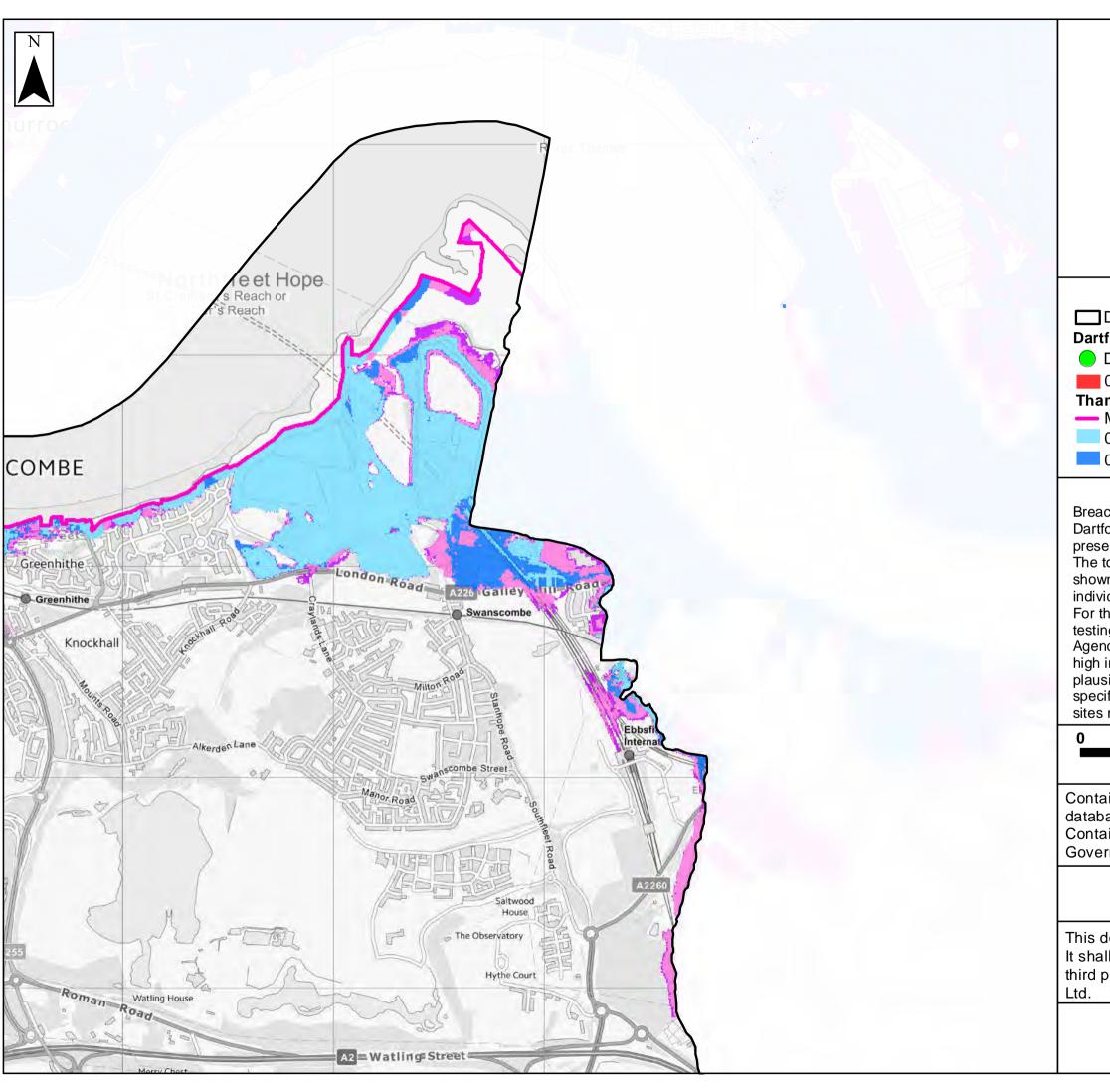
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SFRA: APPENDIX K.2 BREACH EXTENTS

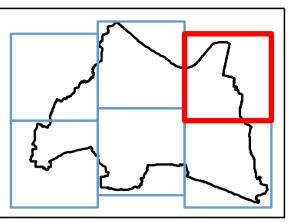
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DARTFORD BOROUGH COUNCIL







Legend

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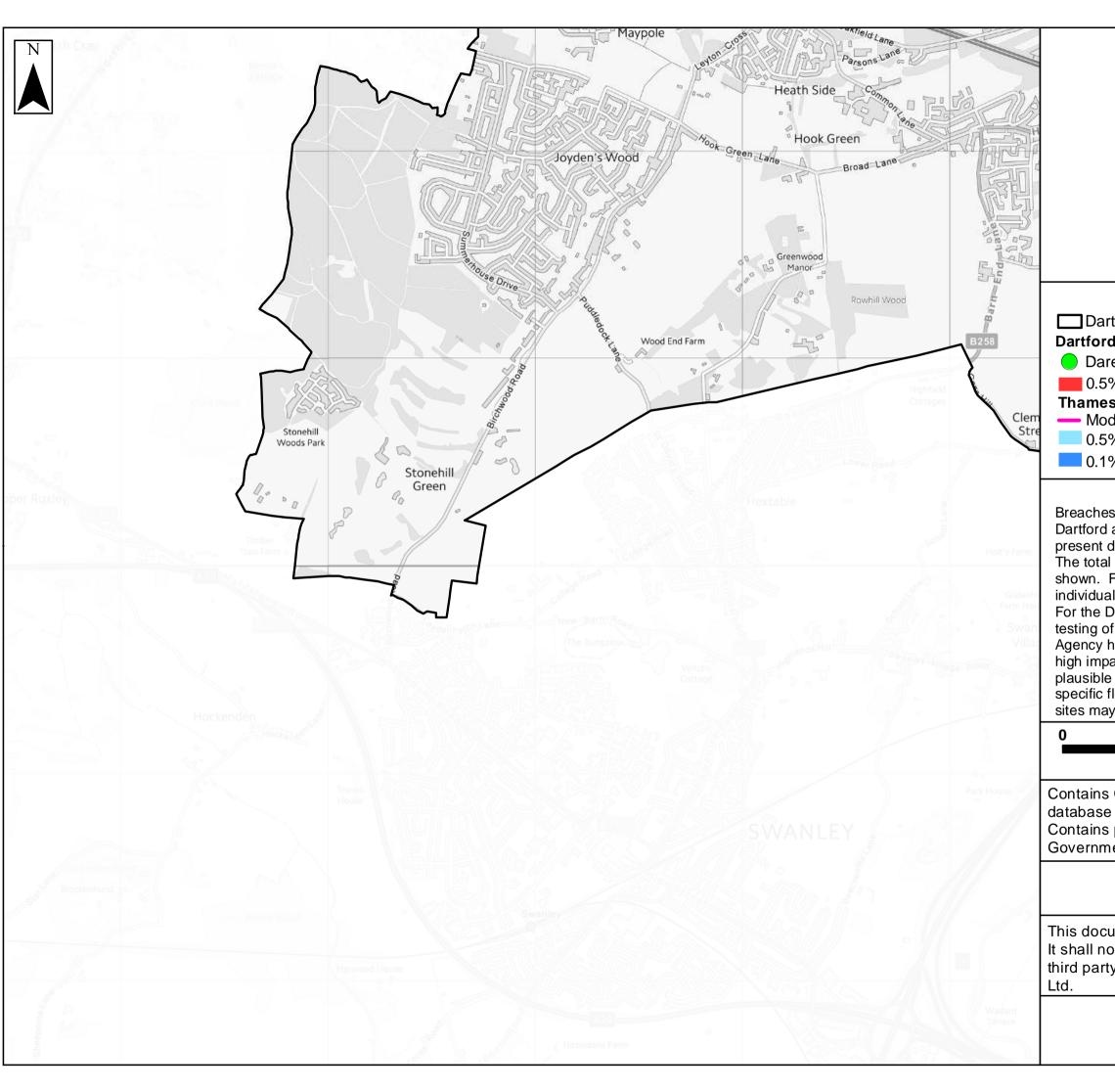
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SFRA: APPENDIX K.2 BREACH EXTENTS

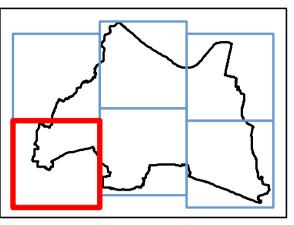
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Key Plan



Legend

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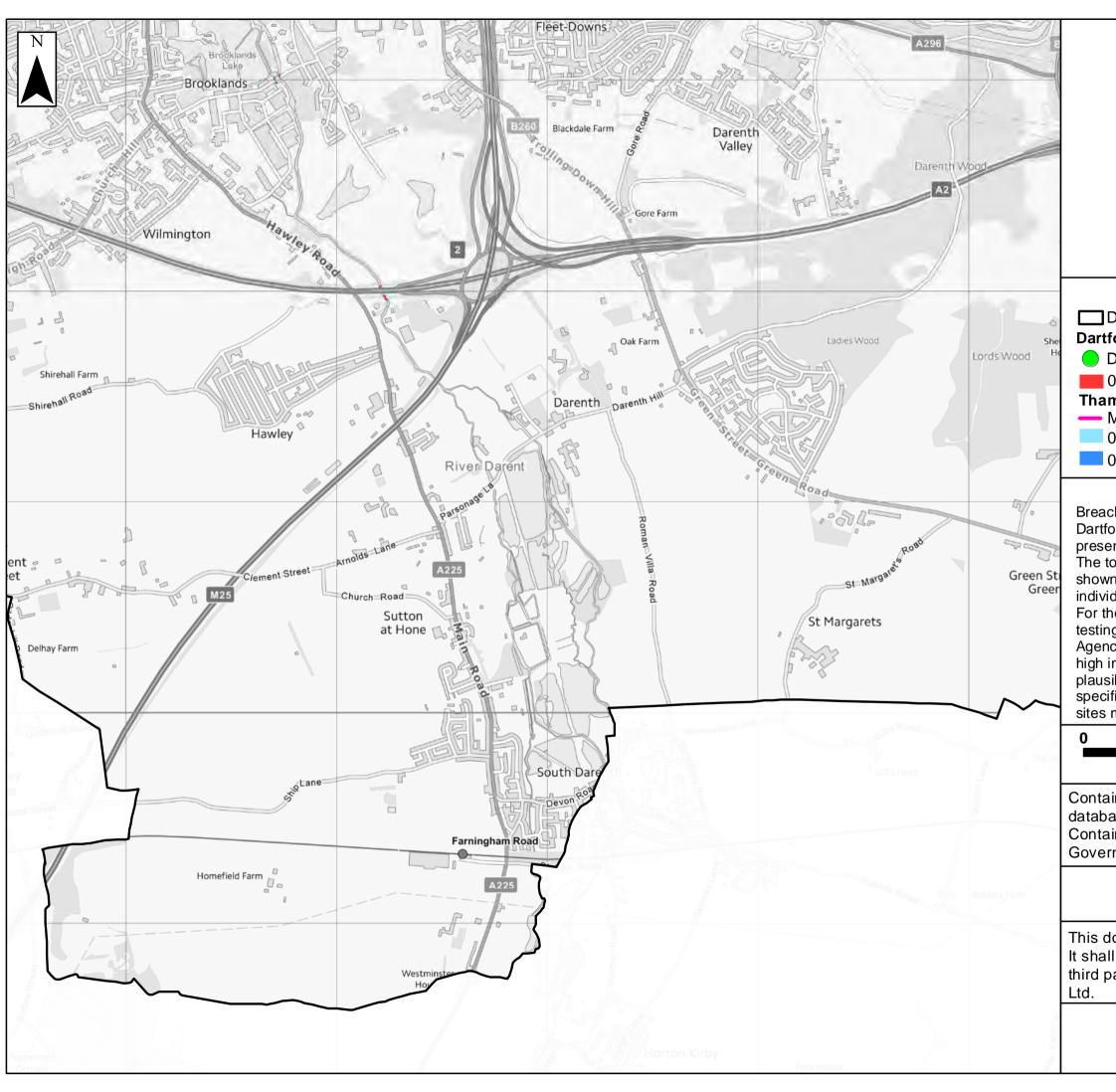
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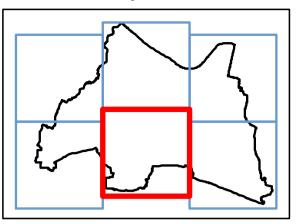
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Key Plan



Legend

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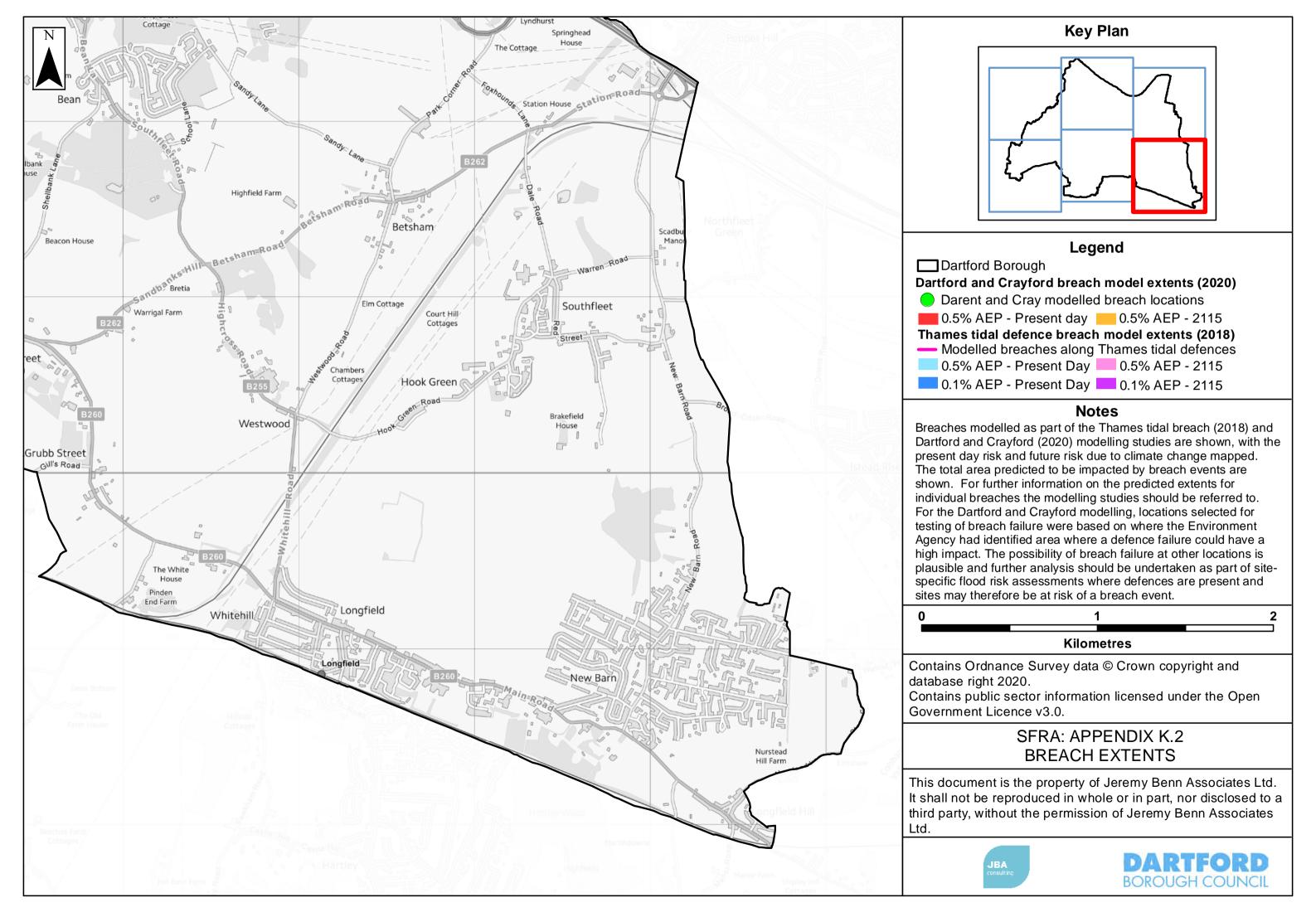
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SFRA: APPENDIX K.2 BREACH EXTENTS

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SFRA: APPENDIX M LEVEL 2 SFRA **DETAILED SITE** SUMMARY TABLES



Site name		Prospect Place			
	OS Grid reference	554032 E, 174426 N			
	Area (ha)	4.44			
	Current land use	Commercial			
	Proposed site use	Residential and town centre uses			
	Flood risk vulnerability	More Vulnerable and less vulnerable			
Site details	Topography	Elevation Contains Ordnance Survey data Corown copyright and database right 2020. Contains public sector information licensed under the Open Government License v3.0. 45 90 Metres The topography of the site is generally flat. The north-western corner of the site is lowest in elevation The ground slope across the site generally has a gradient of less than 5% There are a number of existing buildings across the site and which have affected localised filtering of the LIDAR data.			
Sources of flood risk	Existing watercourses	The Darent and Cray (Main River) is located 220m to the east of the site.			





Site name		Prospect Place		
	Flood history	A small segment of the site is reported to have flooded which occurred in 1968 as		
	· ·	a result of channel capacity exceedance and no raised defences. Proportion of the site at risk in the defended scenario (proportion reported are for the area of land occupied by each flood extent between larger or smaller return period events, and therefore not cumulative. Percentages rounded to the nearest 1%. Areas <0.5% not recorded)		
		5% AEP	1% AEP	0.1% AEP
		0%	0%	99%
	Fluvial/Tidal	Available modelled data: The site is covered by the Environment Agency Darent and Cray (Fluvial) 2019 Flood Modeller-TUFLOW model and the Environment Agency North Kent Coast (Tidal) 2019 Flood Modeller-TUFLOW model. The extent of the Flood Zones predicted by the flood model are different to the extent of the actual flood risk, as there are flood risk management features that change the risk. Flood characteristics:		
		Zone 2. When flood risk negligible risk from fluvia	a and partially within Flood plied, the entire site is at a 5 AEP events and all tidal of the site is intersected by	
		·	oportion of site at risk (RoF	
		(proportion reported are for the area of land occupied by each flood extent between larger or smaller return period events, and therefore not cumulative. Percentages rounded to the nearest 1%. Areas <0.5% not recorded)		
		3.3% AEP	1% AEP	0.1% AEP
		0%	2%	18%
	Surface Water	site. There is no risk of surface is a 2% increase in strip of surface water accurate ground elevations are low water for the 0.1% AEP water through the site.	on occurs predominantly on thurface water flooding during the flood event for the 1% AEP examples are the flood event for the 1% AEP examples are there is a significant increshere there is further expansion	e 3.3% AEP event. vent, with only a small n side of the site where ease in risk from surface n and development of flow
		RoFSW takes into account of building footprints so the flood risk may be affected by existing buildings on the site. It also only considers flood risk where the hazard rating is greater than 0.575.		
It should be noted that this dataset does not account for tide locking exacerbate the surface water risk at the site given the proximity of the influenced Thames which could influence levels within the River Dark the Dartford Barrier is located on the River Darent, risk is dependent operation of the barrier. The barrier shuts during extreme tidal levels Thames but a normal high tide occurring at the same time as a surfacevent could be worsened by tide locking. The Areas Susceptible to Groundwater Flooding (AStGWF) datasets third of the site (western side) is located within a 1km grid square where 150% of the 1km grid is considered to be susceptible to groundwater for the site is located within a 1km grid square where 150% of the 1km grid is considered to be susceptible to ground water			roximity of the tidally he River Darent. Although is dependent on the ne tidal levels in the	
			rid square where less than groundwater flooding. The quare where between 25-	



Site name		Prospect Place
		The AStGWF data should be used only in combination with other information, for example local data or historical data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. However, the data can help to identify areas for assessment at a local scale where finer resolution datasets exist.
Reservoir		The Environment Agency Risk of Flooding from Reservoirs dataset does not show the site to be at risk of reservoir flooding.



Site name Prospect Place

	Defences	Defence Type	Standard of Protection	Condition
		Concrete Wall	0.1% AEP	2
		Earth Embankment	0.1% AEP	3
		Bridge Abutment	0.1% AEP	2
		Dartford Barrier and Thames tidal defences	0.1% AEP	-
		Culvert / structure blockage?		ts located within the site a residual risk in the event
		Impounded water body failure?	The site is not at risk breach	of flooding due to reservoir
Flood risk management infrastructure	Residual risk	Thames tidal defence breach?	The Thames tidal defences pose a residual ris to the site in the event of a breach. Modelling was undertaken in 2018 to assess the risk of breach from these defences. Results of modelling show that the site is intersected by 0.5% AEP (present day) extent This impacts 1% of the site with land situated at low elevations towards the north-eastern corner of the site. There is an increase in extent to 25% of the site at risk for the 0.1% AEP (present day breach event. In the future, the site is predicted an increase in risk to 98% for both the 0.5% and 0.1% AEI (2115 Upper End) breach event. Majority of the site is predicted to be at risk due to climate change in the future.	
		Other defence breach / overtopping?	The site also benefits from flood rismanagement infrastructure along the Riv Darent. Breach modelling was undertaken at the Dartford Industrial Park/ Priory Road (Left Ban for the 0.5% AEP (present day and 2115 Upp End). Results show that the site is not at risfrom this breach location. However, as there a flood risk management infrastructures along the Darent and Cray river, the site could be at risfrom defence breach or overtopping.	
Emergency planning	Flood warning	The site is situated within the River Darent at Dartford Trade Park, Brooklands and Dartford to the Thames estuary (064FWF7Dartford) and the Dartford, Crayford and Greenhithe (064FWT1Dartford) Flood Warning Areas. The site is also situated within the River Darent from Westerham to Dartford (064WAF7Darent) and the Coast from Dartford to Allhallows (064WAT1ThamesEst) Flood Alert Areas.		



Site name		Prospect Place			
	Access and egress	Safe access and egress for the site may be available during flood events up to 0.1% AEP via any of the surrounding roads such Priory Road to the west, and Highfield Road North to the south and east of the site. However, during the 01% AEP fluvial flood event, access and egress may only be abale via the south-west corner of the site along Priory Place or Highfield Road North due to the entire site predicted to at risk of flooding. Safe access and egress may be available to the south-west of the site during a 1% AEP plus 35% or 70% fluvial flood event given large parts of the site to the east and north is predicted to be at risk of flooding. Additionally, access and egress routes may need to account for surface water flooding along Highfield Road North and Priory Road.			
		Proportion	of site at 1% AEP flu	vial flood risk in t	he defended scenario
	Climate Change allowances for	River Basin District	Present day	Higher Centra	al Upper End
	'2080s'	Thames	n/a	35% increase peak river flow	-
			0%	1%	68%
Climate Change	Implications for the site	There is an increase in extent for all climate change allowances in comparison the present day 1% AEP flood extent (not predicted to be at risk). The flood exter for the Upper End (+70%) scenario exceeds that of that of the Higher Central exter and present day but does not reach that of the 0.1% AEP flood extent (99%). Therefore, the site will be at a higher risk from fluvial flooding in the future. The site affected by flood risk both under existing conditions and in the future. Commitment will be required to measures so that development is safe and the parties are not adversely affected by proposals. This could potentially be achieved by provision of wider strategic measures, site specific measures, or a combination of these.			e at risk). The flood extent of the Higher Central extent AEP flood extent (99%). ding in the future. The site ns and in the future. A elopment is safe and third uld potentially be achieved
	Impact of climate	Pro	oportion of site at 1%	AEP surface wa	ter flood risk
	change on risk from surface	Present day	+20% raiı	nfall uplift	+40% rainfall uplift
	water	2%	4	%	7%
Implications for the site		A small increase in flood extent during the 1% AEP surface water event is predicted for the plus 20% and 40% climate change events. However, the extents do not reach that of the 0.1% AEP surface water flood event. Therefore, the site will be a slightly higher risk from surface water flooding in the future. However, it should be noted that this dataset does not take account of the impact of tide locking from increased sea levels on drainage from the site which could exacerbate the surface water risk at the site in the future.			



Site name		Prospect Place		
	Bedrock Geology	The entire site's bedrock geology consists of White Chalk.		
	Superficial Geology	The entire site is overlain by alluvium (clay, silt, and sand)		
Requirement for drainage control and impact	Soils	The parcels are overlain by loamy and clayey floodplain or coastal flat soils with naturally high groundwater.		
mitigation Groundwater Source Protection Zone		The site is not located within a Groundwater Source Protection Zone.		
	Historic Landfill Site	There is a historic landfill site located 261m south-east of the site.		

Level 2 SFRA Detailed Site Summary Tables – FINAL DOCUMENT



Level 2 SFRA Detailed Site Summary Tables – FINAL DOCUMENT



		I			
Site name	ite name Prospect Place				
		Sensitivity to cumulative	impacts		
	Cumulative impacts of development	The site is located within a catchment with a high sensitivity to development. The Implications of increased volumes both generated by the development and potentially affecting it should be addressed at an appropriate catchment level to demonstrate that additional volumes from upstream or at the site do not exacerbate flood risk at vulnerable locations remote from the site. This exercise should also consider whether the site is potentially affected by proposed development upstream.			
			e within each Flood Zone		
	Flood Zone 1	Flood Zone 2	Flood Zone 3a	Flood Zone 3b	
	0%	1%	99%	0%	
	Sequential Test an	d Exception Test requirem	ents		
	Exception test is ap	•		s of flood risk before the	
	highly vulnessential ir	st will be required in the following scenario: Inclinerable and in flood zone 2 Il infrastructure in flood zone 3a or 3b Inerable in flood zone 3a not be permitted for the following scenario: Inclinerable development within FZ3a. Inclinerable, More vulnerable and / or Less vulnerable development within FZ3b.			
	Highly vuln				
	Recommendations for developers	s for requirements of site-specific Flood Risk Assessment, including guidance			
		At the planning application stage, a site-specific flood risk assessment will be required for this site as it is greater than 1ha, located within Flood Zone 2 and 3 and may be subject to other sources of flooding where the development would introduce a more vulnerable use and contains land identified in the strategic flood risk assessment as being at increased flood risk in the future.			
Recommend- ations for Local Plan	At the plan site as it is sources of land identif				
policy	o Is	It is also required where development: o Is on land which has been identified by the Environment Agency as having critical drainage problems; or			
	o 0	ther sources of flooding mussessment, including surface		any site-specific flood risk	
	o C w m				
	o Bi	reach modelling should be enefits from flood risk manag	ement infrastructure		
	 Climate change modelling should be undertaken using the relevant allowances for type of development and level of risk. 				
	 Where there is a reasonable likelihood of multiple sources of flood risk ha significant impact, it is recommended that consideration is given to assessing combined risks of these. 				
	A	onsultation with the Local A gency should be undertaken	at an early stage.	-	
	 Proposals will need to demonstrate that the site can adopt a sequential approach we more vulnerable uses located in lower risk parts of the site where possible. Consideration must be given to the flood risk management measures a commitments required to make development safe over the intended lifetime. Cumulative effects should be considered (see above). 				

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Site name	Prospect Place
Site name	Prospect Place

Guidance for site design and making development safe:

- New development must seek opportunities to reduce the overall level of flood risk at the site.
 For example, by:
 - Reducing volume and rate of runoff
 - o Relocating development to zones with lower flood risk
 - Creating space for flooding.
- Safe access and egress should be demonstrated in the fluvial plus climate change events.
 Consideration should also be given to providing safe access and egress during surface water events.
- The Environment Agency has confirmed that more vulnerable uses should be set above the climate change flood level with a freeboard allowance, and developments should not displace water or block flow routes. Detailed proposals for the site will need to be developed in consultation with the Environment Agency.
- All development should adopt source control SuDS techniques to reduce the risk of frequent low impact flooding due to post development runoff.
- Ground investigations at the site should be undertake to confirm groundwater levels and the
 permeability of soils to support the design of SUDS features.
- SuDS should be designed to deliver multiple benefits including water quality, biodiversity, amenity, green infrastructure etc.
- Example features include swales, attenuation features, green roofs, rainwater capture and reuse and permeable paving.
- Assessment of runoff should include allowances for climate change effects.
- Efforts should be made to limit runoff to greenfield rates and discharge rates from the site should not increase downstream flood risk.
- SuDS design must follow Kent County Council policy, meet the Defra National Non-Statutory Technical Standards, and follow current best practice (CIRIA C752 Manual 2015).



Site name		Priory Shopping Centre			
	OS Grid reference	554054 E, 173959 N			
	Area (ha)	3.1			
	Current land use	Commercial			
	Proposed site use	Residential and town centre uses			
	Flood risk vulnerability	More Vulnerable and less vulnerable			
Site details	Topography	Elevation Contains Ordnance Survey data © Grown cepyright and database gint 2020. Contains public sector information licensed under the Open Government License v3.0. 40 80 Metres The topography of the site slopes inwards where the lowest elevation is located near the centre There are existing buildings at the site The ground slope across the site generally has a gradient of less than 5%. There are a number of existing buildings across the site and which have affected localised filtering of the LIDAR data.			
Sources of flood risk	Existing watercourses	The Darent and Cray (Main River) is located 235m to the east of the site.			





Site name		Priory Shopping Centre			
		The Environment Agency's recorded flood outlines dataset indicates that the site has not previously flooded. Kent County Council may hold additional records which are not available at this time. These records detail historical flood incidents from all sources, whereas the Environment Agency dataset only records incidents of fluvial, tidal or coastal flooding. The Lead Local Flood Authority should be contacted to obtain further details.			
	Flood history				
		Proportion of the site at risk in the defended scenario			
		**	re for the area of land occupie	-	
			ler return period events, and the detection to the nearest 1%. Areas s		
		5% AEP	1% AEP	0.1% AEP	
		0%	0%	97%	
	Fluvial/Tidal	Available modelled data: The site is covered by the Environment Agency Darent and Cray (Flux Flood Modeller-TUFLOW model and the Environment Agency North Ke (Tidal) 2019 Flood Modeller-TUFLOW model. The extent of the Floor predicted by the flood model are very similar to the extent of the actual floot the site. Flood characteristics:			
		The site is at a negligible risk of fluvial flooding for the 5% and 1% AEP flood ever the entire site apart from a very small section towards the south-west cornwithin the 0.1% AEP fluvial event. When the Dartford Barrier is closed there is a negligible risk of tidal flooding to site, though in the North Kent Coast undefended scenario the site is only predicted to be impacted by tidal flooding during the 0.1% AEP event.			
			oportion of site at risk (RoFS		
		between larger or smal	re for the area of land occupie ler return period events, and tl ed to the nearest 1%. Areas <	herefore not cumulative.	
		3.3% AEP	1% AEP	0.1% AEP	
		8%	19%	44%	
	Surface Water	Description of surface water flow paths: Surface water accumulation occurs in the 3.3% AEP event predominantly on the roads surrounding the site, in particular Lowfield Street, the northern end of Spring Vale North, and along a side street off Instone Road. Risk from surface water flooding over doubles between each AEP with development of flow routes through the site between the two side streets off Instone Road. Nearly half the site at risk during the 0.1% AEP event. RoFSW takes into account of building footprints so the flood risk may be affected by existing buildings on the site. It also only considers flood risk where the hazard rating is greater than 0.575. It should be noted that this dataset does not account for fluvial "locking" during periods of high river flows and levels of any outfalls discharging to the Darent which could exacerbate the surface water risk at the site. The Areas Susceptible to Groundwater Flooding (AStGWF) dataset shows that a third of the site (western side) is located within a 1km grid square where less than 25% of the 1km grid is considered to be susceptible to groundwater flooding. The remaining area of the site is located within a 1km grid square where between 25-50% of the 1km grid is considered to be susceptible to ground water flooding.			
	Groundwater				



Site name		Priory Shopping Centre	
		The AStGWF data should be used only in combination with other information, for example local data or historical data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. However, the data can help to identify areas for assessment at a local scale where finer resolution datasets exist.	
	Reservoir	The Environment Agency Risk of Flooding from Reservoirs dataset does not show the site to be at risk of reservoir flooding.	



Site name Priory Shopping Centre

	Defences	Defence Type	Standard of Protection	Condition	
		High Ground 5%-1% AEP 2-3		2-3	
		Earth Embankment	2%-1% AEP	2-3	
		Concrete Wall	1% AEP	3	
Flood risk management infrastructure	Residual risk	Culvert / structure blockage?	There are no culverts located within the site which could present a residual risk in the event of a blockage		
		Impounded water body failure?	The site is not at risk of flooding due to reservoir breach		
		Thames tidal defence breach?	Modelling was undertaken in 2018 to assess the residual risk from a breach in the Thames tidal defences. Results of the modelling show that the site is not intersected by present day extents. The site is also predicted to not be impacted by climate change in the future (2115 Upper End).		
		Other defence breach / overtopping?	The site benefits from flood risk management infrastructure along the River Darent. Breach modelling was undertaken at the Dartford Industrial Park/ Priory Road (Left Bank) for the 0.5% AEP (present day and 2115 EPOCH). Results show that the site is not at risk from this breach location. However, as there are flood risk management infrastructures along the Darent and Cray river, the site could be at risk from defence breach or overtopping.		
Emergency planning	Flood warning	The site is situated within the River Darent at Dartford Trade Park, Brooklands and Dartford to the Thames estuary (064FWF7Dartford) and the Dartford, Crayford and Greenhithe (064FWT1Dartford) Flood Warning Areas. The site is also situated within the River Darent from Westerham to Dartford (064WAF7Darent) and the Coast from Dartford to Allhallows (064WAT1ThamesEst) Flood Alert Areas.			
	Access and egress	Safe access and egress for the whole site may be available up the 0.1% AEP fluvial flood event by any of the surrouding access roads. However, as the entire site is intersected by the 0.1% AEP fluvial flood extent, safe access and agrees may be available via the souther-west corner on Instone Road. A significant flow route is highlighed across the southern half of the site during present day surface water flood events, safe access and egress may be availabe on Instone Road and Spital Street. Safe acess and egress for the south and south-west corners of the site may be available during the 1% AEP plus 35% or 70% fluvial event given large parts of the site to the north and surrounding land is predicted to be at risk of flooding. Additionally, access and egress routes along Instone Road and Spital Street may need to account for surface water flooding.			



Site name Priory Shopping Centre

	Climate Change allowances for '2080s'	Proportion of site at 1% AEP fluvial flood risk in the defended scenario			
		River Basin District	Present day	Higher Centra	al Upper End
		Thames	n/a	35% increase i peak river flow	
			0%	36%	54%
Climate Change	Implications for the site	There is an increase in extent for all climate change allowances in comparison to the present day 1% AEP flood extent (not predicted to be at risk). The northern area of the site is at most risk from fluvial climate change flooding. The southern area of the site is not intersected by any flood extents. The flood extent for the Upper End (+70%) scenario far exceeds that of that of the Higher Central extent and present day but does not reach that of the 0.1% AEP flood extent (98%). Therefore, the site will be at a slightly higher risk from fluvial flooding in the future. The site is affected by flood risk both under existing conditions and in the future. A commitment will be required to measures so that development is safe, and third parties are not adversely affected by proposals. This could potentially be achieved by provision of wider strategic measures, site specific measures, or a combination of these.			
	Impact of climate change on risk from surface water	Proportion of site at 1% AEP surface water flood risk			
		Present day	+20% rair	nfall uplift	+40% rainfall uplift
		19%	23	3%	28%
	Implications for the site	A slight increase in flood extent during the 1% AEP surface water event is predicted for the plus 20% and 40% climate change events. However, the extent do not reach that of the 0.1% AEP event. These increases are located towards the southern area of the site, linking the two side roads leading from Instone Road.			



Site name		Priory Shopping Centre	
Requirement for drainage control and impact mitigation	Bedrock Geology	The entire site's bedrock geology consists of White Chalk.	
	Superficial Geology	The entire site is overlain by alluvium (clay, silt and sand)	
	Soils	The site is overlain by loamy and clayey floodplain or coastal flat soils with naturally high groundwater.	
	Groundwater Source Protection Zone	The site is not located within a Groundwater Source Protection Zone.	
	Historic Landfill Site	There is a historic landfill site located 715m south-west of the site.	

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Site name	Priory Shopping Centre
	1
	Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.
	Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development.
	British Geological Society (BGS) data indicates that the underlying geology is the White Chalk subgroup, though the soils at the site are loamy and clayey with high groundwater levels. Groundwater levels and the permeability of soils at the site should be assessed via an infiltration test, with the use of infiltration maximised as much as possible. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site.
	Groundwater ingress could potentially impact the hydraulic capacity and structural integrity of detention and attenuation features, if measures to prevent this are not implemented in the design of the surface water drainage system.
	Given the high-density nature of the site, use of urban SuDS is recommended. Urban sites should not preclude the use of SuDS. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques. Mapping suggests that the site slopes make it possible to consider most forms of dentition.
Broad scale assessment of possible SuDS	Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting should be considered in the design of the site.
	The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.
	Overland flows paths are present at the development site along highways and in the south of the eastern parcel. Where possible opportunities to incorporate these flow paths into the site layout should be considered.
	If it is proposed to discharge runoff to the River Darent or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and discharge rate agreed with the asset owner. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA.
	Surface water outfalls that discharge into the River Darent may be affected by tide locking due to water levels in the River Darent. The impacts of tide locking/flood flows will need to be considered in terms of the attenuation storage requirements of the site.
	Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible opportunities and constraints.

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Site name		Priory Shopping Centre		
		L		
		Sensitivity to cumulative im	pacts	
	Cumulative impacts of development	The site is located within a catchment with a high sensitivity to development. The Implications of increased volumes both generated by the development and potentially affecting it should be addressed at an appropriate catchment level to demonstrate that additional volumes from upstream or at the site do not exacerbate flood risk at vulnerable locations remote from the site. This exercise should also consider whether the site is potentially affected by proposed development upstream.		
	Proportion of the site within each Flood Zone			
	Flood Zone 1	Flood Zone 2	Flood Zone 3a	Flood Zone 3b
	3%	97%	0%	0%
	Sequential Test an	d Exception Test requiremen	ts	
		st must be satisfied based on		s of flood risk before the
	The Exception test will be required in the following scenario: • highly vulnerable and in flood zone 2 • essential infrastructure in flood zone 3a or 3b • more vulnerable in flood zone 3a Development will not be permitted for the following scenario: • Highly vulnerable development within FZ3a. • Highly vulnerable, More vulnerable and / or Less vulnerable development within FZ3b.			
				ment within FZ3b.
	Recommendations for requirements of site-specific Flood Risk Assessment, including guidance for developers			
Recommend- ations for Local Plan policy	Recommendations for requirements of site-specific Flood Risk Assessment, including guidance for developers Flood risk assessment • At the planning application stage, a site-specific flood risk assessment will be required for this site as it is greater than 1ha, located within Flood Zone 2 and may be subject to other source of flooding where the development would introduce a more vulnerable use and contains lant identified in the strategic flood risk assessment as being at increased flood risk in the future. It is also required where development: • Is on land which has been identified by the Environment Agency as having critical drainage problems; or • Other sources of flooding must be considered as part of any site-specific flood risk assessment, including surface water and groundwater. • Consideration should be given to the potential effects of climate change, particularly with respect to surface water. Proposals should consider the opportunity to include measures that provide for a reduction in predicted surface water flood risk at existing development. • Breach modelling should be undertaken on the River Darent as the watercourse benefits from flood risk management infrastructure. • Climate change modelling should be undertaken using the relevant allowances for the type of development and level of risk. • Where there is a reasonable likelihood of multiple sources of flood risk having significant impact, it is recommended that consideration is given to assessing the combined risks of these. • Consultation with the Local Authority, Lead Local Flood Authority and Environmen Agency should be undertaken at an early stage. • Proposals will need to demonstrate that the site can adopt a sequential approach with			
		onsideration must be given	hin lower risk parts of the s	

Cumulative effects should be considered (see above).

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Site name Priory Shopping Centre

Guidance for site design and making development safe:

- New development must seek opportunities to reduce the overall level of flood risk at the site.
 For example, by:
 - Reducing volume and rate of runoff
 - Relocating development to zones with lower flood risk
 - Creating space for flooding.
- Safe access and egress should be demonstrated in the fluvial plus climate change events.
 Consideration should also be given to providing safe access and egress during surface water events.
- The Environment Agency has confirmed that more vulnerable uses should be set above the climate change flood level with a freeboard allowance, and developments should not displace water or block flow routes. Detailed proposals for the site will need to be developed in consultation with the Environment Agency.
- All development should adopt source control SuDS techniques to reduce the risk of frequent low impact flooding due to post development runoff.
- Ground investigations at the site should be undertaken to confirm groundwater levels and the
 permeability of soils to support the design of SUDS features.
- SuDS should be designed to deliver multiple benefits including water quality, biodiversity, amenity, green infrastructure etc.
- Example features include swales, attenuation features, green roofs, rainwater capture and reuse and permeable paving.
- Assessment of runoff should include allowances for climate change effects.
- Efforts should be made to limit runoff to greenfield rates and discharge rates from the site should not increase downstream flood risk.
- SuDS design must follow Kent County Council policy, meet the Defra National Non-Statutory Technical Standards, and follow current best practice (CIRIA C752 Manual 2015).



Site name		Town Centre North East		
	OS Grid reference	51°26′35″N , 000°13′13″E		
	Area (ha)	4.39		
	Current land use	Commercial and mixed use		
	Proposed site use	Residential and town centre uses		
	Flood risk vulnerability	More Vulnerable and less vulnerable		
Site details	Topography	Elevation Contains Ordnance Survey data © Crown copyright and database right 2020. Contains public sector information licensed under the Open Government Licence v3.0. 50 100 The topography of the western parcel generally slopes towards the north and east of the site. The central and eastern parcel are divided by the River Darent and lie on the west and east bank respectively. The topography of the central parcel generally slopes towards the centre of the site. The highest elevation can be seen at the northern end of the site with an additional raised patch of land towards the middle. The topography of the eastern parcel generally slopes towards the south-west corner of the site. There are existing buildings located on all three parcels of land which may have affected the LIDAR filtering.		
Sources of flood risk	Existing watercourses	The River Darent flows between the central and eastern parcels of land		



Site name	Town Centre North East			
	'			
Flood history	western parcel of land floo 1968 due to the channel of central and eastern parce Kent County Council may time. These records deta Environment Agency data	s recorded flood outlines data oded as a result of the event the capacity of the River Darent be a lof land has not flooded previous hold additional records which all historical flood incidents from set only records incidents of flood Authority should be con-	nat occurred in September eing exceeded. The ously. are not available at this m all sources, whereas the luvial, tidal or coastal	
	Proportion o	of the site at risk in the defer	nded scenario	
	between larger or smal	re for the area of land occupie ler return period events, and t ed to the nearest 1%. Areas	herefore not cumulative.	
	5% AEP	1% AEP AEP	0.1% AEP	
	1%	2%	64%	
Available modelled data: The site is covered by the 2019 Darent and Cray (fluvial) Flood Model model and the 2019 North Kent Coast (tidal) tidal Flood Modeller-TUF The extent of the Flood Zones predicted by the flood models are did extent of the actual flood risk, as there are flood risk management change the risk. Flood characteristics: The large majority of the three parcels of land are within Flood Zone 2, though when flood risk management features are account defended scenario (due to the presence of defences along the River flood risk is reduced significantly. Small areas of the site along the (1% of the site) are within the 5% AEP fluvial flood extent. There is a sr of 1% for the 1% AEP fluvial flood event. During the fluvial 0.1% AE defences to the western and the central parcel are predicted to be extended to the entire western parcel and a large majority of the central parcel is be inundated, though the eastern parcel is not within the modelled flood When the Dartford Barrier is closed there is a negligible risk of tidal flooding due to the presence of the north of the site.			Modeller-TUFLOW model. models are different to the management features that in Flood Zone 3a and Flood is are accounted for in the long the River Darent), the site along the River Darent it. There is a small increase uvial 0.1% AEP event, the dicted to be exceeded and entral parcel is expected to be modelled flood extents.	
Surface Water	Proportion of site at risk (RoFSW) (proportion reported are for the area of land occupied by each flood extent between larger or smaller return period events, and therefore not cumulative. Percentages rounded to the nearest 1%. Areas <0.5% not recorded)			
	3.3% AEP	1% AEP	0.1% AEP	
	7%	15%	35%	



Site name	Town Centre North East
	Description of surface water flow paths: Surface water flooding is predicted along Suffolk Road, Home Gardens and Overy Street during the 3.33% AEP event. During the 1% AEP event, there is an increase in area predicted to be impacted, particularly at the northern ends of the western and eastern parcels. There is over double the area predicted to be affected for the 0.1% AEP event, where further surface water flows are predicted to accumulate across the northern area of the western parcel, the low area of land in the central parcel, and across the eastern parcel. There is also the expansion of surface water flooding on Suffolk Road, Home Gardens and Overy Street during the 0.1% AEP event. RoFSW takes account of building footprints so the flood risk may be affected by existing buildings on the site. It also only considers flood risk where the hazard rating is greater than 0.575. It should be noted that this dataset does not account for tide locking which could exacerbate the surface water risk at the site given the proximity of the tidally influenced Thames which could influence levels within the River Darent. Although the Dartford Barrier is located on the River Darent, risk is dependent on the operation of the barrier. The barrier shuts during extreme tidal levels in the River Thames.
Groundwater	The Areas Susceptible to Groundwater Flooding (AStGWF) dataset shows the site is located within a 1km grid square where >=25% to <50% of the 1km grid is considered to be susceptible to ground water flooding. The AStGWF data should be used only in combination with other information, for example local data or historical data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any
	scale. However, the data can help to identify areas for assessment at a local scale where finer resolution datasets exist.
Reservoir	The Environment Agency Risk of Flooding from Reservoirs dataset does not show the site to be at risk of reservoir flooding.



Site name	Town Centre North East
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		Defence Type	Standard of Protection	Condition
		High Ground	1% AEP	3
	Defences	Concrete Wall	5% AEP	2
		Concrete wall	0.1% AEP	3
		Dartford Barrier and Thames tidal defences	0.1% AEP	-
		Culvert / structure blockage?	There are culverts in may present a residua	proximity of the site which al risk to the site.
		Impounded water body failure?	The site is not at risk breach.	of flooding due to reservoir
Flood risk management infrastructure	Residual risk	Thames tidal defence breach?	The Thames tidal defences pose a residual risk to the site in the event of a breach. Modelling was undertaken in 2018 to assess the risk of breach from these defences. Results of this modelling show that most of the western parcel and middle area of the central parcel is at risk of flooding during the present day 0.5% and 0.1% AEP events (16% and 29% of the entire site respectively). The eastern parcel is not predicted to be impacted in the present day events. In the future, the large majority of both the western and central parcels are predicted to be impacted. 52% and 58% of the entire site are predicted to be at risk for the 0.5% AEP (2115 Upper End) and 0.1% AEP (2115 Upper End respectively.	
		Other defence breach / overtopping?	The site also benefits from flood rimanagement infrastructure along the Riv Darent. The extent of the undefended 0.1% All event indicates that the entire site has to potential to be at risk during a breach.	
Emergency planning	Flood warning	The site is situated within the River Darent at Dartford Trade Park, Brooklands and Dartford to the Thames estuary (064FWF7Dartford) and the Dartford, Crayford and Greenhithe (064FWT1Dartford) Flood Warning Areas. The site is also situated within the River Darent from Westerham to Dartford (064WAF7Darent) and the Coast from Dartford to Allhallows (064WAT1ThamesEst) Flood Alert Areas.		



Site name Town Centre North East					
	Access and egress	Safe access and egress is available for each land parcels via the southern site boundaries for all surface water events. Dry access and egress is available to all three land parcels for the 5% and 1% AEP fluvial events. For the 0.1% AEP fluvial event, dry access and egress can only be available to the eastern land parcel via Overy Street. Wet access and egress could be available to the central and west land parcels via the south site boundaries for the 0.1% AEP fluvial event. During this event, the access route has a hazard rating of 0.5 – 0.75. This hazard is classified as 'Very low hazard' and is considered safe for access and egress.			
		Proportion of	of site at 1% AEP flux	/ial flood risk in t	the defended scenario
	Climate Change allowances for	River Basin District	Present day	Higher Centra	al Upper End
	'2120'	Thames	n/a	35% increase peak river flow	
			2%	37%	54%
Climate Change			during the 1% AEP p to the presence of flo edicted to be at risk of e is affected by flood rinitment will be require are not adversely affe	olus 35% and 700 ood risk managen of fluvial flooding isk both under exide to measures so ected by proposals	is predicted to be at risk of % climate change events. nent features, the eastern during the climate change sting conditions and in the that development is safe, s. This could potentially be see specific measures, or a
	Impact of climate	Proportion of site at 1% AEP surface water flood risk			
	change on risk from surface	Present day	+20% rair	nfall uplift	+40% rainfall uplift
	water	15%	21	%	24%
Implications for the site		surface water evare located in properties, western parcel, eastern parcel.	vent 20% and 40% clir roximity of Home Gard the middle area of the	mate change even lens roundabout fo central parcel, an do not reach that	ccur during the 1% AEP tts. The areas of increase or the northern part of the d the northern area of the of the 0.1% AEP event.



Site name		Town Centre North East	
	Bedrock Geology	The entire site's bedrock geology consists of White Chalk.	
Superficial Geology Requirement		The western parcel is entirely overlain by alluvium (clay, silt, and sand). The northern part of the central parcel is overlain by undifferentiated river terrace deposits. The southern half of the central parcel and the entire eastern parcel has no recorded geological deposits.	
for drainage control and impact	Soils	The parcels are overlain by loamy and clayey floodplain or coastal flat soils with naturally high groundwater	
mitigation	Groundwater Source Protection Zone	The whole eastern parcel; the southern half of the central parcel; and the south- eastern third of the western parcel is located in Groundwater Source Protection Zone 1.	
	Historic Landfill Site	There is a historic landfill site located 1.04km north-east of the eastern parcel.	

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Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.

Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development.

British Geological Society (BGS) data indicates that the underlying geology is the White Chalk subgroup, though the soils at the site are loamy and clayey with high groundwater levels. Groundwater levels and the permeability of soils at the site should be assessed via an infiltration test, with the use of infiltration maximised as much as possible. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site.

The entire eastern parcel site is located within Groundwater Source Protection Zone 1 (SPZ), with the central and western parcels partially located within SPZ 1. Kent County Council and the Environment Agency have confirmed that only infiltration from clean roof drainage will potentially be permitted in SPZ1, with appropriate measures in place.

Groundwater ingress could potentially impact the hydraulic capacity and structural integrity of detention and attenuation features, if measures to prevent this are not implemented in the design of the surface water drainage system.

Broad scale assessment of possible SuDS

Given the high-density nature of the site, use of urban SuDS is recommended. Urban sites should not preclude the use of SuDS. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques. Mapping suggests that the site slopes make it possible to consider most forms of dentition.

Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting should be considered in the design of the site. However, when assessing suitable SuDS, consideration should be given to the location of SPZ1 at the site as discussed above.

The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.

Overland flows paths are present at the development site along highways and in the middle of the central parcel. Where possible opportunities to incorporate these flow paths into the site layout should be considered.

If it is proposed to discharge runoff to the River Darent or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and discharge rate agreed with the asset owner. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA.

Surface water outfalls that discharge into the River Darent may be affected by tide locking due to water levels in the River Darent. The impacts of tide locking/flood flows will need to be considered in terms of the attenuation storage requirements of the site.

Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible opportunities and constraints.

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Site name		Town Centre North East			
		Sensitivity to cumulative in	npacts		
		The site is located within a ca	atchment with a high sensitiv		
	Cumulative impacts of	site is potentially affected by upstream and could potentia			
	development	downstream. The Flood Risl			
		implications of proposals. The potential changes to fluvial flood storage volume			
		should also be addressed, if development safe at the site.		ures to make	
		<u> </u>	within each Flood Zone		
	Flood Zone 1	Flood Zone 2	Flood Zone 3a	Flood Zone 3b	
	3%	9%	87%	1%	
	Sequential Test ar	nd Exception Test requireme	nts		
	The Sequential Te Exception test is ap	est must be satisfied based opplied.	n fluvial and other sources	of flood risk before the	
	The Exception test	will be required in the following	scenario:		
	0 1	nerable and in flood zone 2			
		nfrastructure in flood zone 3a o erable in flood zone 3a	r 3b		
	• more vain	erable ili iloou zone sa			
	Development will no	ot be permitted for the following scenario:			
		nerable development within FZ3a. nerable, More vulnerable and / or Less vulnerable development within FZ3b.			
	Highly vuli	nerable, More vulnerable and /	or Less vulnerable developr	nent within FZ3b.	
	Recommendations for developers	s for requirements of site-sp	ecific Flood Risk Assessm	nent, including guidance	
	Flood risk assess				
Recommend-		nning application stage, a site-specific flood risk assessment will be required for this greater than 1ha in size, it is located within Flood Zone 2 and 3 and may be subject			
ations for		greater than that in size, it is in ources of flooding where the dev			
Local Plan	contains la	and identified in the strategic flo	od risk assessment as being		
policy		It is also required where deve		A	
		s on land which has been ide rainage problems; or	nulled by the Environment.	Agency as naving childar	
	o C	Other sources of flooding must		ny site-specific flood risk	
	assessment, including surface water and groundwater.				
		with respect to surface water. Proposals should consider the opportunity to include measures that provide for a reduction in predicted surface water flood risk at existing			
	development.				
		benefits from flood risk management infrastructure. O Climate change modelling should be undertaken using the relevant allowances for t			
	ty	pe of development and level o	f risk.		
		Vhere there is a reasonable			
		ignificant impact, it is recomm ombined risks of these.	ended that consideration is	s given to assessing the	
		Consultation with the Local Aut	hority, Lead Local Flood A	uthority and Environment	
		Agency should be undertaken at an early stage.			
		Proposals will need to demonstr			

more vulnerable uses located within lower risk parts of the site where possible. Consideration must be given to the flood risk management measures and

commitments required to make development safe over the intended lifetime.

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Site name Town Centre North East

o Cumulative effects should be considered (see above).

Guidance for site design and making development safe:

- New development must seek opportunities to reduce the overall level of flood risk at the site.
 For example, by:
 - Reducing volume and rate of runoff
 - Relocating development to zones with lower flood risk
 - Creating space for flooding.
- Safe access and egress should be demonstrated in the fluvial plus climate change events.
 Consideration should also be given to providing safe access and egress during surface water events.
- The Environment Agency has confirmed that more vulnerable uses should be set above the climate change flood level with a freeboard allowance, and developments should not displace water or block flow routes. Detailed proposals for the site will need to be developed in consultation with the Environment Agency.
- All development should adopt source control SuDS techniques to reduce the risk of frequent low impact flooding due to post development runoff.
- Ground investigations at the site should be undertaken to confirm groundwater levels and the
 permeability of soils to support the design of SUDS features.
- SuDS should be designed to deliver multiple benefits including water quality, biodiversity, amenity, green infrastructure etc.
- Example features include swales, attenuation features, green roofs, rainwater capture and reuse and permeable paving.
- Assessment of runoff should include allowances for climate change effects.
- Efforts should be made to limit runoff to greenfield rates and discharge rates from the site should not increase downstream flood risk.
- SuDS design must follow Kent County Council policy, meet the Defra National Non-Statutory Technical Standards, and follow current best practice (CIRIA C752 Manual 2015).
- According to the Environment Agency, development should seek to leave an undeveloped margin of 8m next to fluvial watercourses and 16m next to tidal watercourses. Any development within 8m either side of a Main River or within 16m from the foot of any sea defence may require the separate consent of the Environment Agency under local land drainage byelaws.



Site name		The Vicarage, Overy Liberty		
	OS Grid reference	51°26′35″N , 000°13′13″E		
	Area (ha)	0.27		
	Current land use	Residential		
	Proposed site use	Residential		
	Flood risk vulnerability	More Vulnerable		
Site details	Topography	Elevation Contains Ordnance Survey data Orrown copyright and database right 2020. Contains public sector information licensed under the Open Government Licence v3.0. 15 30 Metres The topography of the slope is generally flat. The south-west corner of the site is lowest in elevation The ground slope across the site generally has a gradient of less than 5%		
Sources of flood risk	Existing watercourses	The Darent and Cray (Main River) flows through the site.		





Site name	The Vicarage, Overy Liberty					
5 100 11 10 1	The entire site is reported	The entire site is reported to have flooded which occurred in 1968 as a result of				
Flood history		channel capacity exceedance and no raised defences.				
	(proportion reported a between larger or sma	Proportion of the site at risk in the defended scenario (proportion reported are for the area of land occupied by each flood extent between larger or smaller return period events, and therefore not cumulative. Percentages rounded to the nearest 1%. Areas <0.5% not recorded) 5% AEP 1% AEP 0.1% AEP				
	0%	81%	99%			
Fluvial/Tidal	Available modelled data The site is covered by the Flood Modeller-TUFLOW (Tidal) 2019 Flood Modeller-Tufled Mo	vailable modelled data: he site is covered by the Environment Agency Darent and Cray (Fluvial) 2019 lood Modeller-TUFLOW model and the Environment Agency North Kent Coast Fidal) 2019 Flood Modeller-TUFLOW model. The extent of the Flood Zones redicted by the flood model are very similar to the extent of the actual flood risk at the site.				
	·					
	(proportion reported a between larger or sma	Proportion of site at risk (RoFSW) (proportion reported are for the area of land occupied by each flood extent between larger or smaller return period events, and therefore not cumulative. Percentages rounded to the nearest 1%. Areas <0.5% not recorded)				
	3.3% AEP	1% AEP	0.1% AEP			
	12%	14%	76%			
Surface Water	Surface water accumulati the north of the site and a event. An increase of 2% increase for the 0.1% AE surface water flooding whroutes through the site. RoFSW takes into account by existing buildings on the rating is greater than 0.57. It should be noted that this periods of high river flows which could exacerbate the event.	escription of surface water flow paths: urface water accumulation occurs predominantly on the Overy Liberty road to e north of the site and along the Darent and Cray watercourse for the 3.3% AEF vent. An increase of 2% occurs for the 1% AEP event. There is a significant crease for the 0.1% AEP event where three quarters of the site is at risk from urface water flooding where there is further expansion and development of flow utes through the site. DESW takes into account of building footprints so the flood risk may be affected of existing buildings on the site. It also only considers flood risk where the hazar ting is greater than 0.575. Should be noted that this dataset does not account for fluvial "locking" during eriods of high river flows and levels of any outfalls discharging to the Darent nich could exacerbate the surface water risk at the site.				
Groundwater	within a 1km grid square be susceptible to ground The AStGWF data should example local data or his any specific flood risk ma scale. However, the data	The Areas Susceptible to Groundwater Flooding dataset shows the site within a 1km grid square where between 25-50% of the 1km grid is corbe susceptible to ground water flooding. The AStGWF data should be used only in combination with other informexample local data or historical data. It should not be used as sole evid any specific flood risk management, land use planning or other decision scale. However, the data can help to identify areas for assessment at a scale where finer resolution datasets exist.				
Reservoir	The Environment Agency Risk of Flooding from Reservoirs dataset does not show the site to be at risk of reservoir flooding.					





Site name	The Vicarage, Overy Liberty
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		Defenc	е Туре	Standard of Protection	Condition	
	Defences	High G	Ground	5%-1% AEP	2-3	
		Earth Eml	bankment	2%-1% AEP	2-3	
		Culvert / struct blockage?	ture		culverts in proximity of the sent a residual risk in the	
			ter body	The site is not at risk breach.	of flooding due to reservoir	
Flood risk management infrastructure	Residual risk	Thames tidal d	efence	residual risk from a bedefences. Results of the modelli intersected by preser also predicted to no change in the future (2)	taken in 2018 to assess the breach in the Thames tidal and show that the site is not at day extents. The site is to be impacted by climate 2115 Upper End). The site is to not be impacted by a stidal flood defences.	
		The site benefits from flood risk management infrastructure along the River Darent. Breach modelling was undertaken at the Dartford Industrial Park/ Priory Road (Left Bank) for the 0.5% AEP (present day and Upper End EPOCH). Results show that the site is not at risk from this breach location. However, as there are flood risk management infrastructures along the Darent and Cray river, the site could be at risk from defence breach or overtopping.				
	Flood warning	The site is situated within the River Darent at Dartford Trade Park, Brooklands and Dartford to the Thames estuary (064FWF7Dartford) and the Dartford, Crayford and Greenhithe (064FWT1Dartford) Flood Warning Areas. The site is situated within the River Darent from Westerham to Dartford (064WAF7Darent) and the Coast from Dartford to Allhallows (064WAT1ThamesEst) Flood Alert Areas. Dry safe access and egress may be available to the north-east via the access road leading to the A226 for the 5% and 1% AEP fluvial flood event. Wet access and egress could be available via an unnamed access road to the west and north of the site. During this event, the access route has a hazard rating of 0.5 – 0.75. This hazard is classified as 'Very low hazard' and is considered safe for access and egress. Dry safe access and egress is available for the site in the south west via an unnamed road for the 3.33% and 1% AEP surface water events. However, wet access and egress could be available via the same route for the 0.1% AEP surface water event. During this event, the access route has a hazard rating of 0.75-1.25. This hazard is classified as 'danger for some', generally placing only the most vulnerable people in danger when walking through floodwater.				
Emergency planning	Access and egress					
					the defended scenario	
Climate Change	Climate Change allowances for '2080s'	River Basin District	Present day	/ Higher Centr	al Upper End	
	20003	Thames	n/a	35% increase peak river flov	_	



Site name		The Vicarage, Overy Liberty					
			81%	98%	98		
	Implications for the site	There is an increase in extent for all climate change allowances in comparison to the present day 1% AEP flood extent. The southern area of the site is at most risk from fluvial climate change flooding with the northern area becoming more at risk with an increase in climate change. The flood extent for the Upper End (+70%) scenario does not reach that of the 0.1% AEP flood extent. Therefore, the site will be at a slightly higher risk from fluvial flooding in the future. The site is substantially affected by flood risk both under existing conditions and in the future. A commitment will be required to measures so that development is safe and third parties are not adversely affected by proposals. Without evidence that this could potentially be achieved by provision of wider strategic measures, site specific measures, or a combination of these the principle of development is not supported at this site.					
	Impact of climate	Proportion of site at 1% AEP surface water flood risk					
change on risk	change on risk from surface	Present day	+20% rair	nfall uplift	+40% rainfall uplift		
	water	14%	14	1%	32%		
	Implications for the site	Slight increases in flood extent during the 1% AEP surface water event is predicted for the plus 20% climate change event with flooding being concentrate at the northern end of the site where it intersects the main A226 and the Darent and Cray watercourse. There is a significant increase in extent for the plus 40% climate change event with a large area in the south-west corner of the site predicted to flood. However, the extents do not reach that of the 0.1% AEP ever The site will therefore be at a slightly higher risk from surface water flooding in the future.					



Site name The Vicarage, Overy Libe		The Vicarage, Overy Liberty	
Bedrock Geology Superficial Geology		The entire site's bedrock geology consists of White Chalk.	
		The entire site if overlain by alluvium (clay, silt and sand)	
Requirement for drainage control and impact	Soils	The site is overlain by freely draining slightly acid but base-rich soils.	
mitigation	Groundwater Source Protection Zone	The site is located within Groundwater Source Protection Zone 1 (Inner Zone).	
	Historic Landfill Site	There is a historic landfill site located 1.12km north-east of the site.	

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Site name		The	e Vicarage, Overy Liberty				
		Se	nsitivity to cumulative im	nacts			
			e site is located within a ca		vity to development. The		
	Cumulative	site	e is potentially affected by o	umulative effects from pro	posed development		
	impacts of development	upstream and could potentially contribute to a small increase in volumes downstream. The Flood Risk Assessment should thus consider wider catchn					
	·	imp	olications of proposals. The	e potential changes to fluvi	al flood storage volumes		
		should also be addressed, if these are affected by measures to make development safe at the site.					
		dev	<u> </u>	within each Flood Zone			
	Flood Zone 1		Flood Zone 2	Flood Zone 3a	Flood Zone 3b		
	0%		16%	84%	0%		
	Sequential Test an	nd Ex	ception Test requiremen	ts			
		st m	ust be satisfied based on		s of flood risk before the		
			e required in the following s	scenario:			
			le and in flood zone 2	24			
		 essential infrastructure in flood zone 3a or 3b more vulnerable in flood zone 3a 					
	THOSE VUINCIADIC III HOOG ZONE JA						
		evelopment will not be permitted for the following scenario:					
		vulnerable development within FZ3a. vulnerable, More vulnerable and / or Less vulnerable development within FZ3b. tions for requirements of site-specific Flood Risk Assessment, including guidants					
	Trigrily vuli						
	Recommendations for developers						
	Flood risk assessr	ment					
Recommend-	At the plan	nning	application stage, a site-s	pecific flood risk assessme	ent will be required for this		
ations for	site as it is where the	oca deve	ited within Flood Zone 2 ar elopment would introduce a	more vulnerable use and	contains land identified in		
Local Plan	the strateg	gic flo	ood risk assessment as be				
policy	l ·		development:	tified by the Environment	Agonou on housing oritical		
			land which has been iden ge problems; or	uned by the Environment	Agency as naving critical		
	o 0	ther	sources of flooding must I		any site-specific flood risk		
			sment, including surface wa				
			deration should be given to espect to surface water. F				
			ires that provide for a redu				
			ppment.				
	b	Breach modelling should be undertaken on the River Darent as the watercould benefits from flood risk management infrastructure.					
			e change modelling should f development and level of		elevant allowances for the		
			there is a reasonable l		ces of flood risk having		
	si	ignific	cant impact, it is recomme				
			ned risks of these. Iltation with the Local Auth	ority I ead I ocal Flood A	uthority and Environment		
	 Consultation with the Local Authority, Lead Local Flood Authority and Environment Agency should be undertaken at an early stage. 						
	-						

Proposals will need to demonstrate that the site can adopt a sequential approach with more vulnerable uses located within lower risk parts of the site where possible.

Consideration must be given to the flood risk management measures and

commitments required to make development safe over the intended lifetime.

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Site name The Vicarage, Overy Liberty

o Cumulative effects should be considered (see above).

Guidance for site design and making development safe:

- New development must seek opportunities to reduce the overall level of flood risk at the site.
 For example, by:
 - Reducing volume and rate of runoff
 - Relocating development to zones with lower flood risk
 - Creating space for flooding.
- Safe access and egress should be demonstrated in the surface water 1% AEP plus climate change event.
- The Environment Agency has confirmed that more vulnerable uses should be set above the climate change flood level with a freeboard allowance, and developments should not displace water or block flow routes. Detailed proposals for the site will need to be developed in consultation with the Environment Agency.
- All development should adopt source control SuDS techniques to reduce the risk of frequent low impact flooding due to post development runoff.
- A greenfield site such as this should be able to implement an exemplar surface water drainage scheme to deliver multiple benefits including water quality, biodiversity, amenity, green infrastructure etc.
- Example features include swales, attenuation features, green roofs, rainwater capture and reuse and permeable paving.
- Assessment of runoff should include allowances for climate change effects.
- Efforts should be made to limit runoff to greenfield rates and discharge rates from the site should not increase downstream flood risk.
- According to the Environment Agency, development should seek to leave an undeveloped margin of 8m next to fluvial watercourses and 16m next to tidal watercourses. Any development within 8m either side of a Main River or within 16m from the foot of any sea defence may require the separate consent of the Environment Agency under local land drainage byelaws.



Site name		Glentworth Club
	OS Grid reference	554146 E, 173590 N
	Area (ha)	0.66
	Current land use	Commercial
	Proposed site use	Residential
	Flood risk vulnerability	More Vulnerable
Site details	Topography	Elevation Contains Ordnance Survey data © Crown copyright and database right 2020. Contains public sector information licensed under the Open Government Licence v3.0. 20 40 Metres The topography of the site slopes from west to east. The ground slope across the site generally has a gradient of less than 5%. There is an existing building located on the north east corner of the site.
Sources of flood risk	Existing watercourses	The Darent and Cray (Main River) is located 190m to the north-east of the site.





Site name		Glentworth Club				
F	Flood history	A small segment to the east of the site is reported to have flooded in 1968 as a result of channel capacity exceedance and no raised defences. Kent County Council may hold additional records which are not available at this time. These records detail historical flood incidents from all sources, whereas the Environment Agency dataset only records incidents of fluvial, tidal or coastal flooding. The Lead Local Flood Authority should be contacted to obtain further details.				
		(proportion reported a between larger or small Percentages round 5% AEP	f the site at risk in the defender of the area of land occupied er return period events, and the dot the nearest 1%. Areas 1% AEP 0%	ed by each flood extent herefore not cumulative.		
F	Fluvial	Available modelled data: The site is covered by the Environment Ager Flood Modeller-TUFLOW model. The extent of flood model are very similar to the extent of the Flood characteristics: The site is at a negligible risk from the 5% a modelled tidal events. The eastern half of the flood event.		ood Zones predicted by the ood risk at the site. AEP fluvial events and all within the 0.1% AEP fluvial		
		Proportion of site at risk (RoFSW) (proportion reported are for the area of land occupied by each flood extent between larger or smaller return period events, and therefore not cumulative. Percentages rounded to the nearest 1%. Areas <0.5% not recorded)				
		3.3% AEP	1% AEP	0.1% AEP		
		3%	13%	14%		
	Surface Water	the site as well as in the n increase of 10% in flood e development of flooding ir corner. There is a further event with the formation o RoFSW takes into accoun by existing buildings on th rating is greater than 0.57	on occurs on the A225 road accorth-east corner for the 3.3% attent for the 1% AEP event we atthe north-east corner as well 1% increase in flood extent at a flow route from the A225 that of building footprints so the flee site. It also only considers floor.	ent where there is further s well as in the south-east ent at the site for the 0.1% AEP 225 through the site. the flood risk may be affected ders flood risk where the hazard		
It should be noted that this dataset does not account for fluvial "looperiods of high river flows and levels of any outfalls discharging to which could exacerbate the surface water risk at the site.						
	Groundwater	site is located within a 1kn considered to be susceptil The AStGWF data should	Groundwater Flooding (AStG'n grid square where between ble to ground water flooding. be used only in combination worical data. It should not be used	25-50% of the 1km grid is with other information, for		
		example local data or historical data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at an scale. However, the data can help to identify areas for assessment at a local scale where finer resolution datasets exist.				



Site name Glentworth Club

	Reservoir	The Environment Agency Risk of Flooding from Reservoirs dataset does not show the site to be at risk of reservoir flooding.				
		Defenc	е Туре	Standard of Protection	Condition	
Defences		High G	Ground	2%-1.3% AEP	3	
		Earth Embankment		2% AEP	3	
			ture		Š	
		Impounded wa failure?	ter body	The site is not at risk breach	of flooding due to reservoir	
Flood risk management infrastructure	Residual risk	Thames tidal d	lefence	residual risk from a b tidal defences. Results of the modelli intersected by preser also predicted to no change in the future (is therefore predicte	esults of the modelling show that the site is no ersected by present day extents. The site is predicted to not be impacted by climate ange in the future (2115 Upper End). The site therefore predicted to be not at risk from each of the River Thames tidal flood defences	
		Other defence breach / overtopping? The site benefits partially from flood rismanagement infrastructure along the Rive Darent. Breach modelling was undertaken at the Dartford Industrial Park/ Priory Road (Left Bank for the 0.5% AEP (present day and 2115 Upper End). Results show that the site is not at risman from this breach location. However, as there are flood risk management infrastructures along the Darent and Cray river, the site could be at risman from defence breach or overtopping.			ructure along the River lling was undertaken at the rk/ Priory Road (Left Bank) esent day and 2115 Upper that the site is not at risk ion. However, as there are nt infrastructures along the r, the site could be at risk	
	Flood warning	The site is situated within the River Darent at Dartford Trade Park, Brooklands and Dartford to the Thames estuary (064FWF7Dartford) Flood Warning Areaa. The site is also situated within the River Darent from Westerham to Dartford (064WAF7Darent) Flood Alert Area. Safe access and egress for the western half of the site may be available during surface water events and the 5% and 1% AEP fluvial flood events via the may A225 Lowfield Street road. However, safe access and egress for the eastern are of the site may not be available during the 0.1% AEP flood event or during the AEP plus 35% or 70% climate change fluvial events given large parts of the sand the surrounding land is predicted to be at risk of flooding. Additionally, access and egress routes for the western half of the site may need to account for surface water flooding along the A225.				
Emergency planning	Access and egress					
		Proportion	of site at 1% AE	P fluvial flood risk in	the defended scenario	
Climate Change	Climate Change allowances for '2080s'	River Basin District	Present day	/ Higher Centr	al Upper End	
		Thames	n/a	35% increase peak river flow		



Site name		Glentworth Club	1			
	1					
			3%	33%	52%	
	Implications for the site	There is an increase in extent for all climate change allowances in comparison to the present day 1% AEP flood extent. The eastern area of the site is predicted to be most susceptible to fluvial risk in the future. The flood extent for the Upper End (+70%) scenario does not reach that of the 0.1% AEP flood extent. The site will therefore be at higher risk from fluvial flooding in the future. The potential change should be considered in the preparation of detailed proposals and assessed in an FRA. A sequential approach should be adopted to the layout and design at the site. The site is affected by flood risk both under existing conditions and in the future. A commitment will be required to measures so that development is safe and third parties are not adversely affected by proposals. This could potentially be achieved by provision of wider strategic measures, site specific measures, or a combination of these.				
	Impact of climate	Proportion of site at 1% AEP surface water flood risk				
	change on risk from surface	Present day	+20% raiı	nfall uplift	+40% rainfall uplift	
	water		16	6%	20%	
	Implications for the site	I AVIANTE NO NOT LESCH THST OF THE 11 1% AFP AVANT. THE SITE WILL THAT FIN			ese increases are the site. However, the te will therefore be at a re. The implications of	



Site name		Glentworth Club		
	Bedrock Geology	The entire site's bedrock geology consists of White Chalk.		
	Superficial Geology	The entire site's is overlain by alluvium (clay, silt, and sand).		
Requirement for drainage control and impact	Soils	The parcels are overlain by loamy and clayey floodplain or coastal flat soils with naturally high groundwater		
mitigation	Groundwater Source Protection Zone	The eastern parcel of the site is located within Ground Water Source Protection Zone 2 (Outer Zone)		
	Historic Landfill Site	There is a historic landfill site located 716 metres south-east of the site.		

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Site name	Glentworth Club
Broad scale assessment of possible SuDS	Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. British Geological Society (BGS) data indicates that the underlying geology is the White Chalk subgroup, though the soils at the site are loamy and clayey with high groundwater levels. Groundwater levels and the permeability of soils at the site should be assessed via an infiltration test, with the use of infiltration maximised as much as possible. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site. The eastern part of the site is located within Groundwater Source Protection Zone 2 (SPZ). Kent County Council and the Environment Agency have confirmed that in GSP2 2, infiltration is potentially possible for surface run-off from roads, car parking and public or amenity provided the SUDS management train is used to treat the drainage. Groundwater ingress could potentially impact the hydraulic capacity and structural integrity of detention and attenuation features, if measures to prevent this are not implemented in the design of the surface water drainage system. Given the location of the site being in close proximity to the Darent and Cray river, the use of SuDS is recommended. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques. Mapping suggests that the site slopes make it possible to consider most forms of
	Where slopes are >5%, features should follow contours or utilise check dams to slow flows. If it is proposed to discharge runoff to the Darent and Cray river, local drainage
	considered and agreed with the LLFA. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible opportunities and constraints

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0:4-	Glentworth Club					
Site name		Glentworth Club				
		Considiuity to sumulative im	naata			
	Cumulative impacts of development	Sensitivity to cumulative impacts The site is located within a catchment with a high sensitivity to development. The Implications of increased volumes from proposed development should be addressed at an appropriate catchment level to demonstrate that additional volumes do not exacerbate flood risk at vulnerable locations remote from the site. This wider assessment should include consideration of other proposed development within the catchments(s).				
			within each Flood Zone			
	Flood Zone 1	Flood Zone 2	Flood Zone 3a	Flood Zone 3b		
	38% 62% 0%					
	-	d Exception Test requirement				
	Exception test is ap The Exception test v	will be required in the following s		of flood risk before the		
		erable and in flood zone 2	O.L.			
		nfrastructure in flood zone 3a or erable in flood zone 3a	30			
	Development will no	t be permitted for the following	scenario:			
		erable development within FZ3				
	Highly vulnerable, More vulnerable and / or Less vulnerable development within FZ3b.					
	Recommendations for requirements of site-specific Flood Risk Assessment, including guidance					
	for developers Flood Risk Assessment					
Recommend- ations for Local Plan	 At the planning application stage, a site-specific flood risk assessment will be required for this site as it is located within Flood Zone 2, if more than 10 dwellings are proposed and may be subject to other sources of flooding where the development would introduce a more vulnerable use and contains land identified in the strategic flood risk assessment as being at increased flood risk in the future. It is also required where development: 					
policy		ls on land which has been identified by the Environment Agency as having critical drainage problems; or				
		Other sources of flooding must be considered as part of any site-specific flood risk assessment, including surface water and groundwater.				
		Consideration should be given to the risk of fluvial flooding associated with the drainage ditches located to the west and east of the site.				
	w m	Consideration should be given to the potential effects of climate change, particularly with respect to surface water. Proposals should consider the opportunity to include measures that provide for a reduction in predicted surface water flood risk at existing development.				
		reach modelling should be un enefits from flood risk managem		rent as the watercourse		
		limate change modelling should e type of development and leve		elevant allowances for		
	si	here there is a reasonable likeli gnificant impact, it is recommen ombined risks of these.				
		onsultation with the Local Autho gency should be undertaken at		ority and Environment		
		onsideration must be given omnitments required to make de				

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Site name Glentworth Club

- Cumulative effects should be considered (see above).
- Proposals will need to demonstrate that the site can adopt a sequential approach with more vulnerable uses located outside Flood Zone 3a and 2 where possible.

Guidance for site design and making development safe:

- New development must seek opportunities to reduce the overall level of flood risk at the site.
 For example, by:
 - Reducing volume and rate of runoff
 - Relocating development to zones with lower flood risk
 - o Creating space for flooding.
- Safe access and egress should be demonstrated in the fluvial and tidal plus climate change events. Consideration should also be given to providing safe access and egress during surface water events.
- The Environment Agency has confirmed that more vulnerable uses should be set above the
 climate change flood level with a freeboard allowance, and developments should not displace
 water or block flow routes. Detailed proposals for the site will need to be developed in
 consultation with the Environment Agency. All development should adopt source control SuDS
 techniques to reduce the risk of frequent low impact flooding due to post development runoff.
- Ground investigations at the site should be undertaken to confirm groundwater levels and the
 permeability of soils to support the design of SUDS features.
- SuDS should be designed to deliver multiple benefits including water quality, biodiversity, amenity, green infrastructure etc.
- Example features include swales, attenuation features, green roofs, rainwater capture and reuse and permeable paving.
- Assessment of runoff should include allowances for climate change effects.
- Efforts should be made to limit runoff to greenfield rates and discharge rates from the site should not increase downstream flood risk.
- SuDS design must follow Kent County Council policy, meet the Defra National Non-Statutory Technical Standards, and follow current best practice (CIRIA C752 Manual 2015).



Site name		Burnham Trading Estate		
	OS Grid reference	553557 E, 175153 N		
	Area (ha)	0.87		
	Current land use	Industrial		
	Proposed site use	Retained as industrial or residential / commercial		
	Flood risk vulnerability	Less vulnerable / More vulnerable		
Site details	Topography	Elevation Contains Ordnance Survey data © Crown copyright and database right 2020. Contains public sector information licensed under the Open Government Licence v3.0. There are several existing buildings located across the site. The ground slope across the site generally has a gradient of less than 5%.		
Sources of flood risk	Existing watercourses	The River Darent is located 215m east of the site and the Stanham River is located 300m west of the site.		



Site name		Burnham Trading Estate			
		The Environment Agency flooding has been recorded	's recorded flood outlines data ed at the site.	set does not indicate that	
	Flood history	Kent County Council may hold additional records which are not available at thi time. These records detail historical flood incidents from all sources, whereas Environment Agency dataset only records incidents of fluvial, tidal or coastal flooding. The Lead Local Flood Authority should be contacted to obtain further details.			
		Proportion of	of the site at risk in the defen	nded scenario	
		between larger or smal	are for the area of land occupie ller return period events, and t led to the nearest 1%. Areas	herefore not cumulative.	
		5% AEP	1% AEP / 0.5% AEP	0.1% AEP	
		0%	0%	0%	
		Available modelled data	1:		
	Fluvial / Tidal	Crayford (fluvial) and 20 models. The extent of the	lata: by the 2019 Darent and Cray (fluvial), 2020 Dartford and 2018 North Kent Coast Flood Modeller-TUFLOW (tidal the Flood Zones predicted by the flood models are different stual flood risk, as there are flood risk management features.		
		Flood characteristics: The site is entirely locate fluvial and tidal flooding.	ted with Flood Zone 1 and is therefore at negligible risk Proportion of site at risk (RoFSW)		
		Proportion of site at risk (RoFSW) (proportion reported are for the area of land occupied by each flood extent between larger or smaller return period events, and therefore not cumulative. Percentages rounded to the nearest 1%. Areas <0.5% not recorded)			
		3.3% AEP	1% AEP	0.1% AEP	
		0%	2%	10%	
	Surface Water	the 3.33% AEP event. Dupredicted to occur at the softhe site. In the 0.1% A surface water flooding, with across the site. RoFSW takes account of	s not predicted to occur within the site boundary during During the 1% AEP event surface water flooding is site, with a small area of ponding occurring in the north AEP event, 10% of the site is predicted to be at risk of with small areas of surface water ponding predicted of building footprints so the flood risk may be affected by site. It also only considers flood risk where the hazard		
			Groundwater Flooding (AStG' m grid square where >=50% to groundwater flooding.		
Groundwater The AStGWF data should be used only in combination of example local data or historical data. It should not be used any specific flood risk management, land use planning of scale. However, the data can help to identify areas for a scale where finer resolution datasets exist. Ground involved				sed as sole evidence for or other decisions at any assessment at a local	



Site name	Burnham Trading Estate
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		should be used to confirm groundwater levels to support the design of SUDS features.					
	Reservoir		The Environment Agency Risk of Flooding from Reservoirs dataset does not show the site to be at risk of reservoir flooding.				
	Defende	Defence	е Туре	Standard of Protection	Condition		
	Defences	N/A		N/A	N/A		
Flood risk management infrastructure		Culvert / struct blockage?	ure	There are no known vicinity of the site.	culverts or structures in the		
	Residual risk	Impounded war failure?	ter body	The site is not at risk breach.	of flooding due to reservoir		
		Defence breach overtopping?	n /	The site is not at risk breach or overtopping	of flooding due to defence g.		
Emergeney	Flood warning	The site is not w	The site is not within a Flood Warning Area or Flood Alert Area.				
Emergency planning	Access and egress	Safe access and egress from the site is likely to be possible during a surface water or fluvial / tidal flood event via Lawson Road, Burnham Road and the road along the site's eastern boundary.					
		Proportion of site at 1% AEP fluvial flood risk in the defended scenario					
	Climate Change allowances for	River Basin District	Present day	y Higher Centr	ral Upper End		
	'2080s'	Thames	n/a	35% increase peak river flow			
			0%	0%	0%		
Climate Change	Implications for the site	The site is not predicted to be impacted by fluvial or tidal flooding as a climate change.			tidal flooding as a result of		
	Impact of climate	Pro	portion of site	at 1% AEP surface wa	ater flood risk		
	change on risk from surface	Present day	+20%	% rainfall uplift	+40% rainfall uplift		
	water	2%		3%	5%		
	Implications for the site	flooding at the s slightly increase	ite. Additional ar	the extent of surface water onding are predicted to rom 2% (1% AEP present			



Site name		Burnham Trading Estate		
	Bedrock Geology	The entire site's bedrock geology consists of White Chalk.		
	Superficial Geology	The entire site is covered by alluvium (clay, silt, sand).		
Requirement for drainage control and impact	Soils	The site is overlain by loamy soils with naturally high groundwater.		
mitigation	Groundwater Source Protection Zone	The site is not located within a Groundwater Source Protection Zone.		
	Historic Landfill Site	There is a historic landfill site located 200m northeast of the eastern parcel.		





Site name	В	urnham Trading Estate				
	Broad scale assessment of possible SuDS Broad scale assessment of possible SuDS Tobby If contains the cont	Implementation of SuDS at the site could provide opportunities to deliver multip benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. British Geological Society (BGS) data indicates that the underlying geology is the White Chalk subgroup, though the soils at the site are loamy and clayey with his groundwater levels. Groundwater levels and the permeability of soils at the site should be assessed via an infiltration test, with the use of infiltration maximised much as possible. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site. Groundwater ingress could potentially impact the hydraulic capacity and structurintegrity of detention and attenuation features, if measures to prevent this are not implemented in the design of the surface water drainage system. Given the high-density nature of the site, use of urban SuDS is recommended. Urban sites should not preclude the use of SuDS. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques. Mapping suggests that site slopes make it possible to consider most forms of dentition. Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting should be considered in the design of the site. The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be locate				
	Cumulative impacts of development	north of the site in a catchment with medium sensitivity. The implications of increased volumes from proposed development should be addressed at an appropriate catchment level to demonstrate that additional volumes do not				
		<u> </u>	within each Flood Zone			
Recommend-	Flood Zone 1	Flood Zone 2	Flood Zone 3a	Flood Zone 3b		
ations for	100%	0%	0%	0%		

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Site name Burnham Trading Estate

Local Plan policy

Sequential Test and Exception Test requirements

The Sequential Test must be satisfied based on fluvial and other sources of flood risk before the Exception test is applied.

The Exception Test is not required as the site is not within Flood Zone 2 or 3 but a Flood Risk Assessment is still required. See below for further details on requirements for a Flood Risk Assessment.

Recommendations for requirements of site-specific Flood Risk Assessment, including guidance for developers

Flood risk assessment

- At the planning application stage, a site-specific flood risk assessment will be required for this site if more than 10 dwellings are proposed for the site. It will also be required if development is:
 - on land which may be subject to other sources of flooding, where the development would introduce a more vulnerable use;
 - on land which has been identified by the Environment Agency as having critical drainage problems; or
 - on land identified in the strategic flood risk assessment as being at increased flood risk in future.
- Other sources of flooding must be considered as part of any site-specific flood risk assessment, including surface water and groundwater.
- Consideration should be given to the potential effects of climate change, particularly with
 respect to surface water. Proposals should consider the opportunity to include measures that
 provide for a reduction in the predicted surface water flood risk at existing development.
- Climate change modelling should be undertaken using the relevant allowances for the type of development and level of risk.
- Where there is a reasonable likelihood of multiple sources of flood risk having significant impact in combination it is recommended that consideration is given to assessing the combined risks of these.
- Consultation with the Local Authority, Lead Local Flood Authority and Environment Agency should be undertaken at an early stage.
- Consideration must be given to the flood risk management measures and commitments required to make development safe over the intended lifetime.
- Cumulative effects should be considered (see above)

Guidance for site design and making development safe:

- New development must seek opportunities to reduce the overall level of flood risk at the site.
 For example, by:
 - o Reducing volume and rate of runoff
 - Relocating development to zones with lower flood risk
 - Creating space for flooding.
- Safe access and egress should be demonstrated in the surface water plus climate change events.
- All development should adopt source control SuDS techniques to reduce the risk of frequent low impact flooding due to post development runoff.
- Ground investigations at the site should be undertaken to confirm groundwater levels and the
 permeability of soils to support the design of SUDS features.
- SuDS should be designed to deliver multiple benefits including water quality, biodiversity, amenity, green infrastructure etc.
- Example features include swales, attenuation features, green roofs, rainwater capture and reuse and permeable paving.
- Assessment of runoff should include allowances for climate change effects.
- Efforts should be made to limit runoff to greenfield rates and discharge rates from the site should not increase downstream flood risk.
- SuDS design must follow Kent County Council policy, meet the Defra National Non-Statutory Technical Standards, and follow current best practice (CIRIA C752 Manual 2015).



Site name		Lower Hythe Street and Central Road
	OS Grid reference Area (ha) Current land use Proposed site	554324 E, 174638 N 5.03 Industrial Residential
	Flood risk vulnerability	More Vulnerable
Site details	Topography	Elevation Idi Contains Ordinance Survey data Crown copyright and database right 2020. Contains Judic Survey data Crown copyright and database right 2020. Contains public sector information licensed under the Open Contains Ordinance Survey data Contains Ordinan
Sources of flood risk	Existing watercourses	The River Darent flows between the two parcels of land.

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		The Environment Agency's recorded flood outlines dataset indicates that flooding occurred in September 1968 along Victoria Road and Hythe Street due to the channel capacity of the River Darent being exceeded.				
	Flood history	Kent County Council may hold additional records which are not available at this time. These records detail historical flood incidents from all sources, whereas the Environment Agency dataset only records incidents of fluvial, tidal or coastal flooding. The Lead Local Flood Authority should be contacted to obtain further details.				
		Proportion of	f the site at risk in the defen	ided scenario		
		(proportion reported are for the area of land occupied by each flood extent				
			ler return period events, and the death of the nearest 1%. Areas			
		5% AEP	1% AEP 0.1% A			
		1%	1%	43%		
		Available modelled data				
	Fluvial / Tidal	2018 North Kent Coast Fl Zones predicted by the flo	2019 Darent and Cray, 2020 ood Modeller-TUFLOW model ood models are different to the k management features that c	ls. The extent of the Flood extent of the actual flood		
	Tidvidi7 Tiddi	Flood characteristics:	t management reatures that s	nange are non.		
		The site is entirely located within Flood Zone 3a, although when flood risk management features are accounted for in the defended scenario both parcels of land are partially (<1%) within the modelled flood extents for the fluvial 5% and 1% AEP events. This is due to the presence of defences along the River Darent. During the fluvial 0.1% AEP event, the defences adjacent to the western parcel are predicted to be exceeded and most of the parcel is expected to be inundated, though the eastern parcel is not within the modelled flood extents.				
		When the Dartford Barrier is closed there is a negligible risk of tidal flooding to the site.				
		Proportion of site at risk (RoFSW)				
		(proportion reported are for the area of land occupied by each flood extent between larger or smaller return period events, and therefore not cumulative. Percentages rounded to the nearest 1%. Areas <0.5% not recorded)				
		3.3% AEP	1% AEP 0.1% AEP			
		2%	6% 18%			
	Surface Water	Road during the 3.33% Al increase in the area prediwhere ponding is predicte the southern boundary. The where further surface wat	redicted along Victoria Road, Hythe Street, and Central P event. During the 1% AEP event there is an ted to be impacted, particularly in the eastern parcel in the north and a flow path is predicted to form along ere is a further 12% increase for the 0.1% AEP event or flows are predicted to accumulate adjacent to Central and to the west of Hythe Street in the western parcel.			
			building footprints so the floo site. It also only considers floo 5.			
		exacerbate the surface value influenced Thames which the Dartford Barrier is looperation of the barrier. T	is dataset does not account for water risk at the site given to could influence levels within to cated on the River Darent, the barrier shuts during extremocurring at the same time as a ng.	he proximity of the tidally he River Darent. Although risk is dependent on the e tidal levels in the Thames		





	Groundwater	The Areas Susceptible to Groundwater Flooding (AStGWF) dataset shows the site is located within a 1km grid square where >=25% to <50% of the area is predicted to be at risk of groundwater flooding. The AStGWF data should be used only in combination with other information, for example local data or historical data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. However, the data can help to identify areas for assessment at a local scale where finer resolution datasets exist. Ground investigations at the site should be used to confirm groundwater levels to support the design of SUDS features. The Environment Agency Risk of Flooding from Reservoirs dataset does not should be used to be at risk of reservoir flooding. Defence Type Standard of Protection Condition			
	Reservoir				
	1100011011				
		High ground (Darent right bank)	1000	3	
	Defences	Wall (Darent right bank)	1000	2/3	
		Wall (Darent left bank)	1000	2/3	
		Dartford Barrier and Thames tidal defences	s 1000 - Around 125m southwest of the we	-	
		Culvert / structure blockage?	Around 125m southwest of the western parcel there is a culvert linking the Mill Pond to the River Darent.		
		Impounded water body failure?	there is a culvert linking the Mill Pond to the Ri		
Flood risk management infrastructure	Residual risk	Thames tidal defence breach?			
		Other defence breach / overtopping?	management infrast Darent. The extent of	enefits from flood risk ructure along the River of the undefended 1% AEP the entire site has the during a breach.	
Emergency planning	Flood warning	Both packages are located within flood alert areas (064WAF7Darent and 064WAT1ThamesEst) and flood warning areas (064WAF7Darent and 064WAT1ThamesEst) associated with the River Darent and the Thames Estuary.			





	Access and egress	Safe access and egress for the eastern parcel may be available during all surface water and fluvial flood events via Central Road or the industrial land to the north of the site. However, safe access and egress for the western parcel may not be available during a 1% AEP plus 35% or 70% fluvial event given large parts of the site and the surrounding land is predicted to be at risk of flooding. Additionally access and egress routes for the western parcel may need to account for surface water flooding along Hythe Street and Victoria Road.				
		Proportion of	of site at 1% AEP flux	vial flood risk in t	he defended scenario	
	Climate Change allowances for	River Basin District	Present day	Higher Centra	al Upper End	
	'2080s'	Thames	n/a	35% increase i peak river flow	_	
			1%	31%	41%	
Climate Change	Implications for the site	Most of the western parcel is predicted to be at risk of fluvial flooding dur AEP plus 35% and 70% climate change events, despite the site not being to flood during the 1% AEP event. However, due to the presence of management features, the eastern parcel is not predicted to be at risk of tidal flooding during the climate change events. The site is affected by both under existing conditions and in the future. A commitment will be measures so that development is safe, and third parties are not adverse by proposals. This could potentially be achieved by provision of wide measures, site specific measures, or a combination of these.				
	Impact of climate change on risk from surface	Proportion of site at 1% AEP surface water flood risk				
		Present day	+20% rair	nfall uplift	+40% rainfall uplift	
	water	6 %	9%		11%	
	Implications for the site	predicted for the do not reach that		limate change eve ent. These increas	nts. However, the extents ses area located in the	
		predicted for the do not reach that area around Hy eastern parcel.	e plus 20% and 40% cl at of the 0.1% AEP eve	limate change eve ent. These increas rn parcel and alon	nts. However, the extents ses area located in the g Central Road in the	
Requirement for drainage	the site Bedrock	predicted for the do not reach that area around Hy eastern parcel. The entire site's The eastern par deposits, with a The northeast common control of the document of the control of the	e plus 20% and 40% of at of the 0.1% AEP eventhe Street in the wester between bedrock geology constructions almost entirely of	limate change eve ent. These increas ern parcel and alon sists of White Chal overlain by undiffer h of the parcel with arcel is also overla	nts. However, the extents ses area located in the g Central Road in the lk. Tentiated river terrace in no deposits recorded. Sain by undifferentiated	
for drainage control and impact	Bedrock Geology	predicted for the do not reach tha area around Hy eastern parcel. The entire site's The eastern par deposits, with a The northeast criver terrace departs and).	e plus 20% and 40% of at of the 0.1% AEP eventhe Street in the wester bedrock geology constreel is almost entirely of small area in the south orner of the western prosits, but most of the overlain by loamy and	limate change eve ent. These increasern parcel and alon sists of White Chal overlain by undiffer h of the parcel with arcel is also overla parcel is covered by	nts. However, the extents ses area located in the g Central Road in the lk. Tentiated river terrace in no deposits recorded. Sain by undifferentiated	
for drainage control and	Bedrock Geology Superficial Geology	predicted for the do not reach tha area around Hy eastern parcel. The entire site's The eastern par deposits, with a The northeast criver terrace deposits and). The parcels are naturally high ground the same are not the same are naturally high ground the same are naturally high ground the same are not the same are naturally high ground the same are not the s	e plus 20% and 40% of at of the 0.1% AEP eventhe Street in the wester bedrock geology constreel is almost entirely of small area in the south orner of the western prosits, but most of the overlain by loamy and	limate change eve ent. These increasern parcel and alon sists of White Chal everlain by undiffer the of the parcel with arcel is also overlate parcel is covered by disclayey floodplain	nts. However, the extents ses area located in the g Central Road in the g Central Road in the lk. Tentiated river terrace in no deposits recorded. A lain by undifferentiated by alluvium (clay, silt, or coastal flat soils with	

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Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.

Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development.

British Geological Society (BGS) data indicates that the underlying geology is the White Chalk subgroup, though the soils at the site are loamy and clayey with high groundwater levels. Groundwater levels and the permeability of soils at the site should be assessed via an infiltration test, with the use of infiltration maximised as much as possible. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site.

Groundwater ingress could potentially impact the hydraulic capacity and structural integrity of detention and attenuation features, if measures to prevent this are not implemented in the design of the surface water drainage system.

Broad scale assessment of possible SuDS

Given the high-density nature of the site, use of urban SuDS is recommended. Urban sites should not preclude the use of SuDS. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques. Mapping suggests that the site slopes make it possible to consider most forms of dentition.

Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting should be considered in the design of the site.

The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.

Overland flows paths are present at the development site along highways and in the south of the eastern parcel. Where possible opportunities to incorporate these flow paths into the site layout should be considered.

If it is proposed to discharge runoff to the River Darent or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and discharge rate agreed with the asset owner. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA.

Surface water outfalls that discharge into the River Darent may be affected by tide locking due to water levels in the River Darent. The impacts of tide locking/flood flows will need to be considered in terms of the attenuation storage requirements of the site.

Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible opportunities and constraints.

Cumulative impacts of development

The site is located within a catchment with a high sensitivity to cumulative impacts of development. The Implications of increased volumes from proposed development should be addressed at an appropriate catchment level to demonstrate that additional volumes do not exacerbate flood risk at vulnerable locations remote from the site. This wider assessment should include consideration of other proposed development within the catchment.

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Proportion of the site within each Flood Zone				
Flood Zone 1 Flood Zone 2 Flood Zone 3a Flood Zone 3b				
0%	0%	99%	1%	

Sequential Test and Exception Test requirements

The Sequential Test must be satisfied based on fluvial and other sources of flood risk before the Exception test is applied.

The Exception test will be required in the following scenario:

- highly vulnerable and in flood zone 2
- essential infrastructure in flood zone 3a or 3b
- more vulnerable in flood zone 3a

Development will not be permitted for the following scenario:

- Highly vulnerable development within FZ3a.
- Highly vulnerable, More vulnerable and / or Less vulnerable development within FZ3b.

Recommendations for requirements of site-specific Flood Risk Assessment, including guidance for developers

Flood risk assessment

- At the planning application stage, a site-specific flood risk assessment will be required for this
 site as it is greater than 1ha, located within Flood Zone 3 and may be subject to other sources
 of flooding where the development would introduce a more vulnerable use and contains land
 identified in the strategic flood risk assessment as being at increased flood risk in the future. It
 is also required where development:
 - Is on land which has been identified by the Environment Agency as having critical drainage problems; or
 - Other sources of flooding must be considered as part of any site-specific flood risk assessment, including surface water and groundwater.
 - Consideration should be given to the potential effects of climate change, particularly with respect to surface water. Proposals should consider the opportunity to include measures that provide for a reduction in predicted surface water flood risk at existing development.
 - Climate change modelling should be undertaken using the relevant allowances for the type of development and level of risk.
 - Where there is a reasonable likelihood of multiple sources of flood risk having significant impact, it is recommended that consideration is given to assessing the combined risks of these.
 - Consultation with the Local Authority, Lead Local Flood Authority and Environment Agency should be undertaken at an early stage.
 - Proposals will need to demonstrate that the site can adopt a sequential approach with more vulnerable uses located within lower risk parts of the site where possible.
 - o Consideration must be given to the flood risk management measures and commitments required to make development safe over the intended lifetime.
 - o Cumulative effects should be considered (see above).

Guidance for site design and making development safe:

- New development must seek opportunities to reduce the overall level of flood risk at the site.
 For example, by:
 - Reducing volume and rate of runoff
 - o Relocating development to zones with lower flood risk
 - Creating space for flooding.
- Safe access and egress should be demonstrated in the fluvial plus climate change events.
 Consideration should also be given to providing safe access and egress during surface water events.
- The Environment Agency has confirmed that more vulnerable uses should be set above the climate change flood level with a freeboard allowance, and developments should not displace water or block flow routes. Detailed proposals for the site will need to be developed in consultation with the Environment Agency.

Recommendations for Local Plan policy





- All development should adopt source control SuDS techniques to reduce the risk of frequent low impact flooding due to post development runoff.
- Ground investigations at the site should be undertaken to confirm groundwater levels and the
 permeability of soils to support the design of SUDS features.
- SuDS should be designed to deliver multiple benefits including water quality, biodiversity, amenity, green infrastructure etc.
- Example features include swales, attenuation features, green roofs, rainwater capture and reuse and permeable paving.
- Assessment of runoff should include allowances for climate change effects.
- Efforts should be made to limit runoff to greenfield rates and discharge rates from the site should not increase downstream flood risk.
- SuDS design must follow Kent County Council policy, meet the Defra National Non-Statutory Technical Standards, and follow current best practice (CIRIA C752 Manual 2015).
- The Environment Agency has confirmed that, both halves of the site border the tidal Darent and works to improve the accessibility, amenity, ecology and flood defences in the river corridor should be incorporated where possible.
- According to the Environment Agency, development should seek to leave an undeveloped margin of 8m next to fluvial watercourses and 16m next to tidal watercourses. Any development within 8m either side of a Main River or within 16m from the foot of any sea defence may require the separate consent of the Environment Agency under local land drainage byelaws.



Site name		Ebbsfleet Central	
	OS Grid reference Area (ha) Current land use	561396 E , 174104 N 125.13 Open land, station and car parks.	
	Proposed site use	Mixed use	
	Flood risk vulnerability	More vulnerable and less vulnerable	
Site details	Topography	Elevation Contains Ordnance Survey data © Crown copyright and database right 2020. Contains public sector information licensed under the Open Government Licence v3.0. 330 660 Metres The site slopes from west to east with the highest elevations located in the north west corner of the site. A railway line intersects the site from the north boundary to the south east. The ground slope across the site generally has a gradient of less than 5%.	
Sources of flood risk	Existing watercourses	The River Ebbsfleet (Main River) flows from south to north east to the River Thames along the eastern site boundary. The River Thames is located 690m north east of the site. Blue Lake is located 100m east of the site and outfalls into the River Ebbsfleet 50m east of the site.	



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Site name		Ebbsfleet Central			
		•			
		The Environment Agency incidents to have occurred	's Recorded Flood Outline dat d at the site.	aset reports no historical	
	Flood history	time. These records deta Environment Agency data	hold additional records which ail historical flood incidents fro aset only records incidents of fl he Lead Local Flood Authority	m all sources, whereas the luvial, tidal or coastal	
		Proportion of	of the site at risk in the defer	nded scenario	
			are for the area of land occupie	•	
		Percentages round	ller return period events, and t led to the nearest 1%. Areas	<0.5% not recorded)	
		5% AEP	1% AEP	0.1% AEP	
		3%	4%	4%	
	Fluvial/Tidal	Available modelled data: The site is covered by the Environment Agency North Kent Coast (Tidal) 2 Flood Modeller-TUFLOW model and River Ebbsfleet (Fluvial) 2015 Flood Model TUFLOW model. The extent of the Flood Zones predicted by the flood mode different to the extent of the actual flood risk, as there are flood risk manager features that change the risk.			
		Flood characteristics:			
		The east boundary of the site is partially within Flood Zone 3b (5% AEP defended fluvial event). This is further increased by <0.5% for the 1% AEP fluvial event. A further increase of <0.5% is predicted to occur for the 0.1% AEP fluvial event along Thames Way. Risk remains contained to the east of the site along the site boundary,			
		Due to the presence of tidal flood risk management features to the north of the site,			
			ลเ แออด risk management teatเ isk of flooding from tidal floodi		
		Proportion of site at risk (RoFSW)			
		(proportion reported are for the area of land occupied by each flood extent			
		between larger or smaller return period events, and therefore not cumulative. Percentages rounded to the nearest 1%. Areas <0.5% not recorded)			
		3.3% AEP	1% AEP	0.1% AEP	
		2%	4 %	14%	
		Description of surface v		I	
	Surface Water	Surface water accumulation occurs in across the centre of the site along line and roads and in the north west and south west corners. Ther increase in flood extent for the 1% AEP event. A flow route from the ventre of the site is further established for this event and further flooding railway line. An increase of 10% occurs for the 0.1% AEP event with increase occurring along the eastern site boundary.			
		exacerbate the surface w	is dataset does not account for a crount for a crount for a crown the line of the crown the crown the crown the crown that the	proximity of the Thames to	
		The RoFSW modelling takes account of building footprints so the flood risk may be affected by existing buildings on the site. It also only considers flood risk where the hazard rating is greater than 0.575.			
	Groundwater	site is located within a 1ki	Groundwater Flooding (AStG m grid square where less than be susceptible to groundwater	25% of the 1km grid	



Site name		Ebbsfleet Central
		The AStGWF data should be used only in combination with other information, for example local data or historical data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. However, the data can help to identify areas for assessment at a local scale where finer resolution datasets exist.
		It should be noted that soils present at the site are loamy and clayey soils with naturally high groundwater, therefore high groundwater levels are expected to be present at the site.
Reser	voir	The Environment Agency Risk of Flooding from Reservoirs dataset does not show the site to be at risk of reservoir flooding.



Site name	Ebbsfleet Central
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		Defence Typ	е	Standard o	of Protection		Condition	
Flood risk management infrastructure	Defences	Tidal embankm	nent	0.1%	% AEP		3	
		Tidal concrete v	wall	0.1%	% AEP		2	
		Culvert / structi blockage?	ure	along the east	e River Ebbsfleet is culverted in a number of locationg the east site boundary which could present a resit in the event of a blockage.			
		Impounded wat body failure?	ter	The site is not at risk of flooding due to reservoir brea				
	Residual risk	Thames tidal defence breach	1?	The Thames tidal defences pose a residual risk to the site in the event of a breach. Modelling was undertaken in 2018 to assess the risk of breach from these defences. Results of modelling show that the site is intersected by the 0.5% AEP breach extent in the north east corner of the site. This impacts 1% of the site. There is an increase in extent of 1% for the 0.1% AEP breach event. In the future, the site is predicted to increase in risk by 6% for the 0.5% AEP (2115 Upper End) breach event. Areas along the east boundary and the railway line are predicted to increase in risk. For the 0.1% AEP (2115 Upper End), an increase of 6% is predicted to occur. Risk remans confined to the eastern boundary and a section of the railway line north of Ebbsfleet International Station. The site is therefore predicted to be at an increased risk from breach due to climate change in the future.				
				The site does not benefit from any additional flood risk management infrastructure along the Ebbsfleet River.				
	Flood warning	(064WAT1Tham	The site is situated within the Coast from Dartford to Allhallow (064WAT1ThamesEst) Flood Alert area and the Gravesend and Northflet (064FWT1Gravesend) Flood Warning areas.					
Emergency planning	Access and egress	Safe access and egress may be available during all surface water and fluvial flood events from the south west via Southfleet Road.					vater and fluvial flood	
		Proportion o	of site	at 1% AEP flux	vial flood risk in t	the de	efended scenario	
Climate Change	Climate Change allowances for	River Basin District	Pr	resent day	Higher Centr	al	Upper End	
Change	'2080s'	Thames		n/a	35% increase peak river flow		70% increase in peak river flows	
				4%	4%		4%	



Site name		Ebbsfleet Central			
	Implications for the site	There is a small increase in extent for all climate change allowances in comparison to the 1% AEP flood extent. For the Upper End (70% increase in peak river flows), the flood extent exceeds that of the 0.1% AEP flood extent. Therefore, climate change is predicted to impact the proposed site in the future. The potential change should be considered in the preparation of detailed proposals and assessed in an FRA. A sequential approach should be adopted to the layout and design at the site. The site is affected by flood risk both under existing conditions and in the future. A commitment will be required to measures so that development is safe, and third parties are not adversely affected by proposals. This could potentially be achieved by provision of wider strategic measures, site specific measures, or a combination of these.			
	Impact of climate	Proportion of site at 1% AEP surface water flood risk			
	change on risk from surface	Present day	+20% rainfall uplift	+40% rainfall uplift	
	water	4%	5%	7%	
		A small increase in flood extent during the 1% AEP surface water event is predicted for the plus 20% and 40% climate change events. However, the extended on the reach that of the 0.1% AEP surface water flood event. Therefore, the will be at a slightly higher risk from surface water flooding in the future. However, it should be noted that this dataset does not take account of the important of tide locking from increased sea levels on drainage from the site which could exacerbate the surface water risk at the site in the future. The implications of predicted changes should be addressed in an FRA and appropriate provision incorporated in the design and layout.			



Site name		Ebbsfleet Central
	Bedrock Geology	The site's bedrock consists of White Chalk.
	Superficial Geology	The site is overlain with alluvium deposits (clay, silt and sand) to the north of the site.
Requirement for drainage control and impact	Soils	Loamy and clayey soils of coastal flats with naturally high groundwater
mitigation	Groundwater Source Protection Zone	The site is partially located within Groundwater Source Protection Zones 1, 2 and 3.
	Historic Landfill Site	There are historic landfill located within the site boundary.

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Site name	Ebbsfleet Central
	Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.
	Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development.
	British Geological Society (BGS) data indicates that the underlying geology is the White Chalk subgroup and is likely to be freely draining. This should be confirmed through infiltration test, with the use of infiltration maximised as much as possible.
	The site is located within Groundwater Source Protection Zones 1, 2 and 3 (SPZ). Kent County Council and the Environment Agency have confirmed that in GSPZ 2 and 3, infiltration is potentially possible for surface run-off from roads, car parking and public or amenity provided the SUDS management train is used to treat the drainage. In GSPZ 1 only infiltration from clean roof drainage will potentially be permitted, with appropriate measures in place.
Broad scale assessment of possible SuDS	Due to the soil type present at the site, groundwater levels may be less than 1m below ground level. Groundwater ingress could potentially impact the hydraulic capacity and structural integrity of detention and attenuation features, if measures to prevent this are not implemented in the design of the surface water drainage system.
	Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level.
	Filtration features may not be suitable given the depth to the water table may be <1m due to the soils at the site. If the site has contamination or groundwater issues; a liner will be required. This should be confirmed as part of ground investigation works.
	All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. Overland flows paths are present at the development site, where possible opportunities to incorporate these flow paths into the site layout should be considered. If the site has contamination or groundwater issues; a liner will be required.
	If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and discharge rate agreed with the asset owner. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA.
	Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible opportunities and constraints.

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Site name	Ebbsfleet Central

- Reducing volume and rate of runoff
- Relocating development to zones with lower flood risk
- Creating space for flooding.
- Safe access and egress should be demonstrated in the surface water 1% AEP plus climate change event.
- All development should adopt source control SuDS techniques to reduce the risk of frequent low impact flooding due to post development runoff.
- A greenfield site such as this should be able to implement an exemplar surface water drainage scheme to deliver multiple benefits including water quality, biodiversity, amenity, green infrastructure etc.
- Example features include swales, attenuation features, green roofs, rainwater capture and reuse and permeable paving.
- Assessment of runoff should include allowances for climate change effects.
- Efforts should be made to limit runoff to greenfield rates and discharge rates from the site should not increase downstream flood risk.
- According to the Environment Agency, development should seek to leave an undeveloped margin of 8m next to fluvial watercourses and 16m next to tidal watercourses. Any development within 8m either side of a Main River or within 16m from the foot of any sea defence may require the separate consent of the Environment Agency under local land drainage byelaws.



Site name		Swanscombe Peninsula			
		T			
	OS Grid reference	560370 E, 175566 N			
	Area (ha)	171.06			
	Current land use	Industrial and marshland			
	Proposed site use	Mixed use / residential / open space			
	Flood risk vulnerability	More vulnerable and less vulnerable.			
Site details	Topography	Elevation Contains Ordnance Survey data © Crown copyright and database right 2020. Contains public sector information licensed under the Open Government Licence v3.0. 310 620 The ground slope across the site varies significantly. The site has varying ground levels with two areas of high ground located in the centre of the site, south west and north east corner. There are a number of drainage ditches and waterbodies located on the site. There are a few small existing buildings on the site but overall, the site is largely green field. The presence of the buildings has also affected localised filtering of the LIDAR data.			
Sources of flood risk	Existing watercourses	There are a number of unnamed watercourses and ditches located in the centre of the site which drain into the Thames which flows along the west and north site boundary. A small watercourse known as Swanscombe Marsh that is designated as Main River is also located within the site boundary.			





Site name		Swanscombe Peninsula			
	Flood history	The site is reported to have flooded twice with the northern half of the site being most affected. One incident was reported to have occurred in 1953 as a result of tidal overtopping of the defences. The second incident occurred in 1968 as a result of channel capacity exceedance and no raised defences. Kent County Council may hold additional records which are not available at this time. These records detail historical flood incidents from all sources, whereas the Environment Agency dataset only records incidents of fluvial, tidal or coastal flooding. Please contact the Lead Local Flood Authority for further details.			
		Proportion o	f the site at risk in the defen	ded scenario	
		between larger or small	re for the area of land occupie er return period events, and tl ed to the nearest 1%. Areas	herefore not cumulative.	
		5% AEP	0.5% AEP	0.1% AEP	
		1%	2%	4%	
	Fluvial / Tidal	Flood Modeller-TUFLOW flood model are different to management features that site are not covered by de Flood characteristics: The west corner of the site AEP defended tidal flood et tidal event, risk remains con River Thames. A further AEP tidal event with a small the unnamed watercourse Therefore, fluvial risk at the flood risk assessment.	the Environment Agency North model. The extent of the Floor the extent of the actual flood to the extent of the actual flood to change the risk. The unnamentalled modelling. This is further increase ontained along the west site bound increase of 2% is predicted all area of the north site bounders located within the site are resiste would need to be confirmed.	od Zones predicted by the risk, as there are flood risk ed watercourses within the y within Flood Zone 3b (5% ed to 2% for the 0.5% AEP oundary in proximity of the cted to occur for the 0.1% dary at risk for this event. not covered by model data, ned as part of a site specific	
		Proportion of site at risk (RoFSW) (proportion reported are for the area of land occupied by each flood ext			
		between larger or small	re for the area of land occupie er return period events, and the ed to the nearest 1%. Areas <	herefore not cumulative.	
		3.3% AEP	1% AEP	0.1% AEP	
		1%	2%	7%	
Surface Water Surface Water Surface south extend of the eleval there such a lt sho exace		southern half of the site for extent for the 1% AEP eve of the site. Risk remains elevations are lower. Risk there is a further expansion such as Manor Way and L. It should be noted that this	on occurs in small areas of or the 3.3% AEP event. There int with a large area of accumulation contained to the southern has further increased by 5% for on of extents in the south of the	e is a 1% increase in flood dation located in the centre of the site where ground the 0.1% AEP event where he site along existing roads	



Site name		Swanscombe Peninsula			
	RoFSW takes account of building footprints so the existing buildings on the site. It also only considers rating is greater than 0.575.				
	Groundwater	The Areas Susceptible to Groundwater Flooding (AStGWF) dataset shows the site is located within a 1km grid square where less than 25% of the 1km grid square are considered to be susceptible to groundwater flooding. The AStGWF data should be used only in combination with other information, for example local data or historical data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. However, the data can help to identify areas for assessment at a local scale where finer resolution datasets exist. It should be noted that soils present at the site are loamy and clayey soils with naturally high groundwater, therefore high groundwater levels are expected to be			
	Reservoir	present at the site. The Environment Age the site to be at risk or	ency Risk of Flooding from Reserv f reservoir flooding.	oirs dataset does not show	
		Defence Type	Standard of Protection	Condition	
	Defences	Concrete Wall	0.1% AEP	3	
		Earth Embankment	0.1% AEP	3	
		Culvert / structure blockage?	There are two culverts located within the site which could present a residual risk in the event of a blockage.		
		Impounded water body failure?	The site is not at risk of flooding due to reservoir breach.		
Flood risk management infrastructure	Residual risk Thames tidal defence breach?		The Thames tidal defences pose a residual risk to the site in the event of a breach. Modelling was undertaken in 2018 to assess the risk of breach from these defences. Results of modelling show that the site is intersected by the 0.5% AEP breach extent. This impacts 42% of the site with land situated at low elevations in the south of the site being most at risk. There is an increase in extent of 8% for the 0.1% AEP breach event with areas of increase located to the south east of the site risk. In the future, the site is predicted increase in risk of 16% for the 0.5% AEP (2115 Upper End) breach event. For the 0.1% AEP (2115 Upper End) breach event, an increase of 11% is precited to occur. Areas located to south east of the site and to the north are predicted to be at an increased risk due to climate change in the future.		
Emergency	Flood warning	The site is situated within the Coast from Dartford to Allhallo (064WAT1ThamesEst) Flood Alert area and the Gravesend and Northfl (064FWT1Gravesend) Flood Warning areas.			
planning	Access and egress	Safe access and egress may be available during all surface water and fluvial floor events from the south east via Galley Hill Road (A226).			



		Proportion o	f site at 0.5% AEP flu	ıvial flood risk in	the defended scenario	
	Climate Change allowances to the year 2120	Area of England	Present day	Higher Centr	al Upper End	
		South East	2%	4%	4%	
Climate	Implications for the site	There is an increase in extent for all climate change allowances in comparison to the 0.5% AEP flood extent. For the year 2120 (Upper End), the flood extent reache and slightly exceeds that of the current Flood Zone 2. Therefore, climate change is predicted to impact the proposed site in the future.				
Change	Impact of climate	Pro	oportion of site at 1%	AEP surface wa	ter flood risk	
	change on risk from surface	Present day	+20% rain	nfall uplift	+40% rainfall uplift	
	water	2%	3	%	4%	
	Implications for the site	A small increase in flood extent during the 1% AEP surface water event is predicted for the plus 20% and 40% climate change events. However, the extent do not reach that of the 0.1% AEP surface water flood event. Therefore, the site will be at a slightly higher risk from surface water flooding in the future. However, it should be noted that this dataset does not take account of the impact of tide locking from increased sea levels on drainage from the site which could exacerbate the surface water risk at the site in the future.				
	Bedrock Geology	The entire site's bedrock geology consists of White Chalk.			ılk.	
D. mains and	Superficial Geology	The site is overlain with alluvium deposits (clay, silt and sand)				
Requirement for drainage control and impact mitigation	Soils	Loamy and clayey soils of coastal flats with naturally high groundwater				
	Groundwater Source Protection Zone	The site is parti	The site is partially located within Groundwater Source Protection Zone 2 and 3.			
	Historic Landfill Site	There are histor	There are historic landfills located within the site boundary.			





Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. British Geological Society (BGS) data indicates that the underlying geology is the White Chalk subgroup and is likely to be freely draining. This should be confirmed through infiltration test, with the use of infiltration maximised as much as possible. The eastern part of the site is located within Groundwater Source Protection Zones 2 and 3 (SPZ). Kent County Council and the Environment Agency have confirmed that in GSPZ 2 and 3, infiltration is potentially possible for surface runoff from roads, car parking and public or amenity provided the SUDS management train is used to treat the drainage Due to the soil type present at the site, groundwater levels may be less than 1m below ground level. Groundwater ingress could potentially impact the hydraulic **Broad scale** capacity and structural integrity of detention and attenuation features, if measures assessment of to prevent this are not implemented in the design of the surface water drainage possible SuDS Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Filtration features may not be suitable given the depth to the water table may be <1m due to the soils at the site. If the site has contamination or groundwater issues; a liner will be required. This should be confirmed as part of ground investigation works. All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. Overland flows paths are present at the development site, where possible opportunities to incorporate these flow paths into the site layout should be considered. If the site has contamination or groundwater issues; a liner will be required. If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and discharge rate agreed with the asset owner. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible opportunities and constraints. The site is almost entirely within a catchment that has a medium sensitivity to Cumulative development, though the far eastern corner is in a catchment with a high impacts of sensitivity. It is unlikely that the site is in a location where cumulative effects will development Proportion of the site within each Flood Zone Flood Zone 3b Flood Zone 1 Flood Zone 2 Flood Zone 3a Recommend-12% 30% 57% 1% ations for Sequential Test and Exception Test requirements

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Local Plan policy

The Sequential Test must be satisfied based on fluvial and other sources of flood risk before the Exception test is applied.

The Exception test will be required in the following scenario:

- If Highly vulnerable development is proposed to be located in Flood Zone 2.
- If Most vulnerable or Essential Infrastructure development is proposed to be located in Flood Zone 3.
- If Essential infrastructure is proposed to be located in Flood Zone 3b.

Development will not be permitted for the following scenario:

- Highly vulnerable development within Flood Zone 3a.
- Highly vulnerable, More vulnerable and / or Less vulnerable development within Flood Zone 3b.

Recommendations for requirements of site-specific Flood Risk Assessment, including guidance for developers

Flood risk assessment

- At the planning application stage, a site-specific flood risk assessment will be required for this
 site as it is greater than 1 hectare in size, is located within Flood Zone 2 and 3 and may be
 subject to other sources of flooding where the development would introduce a more vulnerable
 use and contains land identified in the strategic flood risk assessment as being at increased
 flood risk in the future. It is also required where development:
 - Is on land which has been identified by the Environment Agency as having critical drainage problems; or
 - Other sources of flooding must be considered as part of any site-specific flood risk assessment, including surface water and groundwater.
 - Consideration should be given to the potential effects of climate change, particularly
 with respect to surface water. Proposals should consider the opportunity to include
 measures that provide for a reduction in predicted surface water flood risk at existing
 development.
 - Climate change modelling should be undertaken using the relevant allowances for the type of development and level of risk.
 - Where there is a reasonable likelihood of multiple sources of flood risk having significant impact, it is recommended that consideration is given to assessing the combined risks of these.
 - Consultation with the Local Authority, Lead Local Flood Authority and Environment Agency should be undertaken at an early stage.
 - o Proposals will need to demonstrate that the site can adopt a sequential approach with more vulnerable uses located within lower risk parts of the site where possible.
 - o Consideration must be given to the flood risk management measures and commitments required to make development safe over the intended lifetime.

It should be noted that at the time of preparing this Level 2 SFRA, an FRA was being prepared for the site in association with the proposals for a London Resort.

Guidance for site design and making development safe:

- New development must seek opportunities to reduce the overall level of flood risk at the site.
 For example, by:
 - Reducing volume and rate of runoff
 - o Relocating development to zones with lower flood risk
 - Creating space for flooding.
- Safe access and egress should be demonstrated in the surface water 1% AEP plus climate change event.
- All development should adopt source control SuDS techniques to reduce the risk of frequent low impact flooding due to post development runoff.
- A greenfield site such as this should be able to implement an exemplar surface water drainage scheme to deliver multiple benefits including water quality, biodiversity, amenity, green infrastructure etc.
- Example features include swales, attenuation features, green roofs, rainwater capture and reuse and permeable paving.



- Assessment of runoff should include allowances for climate change effects.
- Efforts should be made to limit runoff to greenfield rates and discharge rates from the site should not increase downstream flood risk.
- The site has potential to reduce flood risk to the site and/or wider community by incorporating improved flood defences into the landscaping of the site.
- According to the Environment Agency, development should seek to leave an undeveloped margin of 8m next to fluvial watercourses and 16m next to tidal watercourses. Any development within 8m either side of a Main River or within 16m from the foot of any sea defence may require the separate consent of the Environment Agency under local land drainage byelaws.



Site name		Former Littlebrook Power Station	
	OS Grid reference	555985 E, 176430 N	
	Area (ha)	45.58	
	Current land use	Industrial	
	Proposed site use	Employment – Approximately two-thirds of the site has already been granted planning permission for class B8 (storage and distribution) uses and ancillary class B1 uses as part of phased development at the site.	
	Flood risk vulnerability	Less Vulnerable	
Site details	Topography	Elevation Contains Ordnance Survey data © Crown copyright and database right 2020. Contains public sector information licensed under the Open Government Licence vs.0. The site sits upon land where ground levels are raised above the surround low lying marshes. Within the site boundary there is an area of low-lying ground in the southwest corner. The LIDAR appears to represent former buildings at the site, many of which have since been demolished. The ground slope across the site generally has a gradient of less than 5%.	
Sources of flood risk	Existing watercourses	The River Thames (Main River) is located along the northern boundary of the site. Along the western boundary of the site there are several small drains, a section of which is classified as Main River. Additionally, a drain is located 20m east of the eastern boundary, with another drain partially located within the site boundary.	



Site name		Former Littlebrook Power Station		
	The drains flow towards an unnamed drain classified as Main River 135m the site.			Main River 135m east of
F	lood history	The Environment Agency's recorded flood outlines show the whole site was impacted by tidal flooding during the 1953 storm surge. Flooding is also recorded in the west of the site associated with the capacity of a Main River being exceeded in September 1968. Kent County Council may hold additional records which are not available at this time. These records detail historical flood incidents from all sources, whereas the Environment Agency dataset only records incidents of fluvial, tidal or coastal flooding. The Lead Local Flood Authority should be contacted to obtain further details.		
		(proportion reported a between larger or small	f the site at risk in the defender re for the area of land occupied ler return period events, and the ed to the nearest 1%. Areas	ed by each flood extent herefore not cumulative.
		5% AEP	0.5% AEP	0.1% AEP
		0%	2%	2%
F	luvial / Tidal	The site is covered by the Environment Agency North Kent Coast (Tidal) 2019 Flood Modeller-TUFLOW model. The extent of the Flood Zones predicted by the flood model are different to the extent of the actual flood risk, as there are flood risk management features that change the risk. The unnamed ditches located to the west and east of the site are not covered by detailed or broad scale modelling. Flood characteristics: The site is largely located within Flood Zone 3, with the entire site located in Flood Zone 2. However, when flood risk management features are accounted for, the site is at a small risk of tidal flooding during the 0.5% AEP event and the 0.1% AEP event with 2% of the site being interested by both flood extents along the north site boundary. There may be fluvial flood risk from the unnamed ditches along the western and eastern boundaries of the site, though this has not been assessed as part of the		
		Level 2 Assessment as modelling of the watercourses has not been prepared. Fluvial risk for the site will therefore need to be confirmed as part of a site-specific flood risk assessment. Fluvial risk from the River Thames to the north is considered to be negligible to the presence of flood risk management features.		
s	Surface Water	(proportion reported a between larger or smal Percentages round	re for the area of land occupied return period events, and the the nearest 1%. Areas	ed by each flood extent herefore not cumulative. <0.5% not recorded)
		3.3% AEP	1% AEP	0.1% AEP
		0%	1%	7%



Site name	Former Littlebrook Power Station
	Description of surface water flow paths: The RoFSW mapping predicts surface water flooding at the site to be largely limited to the existing roads across the site in the 3.33% AEP event. There is also an area of surface water ponding predicted on the southwest border of the site, which is predicted to increase in size during the large events. In the 1% AEP events surface water flood risk is predicted to increase slightly by 1% and increase by 7% for the 0.1% AEP event, risk is largely contained to isolated areas of ponding within topographic depressions.
	It should be noted that this dataset does not account for tide locking which could exacerbate the surface water risk at the site given the proximity of the tidally influenced River Thames to the north.
	RoFSW takes account of building footprints so the flood risk may be affected by existing buildings on the site. It also only considers flood risk where the hazard rating is greater than 0.575.
	The Areas Susceptible to Groundwater Flooding (AStGWF) dataset shows the site is located within 1km grid squares where no risk is indicated, though the southeast corner of the site is located within a 1km grid square where <25% of the area is predicted to be at risk of groundwater flooding.
Groundwater	The AStGWF data should be used only in combination with other information, for example local data or historical data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. However, the data can help to identify areas for assessment at a local scale where finer resolution datasets exist. Ground investigations at the site should be used to confirm groundwater levels to support the design of SUDS features.
Reservoir	The Environment Agency Risk of Flooding from Reservoirs dataset does not show the site to be at risk of reservoir flooding.



Site name Former Littlebrook Power Station
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		Defenc	е Туре	Standard of Protection	Condition
	Defences	Concre	ete wall	1000	2
		Earth eml	pankment	1000	3
		Culvert / struct	lure	There drainage ditches on the western boundary of the site are culverted through the Thames Frontage defences.	
		Impounded wa failure?	Impounded water body failure? The site is not at risk of flooding due to reserve breach.		of flooding due to reservoir
Flood risk management infrastructure	Residual risk	Thames tidal d breach?	t v k k k k k k k k k k k k k k k k k k	to the site in the every was undertaken in 2 breach from these defended in the second of the site impairs an increase or each with the central to be at risk. In the future, the site in the future, the site in the future, the site in the future of 24% for the 0.5% or each event. For the site in the site in the site in the site in the site are predicted to occur. Are the site are predicted to occur.	ences pose a residual risk nt of a breach. Modelling 018 to assess the risk of fences. g show that the site is % AEP breach extent, with cted in the west and east. of 15% for the 0.1% AEP e of the site also predicted as predicted increase in risk of AEP (2115 Upper End) e 0.1% AEP (2115 Upper an increase of 10% is eas located in the centre of to be at a greater risk of e as a result of climate
	Flood warning	of the site is also within the (064WAF7Darent) Flood Alert (064FWF7Dartford) Flood Warning Area associated with the River Dar Access and Safe access and egress may be available during all surface water an		area and the Dartford g areas. The area al e (064WAF7Darent)	d, Crayford and Greenhithe ong the western boundary Flood Alert Area and
Emergency planning	Access and egress			rface water and tidal flood	
		Proportion	of site at 0.5% AE	P tidal flood risk in t	the defended scenario
Climate Change	Climate Change allowances for	River Basin District	Present day	Higher Centr	al Upper End
Thungo	'2120s'	Thames	2%	2%	2%



Site name		Former Littlebrook Power Station		
	<u>'</u>			
	Implications for	Due to the presence of flood risk management features, the site is not predicted to be at risk in the future from tidal flooding, with the slight increases in flood extent predicted to occur on the Thames side of the defences within the site boundary.		
	the site	The impact of climate change on fluvial flood risk from the unnamed ditches along the western and eastern boundaries of the site has not been assessed as part of the Level 2 Assessment as modelling of the watercourses has not been prepared.		
	Impact of climate	Proportion of site at 1% AEP surface water flood risk		
	change on risk from surface	Present day	+20% rainfall uplift	+40% rainfall uplift
	water	1%	2%	3%
	Implications for	Climate change is predicted to have a negligible impact on surface water flood risk, with only very slight increases in flood extents predicted from the 1% AEP event when rainfall is uplifted by 20% and 40%.		
	the site		pe noted that this dataset does not to increased sea levels on drainage fro ace water risk at the site in the future	om the site which could



Site name		Former Littlebrook Power Station	
	Bedrock Geology	The entire site's bedrock geology consists of White Chalk.	
	Superficial Geology	The southwest of the site is overlain with alluvium deposits (clay, silt and sand), with no deposits recorded in the rest of the site.	
Requirement for drainage control and impact mitigation	Soils	Loamy and clayey soils of coastal flats with naturally high groundwater are recorded across the entire site.	
	Groundwater Source Protection Zone	The site not located within a Groundwater Source Protection Zone.	
	Historic Landfill Site	A historic landfill site associated with the Former Littlebrook Power Station covers the entire site.	

Level 2 SFRA Detailed Site Summary Tables – FINAL DOCUMENT



Site name	Former Littlebrook Power Station		
	Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.		
	Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development.		
	British Geological Society (BGS) data indicates that the underlying geology is the White Chalk subgroup, though the soils at the site are loamy and clayey with high groundwater levels. Groundwater levels and the permeability of soils at the site should be assessed via an infiltration test, with the use of infiltration maximised as much as possible. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff from the site.		
	Groundwater ingress could potentially impact the hydraulic capacity and structural integrity of detention and attenuation features, if measures to prevent this are not implemented in the design of the surface water drainage system.		
	As the site is recorded as a historic landfill site, opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas should be considered. The use of multistage SuDS of runoff will improve water quality and reduce the potential impact on receiving water bodies.		
Broad scale assessment of possible SuDS	Given the high-density nature of the site, use of urban SuDS is recommended. Urban sites should not preclude the use of SuDS. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques. Mapping suggests that the site slopes make it possible to consider most forms of dentition.		
	Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting should be considered in the design of the site.		
	The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.		
	If it is proposed to discharge runoff to the River Thames, local drainage network or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and discharge rate agreed with the asset owner. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA.		
	Surface water outfalls that discharge into the Thames may be affected by tide locking due to water levels in the Thames. The impacts of tide locking/flood flows will need to be considered in terms of the attenuation storage requirements of the site.		
	Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible opportunities and constraints.		

Level 2 SFRA Detailed Site Summary Tables – FINAL DOCUMENT



Site name		Former Littlebrook Power Station				
	Cumulative impacts of development. The east of the site is within a catchment with a high sensitivity to cumulative impacts of development. The east of the site is within a catchment with a medium sensitivity and the south within a catchment with a low sensitivity. The location of the development makes it appropriate for consideration to be given to the additional potential requirements resulting from increased run-off volumes generated by other new development tin the catchment.					
			within each Flood Zone			
	Flood Zone 1	Flood Zone 2	Flood Zone 3a	Flood Zone 3b		
	0%	19%	81%	0%		
	Sequential Test an	d Exception Test requiremen	ts			
	The Sequential Test Exception test is ap	st must be satisfied based on plied.	fluvial and other sources	of flood risk before the		
	The Exception test will be required in the following scenario: Highly vulnerable and in flood zone 2 Essential infrastructure in flood zone 3a or 3b More vulnerable in flood zone 3a					
	Development will not be permitted for the following scenario: • Highly vulnerable development within FZ3a. • Highly vulnerable, More vulnerable and / or Less vulnerable development within FZ3b. Recommendations for requirements of site-specific Flood Risk Assessment, including guida for developers					
Recommend- ations for Local Plan policy	site as it is where the the strateg required work of the strateg of the strategy of the strateg	ining application stage, a site-size located within Flood Zone 2 are development would introduce a gic flood risk assessment as before development: Is on land which has been iderigating problems; or	and 3 and may be subject to more vulnerable use and eing at increased flood risk attified by the Environment be considered as part of a ater and groundwater. To the risk of fluvial flood est and east of the site. To the potential effects of clip proposals should consider a ction in predicted surface will be undertaken using the rerisk. It is is is is is increased that consideration is incrity, Lead Local Flood Alian early stage.	other sources of flooding contains land identified in the future. It is also agency as having critical any site-specific flood risk ding associated with the mate change, particularly the opportunity to include water flood risk at existing elevant allowances for the ces of flood risk having s given to assessing the uthority and Environment agement measures and		
		ommitments required to make d sclude consideration of pote				

Guidance for site design and making development safe:

development within the upstream catchment.

New development must seek opportunities to reduce the overall level of flood risk at the site.
 For example, by:

Level 2 SFRA Detailed Site Summary Tables – FINAL DOCUMENT



Site name Former Littlebrook Power Station	te name
--	---------

- Reducing volume and rate of runoff
- Relocating development to zones with lower flood risk
- Creating space for flooding.
- Safe access and egress should be demonstrated in the fluvial and tidal plus climate change events. Consideration should also be given to providing safe access and egress during surface water events.
- According to the Environment Agency, development should seek to leave an undeveloped margin of 16m next to tidal watercourses. Any development within 8m either side of a Main River or within 16m from the foot of any sea defence may require the separate consent of the Environment Agency under local land drainage byelaws.
- All development should adopt source control SuDS techniques to reduce the risk of frequent low impact flooding due to post development runoff.
- Ground investigations at the site should be undertaken to confirm groundwater levels and the
 permeability of soils to support the design of SUDS features.
- SuDS should be designed to deliver multiple benefits including water quality, biodiversity, amenity, green infrastructure etc.
- Example features include swales, attenuation features, green roofs, rainwater capture and reuse and permeable paving.
- Assessment of runoff should include allowances for climate change effects.
- Efforts should be made to limit runoff to greenfield rates and discharge rates from the site should not increase downstream flood risk.
- SuDS design must follow Kent County Council policy, meet the Defra National Non-Statutory Technical Standards, and follow current best practice (CIRIA C752 Manual 2015).
- The site has potential to reduce flood risk to the site and/or wider community by incorporating improved flood defences into the landscaping of the site.
- According to the Environment Agency, development should seek to leave an undeveloped margin of 8m next to fluvial watercourses and 16m next to tidal watercourses. Any development within 8m either side of a Main River or within 16m from the foot of any sea defence may require the separate consent of the Environment Agency under local land drainage byelaws.



Site name		South of Steele Avenue				
	OS Grid reference	558372 E, 174738 N				
	Area (ha)	0.56 ha				
	Current land use	Car park and open land				
	Proposed site use	Residential and/or health				
	Flood risk vulnerability	More vulnerable				
Site details	Topography	Elevation Indi Contains Ordnance Surveydata © Crown copyright and database right 2020. Contains public sector information licensed under the Open Government Licence v3.0. 1				
Sources of flood risk	Existing watercourses	The River Thames (Main River) is located 400m to the north of the site. 780m North West of the site, there is an unnamed watercourse classified as Main River which feeds into the River Thames.				





Site name		South of Steele Avenue					
	Flood history	There are no historical incidents reported to have occurred at the site within the Environment Agency Recorded Flood Outlines dataset. Kent County Council may hold additional records which are not available at this					
	T look motory	Environment Agency data	ail historical flood incidents from set only records incidents of fluice he Lead Local Flood Authority	luvial, tidal or coastal			
		Proportion of the site at risk in the defended scenario					
		between larger or small	are for the area of land occupie ller return period events, and t led to the nearest 1%. Areas	herefore not cumulative.			
		5% AEP	0.5% AEP	0.1% AEP			
		0%	0%	0%			
		Available modelled data	ı:				
	Fluvial / Tidal	The site is covered by the Environment Agency North Kent Coast (Tidal) 2019 Flood Modeller-TUFLOW model. The extent of the Flood Zones predicted by the flood model are different to the extent of the actual flood risk, as there are flood risk management features that change the risk. The unnamed watercourses located to the north west and north east of the site are not covered by detailed modelling.					
		Flood characteristics: The site is partially located within Flood Zone 3a in the north east corner of the site and Flood Zone 2 for the north and west of the site. However, when flood risk management features are accounted for, the site is at a negligible risk of fluvial/tidal flooding during the 0.5% AEP event. This is due to the presence of tidal defences located along the River Thames.					
		Due to the presence of the defences along the Thames, fluvial risk to the site is also considered to be negligible.					
			oportion of site at risk (RoFS				
			are for the area of land occupion ller return period events, and t				
		Percentages rounded to the nearest 1%. Areas <0.5% not recorded)					
		3.3% AEP	1% AEP	0.1% AEP			
		1%	10%	28%			
	Surface Water	Description of surface water flow paths: Surface water accumulation occurs in a small area along King Edward Road during the 3.3% AEP event and intersects the west site boundary. There is a 9% increase in flood extent for the 1% AEP with accumulation also occurring in the centre of the site. This is further increased by 18% for the 0.1% AEP event where there is a flow path originating from King Edward Road flowing to the north east corner of the site and exiting onto the A206. It should be noted that this dataset does not account for tide locking which could exacerbate the surface water risk at the site given the proximity of the Thames to					
		the north. RoFSW takes account of building footprints so the flood risk may be affected by existing buildings on the site. It also only considers flood risk where the hazard rating is greater than 0.575.					
	Groundwater	site is not located within a	Groundwater Flooding (AStG) 1 1km grid square. This means to be negligible for the site.				



Site name South of Steele Avenue							
	TI ADIONE I I I I I I I I I I I I I I I I I I I						
		The AStGWF data should be used only in combination with other information, for example local data or historical data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. However, the data can help to identify areas for assessment at a local scale where finer resolution datasets exist.					
	Reservoir	The Environment Agency Risk of Flooding from Reservoirs dataset does not show the site to be at risk of reservoir flooding.			ataset does not show		
		Defence Typ	е	Standard o	of Protection		Condition
	Defences	Concrete Wa	ıll	0.1%	6 AEP		3
		Earth Embankm	nent	0.1%	% AEP		3
		Culvert / struct blockage?	ure	There are no known culverts or structures in the vicinity of the site.			
Flood risk management		Impounded wat body failure?	ter	The site is not	at risk of flooding	due t	o reservoir breach.
infrastructure	Residual risk	Thames tidal defence breach	1?	The Thames tidal defences pose a residual risk to the site in the event of a breach. Modelling was undertaken in 2018 to assess the risk of breach from these defences. Results of modelling show that the site is partially intersected (<1%) by the present day 0.1% AEP breach extent in the north east corner of the site. In the future, the site is predicted to cause flooding of 58% in the north of the site for the 0.5% (2115 Upper End) breach extent. There is an increase of 19% for the 0.1% (2115 Upper End) breach extent. The site is therefore predicted to be at an increased risk from breach in the future.			
Emergency	Flood warning	The site is situated within the Coast from Dartford to Allhallows (064WAT1ThamesEst) Flood Alert area and the Dartford, Crayford and Greenhithe (064FWT1Dartford) Flood Warning areas.					
planning	Access and egress	Safe access and egress may be available during all surface water and fluvial flood events from the south via London Road.			water and fluvial flood		
		Proportion of	of site	e at 0.5% AEP ti	dal flood risk in	the d	efended scenario
	Climate Change allowances to the year 2120	Area of England	F	Present day	Higher Centr	al	Upper End
		South East		0%	0%		0%
Climate Change	Implications for the site	Due to the presence of flood risk management features, the site is not predicted to be at risk in the future from tidal or fluvial flooding.				site is not predicted to	
	Impact of climate	Proportion of site at 1% AEP surface water flood risk					
	change on risk from surface	Present day		+20% rair	nfall uplift	+	40% rainfall uplift
water		10% 14%				17%	



Site name	South of Steele Avenue		
Implications for the site	A small increase in flood extent during the 1% AEP surface water event is predicted for the plus 20% and 40% climate change events. However, the extents do not reach that of the 0.1% AEP surface water flood event. These increases are located across the centre of the site and adjacent to King Edward Road. Therefore, the site will be at a slightly higher risk from surface water flooding in the future. However, it should be noted that this dataset does not take account of the impact of tide locking from increased sea levels on drainage from the site which could exacerbate the surface water risk at the site in the future.		



Site name		South of Steele Avenue	
Bedrock Geology Superficial Geology		The entire site's bedrock geology consists of White Chalk.	
		The site is overlain with alluvium deposits (clay, silt and sand)	
impact — G	Soils	The site has freely draining slightly acid but baserich soils.	
	Groundwater Source Protection Zone	The site is located with Groundwater Source Protection Zone 2.	
	Historic Landfill Site	There is a historic landfill site located 160m to the west of the site and 210m to the east of the site.	





Site name		South of Steele Avenue			
	Broad scale assessment of possible SuDS	Implementation of SuDS at the site could provide opportunities to deliver mubenefits including volume control, water quality, amenity and biodiversity. To could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. Development at this site should not increase flood risk either on or off site. design of the surface water management proposals should take into accoun impacts of future climate change over the projected lifetime of the developm British Geological Society (BGS) data indicates that the underlying geology White Chalk subgroup and is likely to be freely draining. This should be confirmed through infiltration test, with the use of infiltration maximised as m as possible. The entire site is located within Groundwater Source Protection Zone 2 (SPZ Kent County Council and the Environment Agency have confirmed that in G.2, infiltration is potentially possible for surface run-off from roads, car parking public or amenity provided the SUDS management train is used to treat the drainage Given the high-density nature of the site, use of urban SuDS is recommende Urban sites should not preclude the use of SuDS. It may be possible to redistile runoff by maximising the permeable surfaces on site using a combination permeable surfacing and soft landscaping techniques. Mapping suggests the site slopes make it possible to consider most forms of dentition. Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting should be considered in the droft the site. Overland flows paths are present at the development site, where possible opportunities to incorporate these flow paths into the site layout should be considered. If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confithrough surveys and d			
	Cumulative impacts of development	The site is located within a catchment with a medium sensitivity to development. The scale of potential development and location in the catchment make it unlikely that there is a requirement to consider cumulative effects at a catchment scale.			
		Proportion of the site within each Flood Zone			
	Flood Zone 1	Flood Zone 2 Flood Zone 3a Flood Zone 3b			
D	14%	67% 19% 0%			
Recommend- ations for		Exception Test requirements			
Local Plan policy	The Sequential Test must be satisfied based on fluvial and other sources of flood risk before the Exception test is applied.				
	-	ill be required in the following scenario: nerable development is proposed to be located in Flood Zone 2.			

Dartford Borough Council

Level 2 SFRA Detailed Site Summary Tables – FINAL DOCUMENT



Site name

South of Steele Avenue

- If Most vulnerable or Essential Infrastructure development is proposed to be located in Flood Zone 3.
- If Essential infrastructure is proposed to be located in Flood Zone 3b.

Development will not be permitted for the following scenario:

- Highly vulnerable development within Flood Zone 3a.
- Highly vulnerable, More vulnerable and / or Less vulnerable development within Flood Zone 3b.

Recommendations for requirements of site-specific Flood Risk Assessment, including guidance for developers

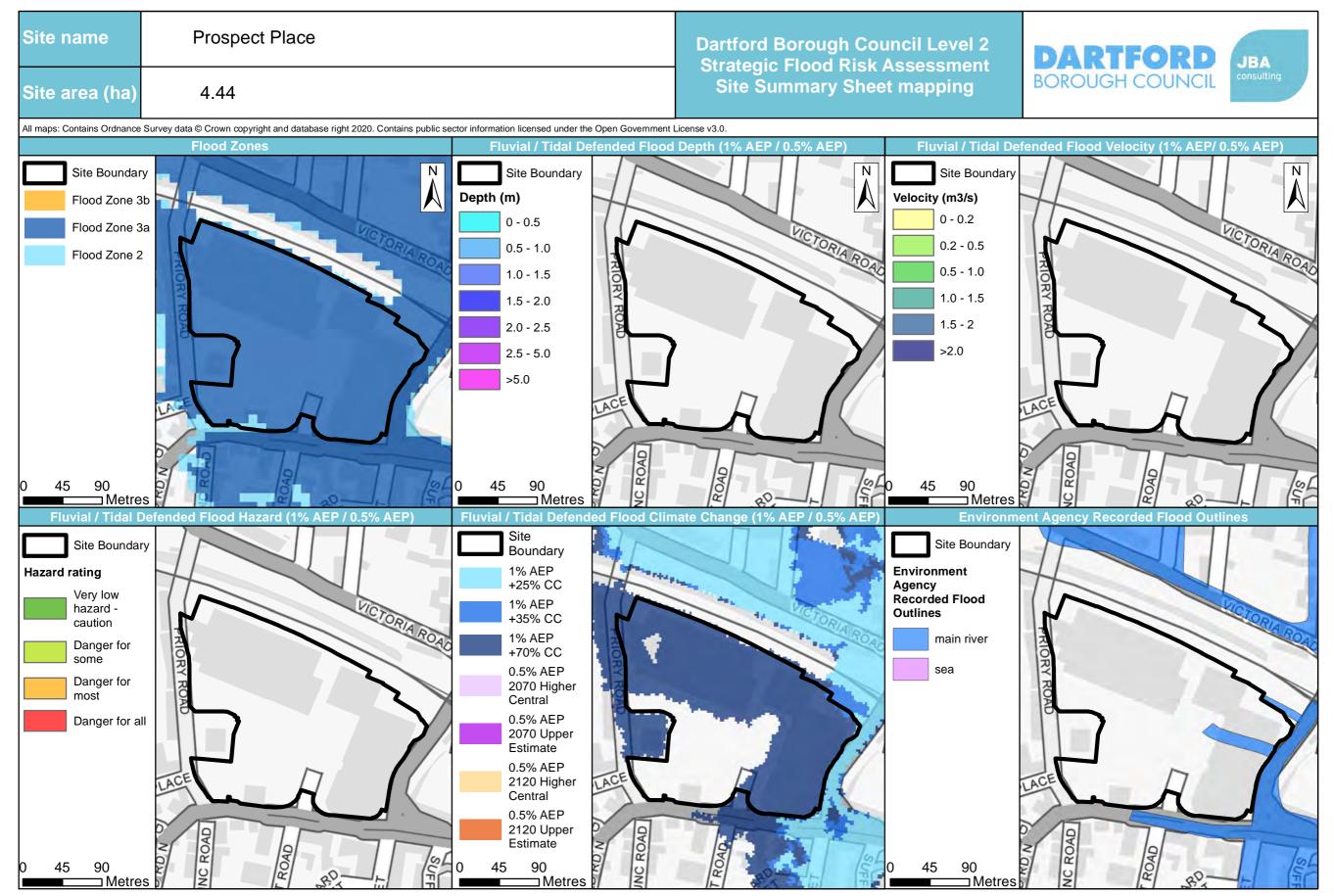
Flood risk assessment

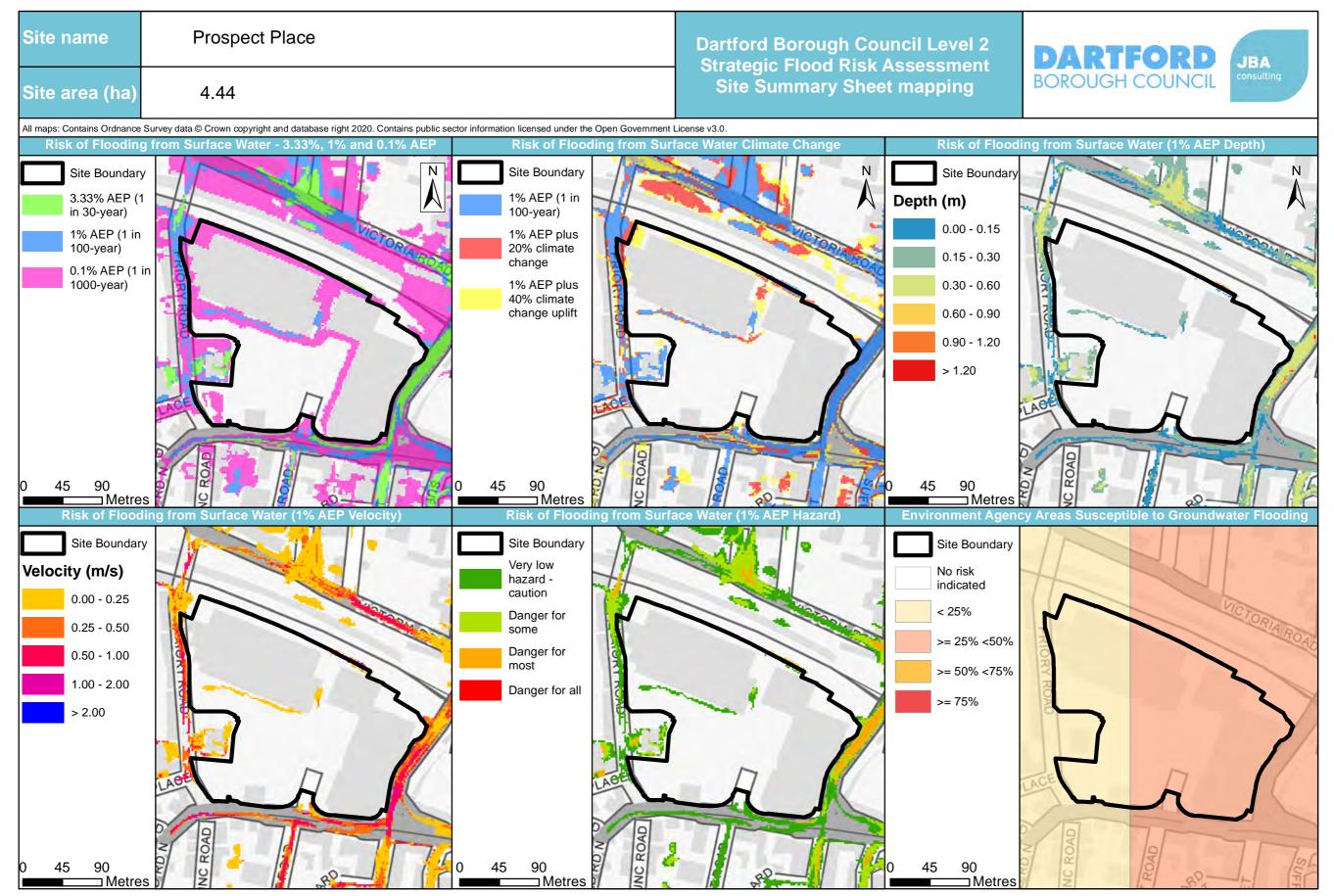
- At the planning application stage, a site-specific flood risk assessment will be required for this
 site as it is located within Flood Zone 2 and 3 and may be subject to other sources of flooding
 where the development would introduce a more vulnerable use and contains land identified in
 the strategic flood risk assessment as being at increased flood risk in the future. It is also
 required where development:
 - Is on land which has been identified by the Environment Agency as having critical drainage problems; or
 - Other sources of flooding must be considered as part of any site-specific flood risk assessment, including surface water and groundwater.
 - Consideration should be given to the potential effects of climate change, particularly with respect to surface water. Proposals should consider the opportunity to include measures that provide for a reduction in predicted surface water flood risk at existing development.
 - Climate change modelling should be undertaken using the relevant allowances for the type of development and level of risk.
 - Where there is a reasonable likelihood of multiple sources of flood risk having significant impact, it is recommended that consideration is given to assessing the combined risks of these.
 - Consultation with the Local Authority, Lead Local Flood Authority and Environment Agency should be undertaken at an early stage.
 - Proposals will need to demonstrate that the site can adopt a sequential approach with more vulnerable uses located within lower risk parts of the site where possible.
 - Consideration must be given to the flood risk management measures and commitments required to make development safe over the intended lifetime.

Guidance for site design and making development safe:

- New development must seek opportunities to reduce the overall level of flood risk at the site.
 For example, by:
 - o Reducing volume and rate of runoff
 - Relocating development to zones with lower flood risk
 - Creating space for flooding.
- Safe access and egress should be demonstrated in the surface water 1% AEP plus climate change event.
- All development should adopt source control SuDS techniques to reduce the risk of frequent low impact flooding due to post development runoff.
- A greenfield site such as this should be able to implement an exemplar surface water drainage scheme to deliver multiple benefits including water quality, biodiversity, amenity, green infrastructure etc.
- Example features include swales, attenuation features, green roofs, rainwater capture and reuse and permeable paving.
- Assessment of runoff should include allowances for climate change effects.
- Efforts should be made to limit runoff to greenfield rates and discharge rates from the site should not increase downstream flood risk.
- SuDS design must follow Kent County Council policy, meet the Defra National Non-Statutory Technical Standards, and follow current best practice (CIRIA C752 Manual 2015).

SFRA: APPENDIX M LEVEL 2 SFRA SITE SUMMARY SHEET **MAPPING**



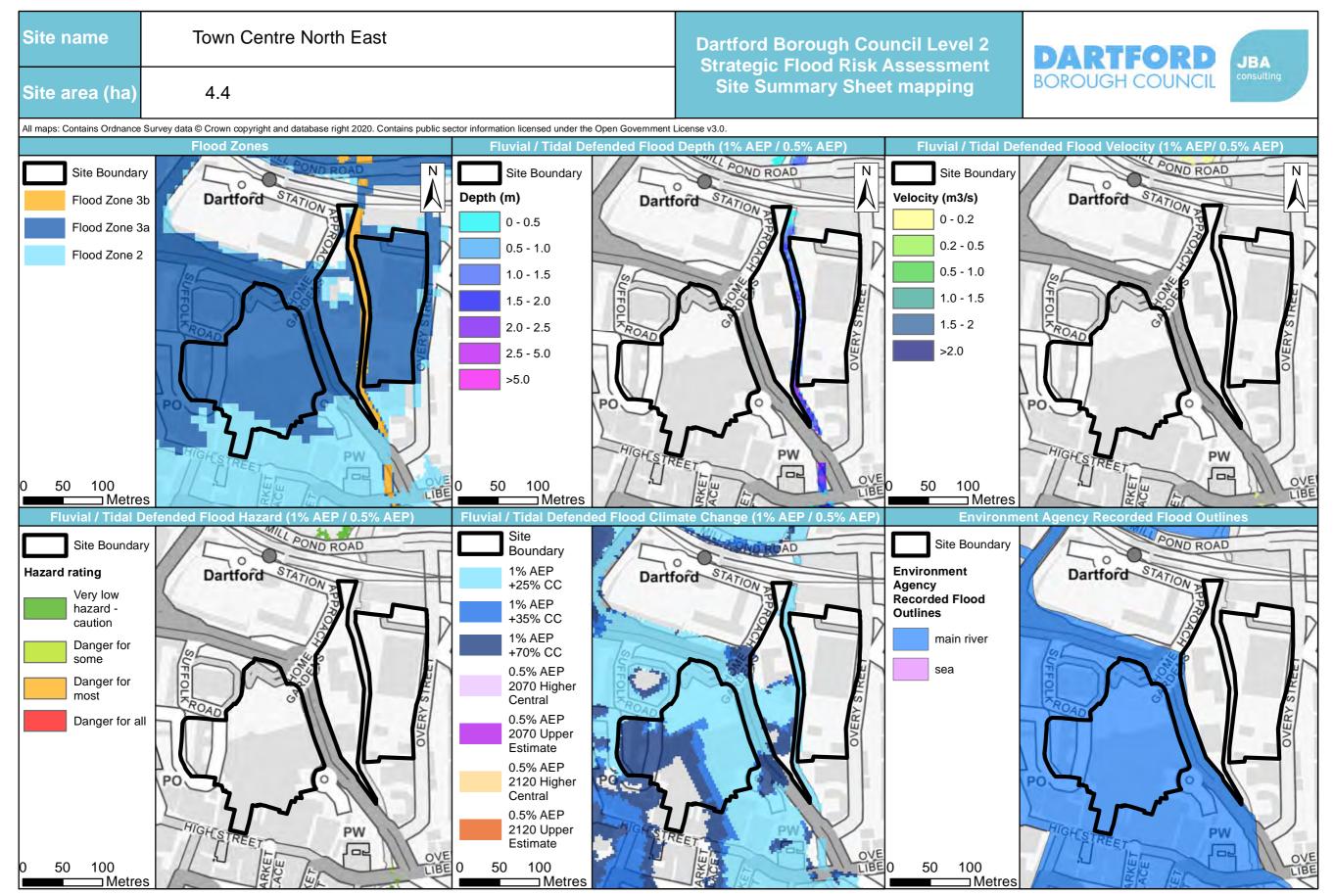


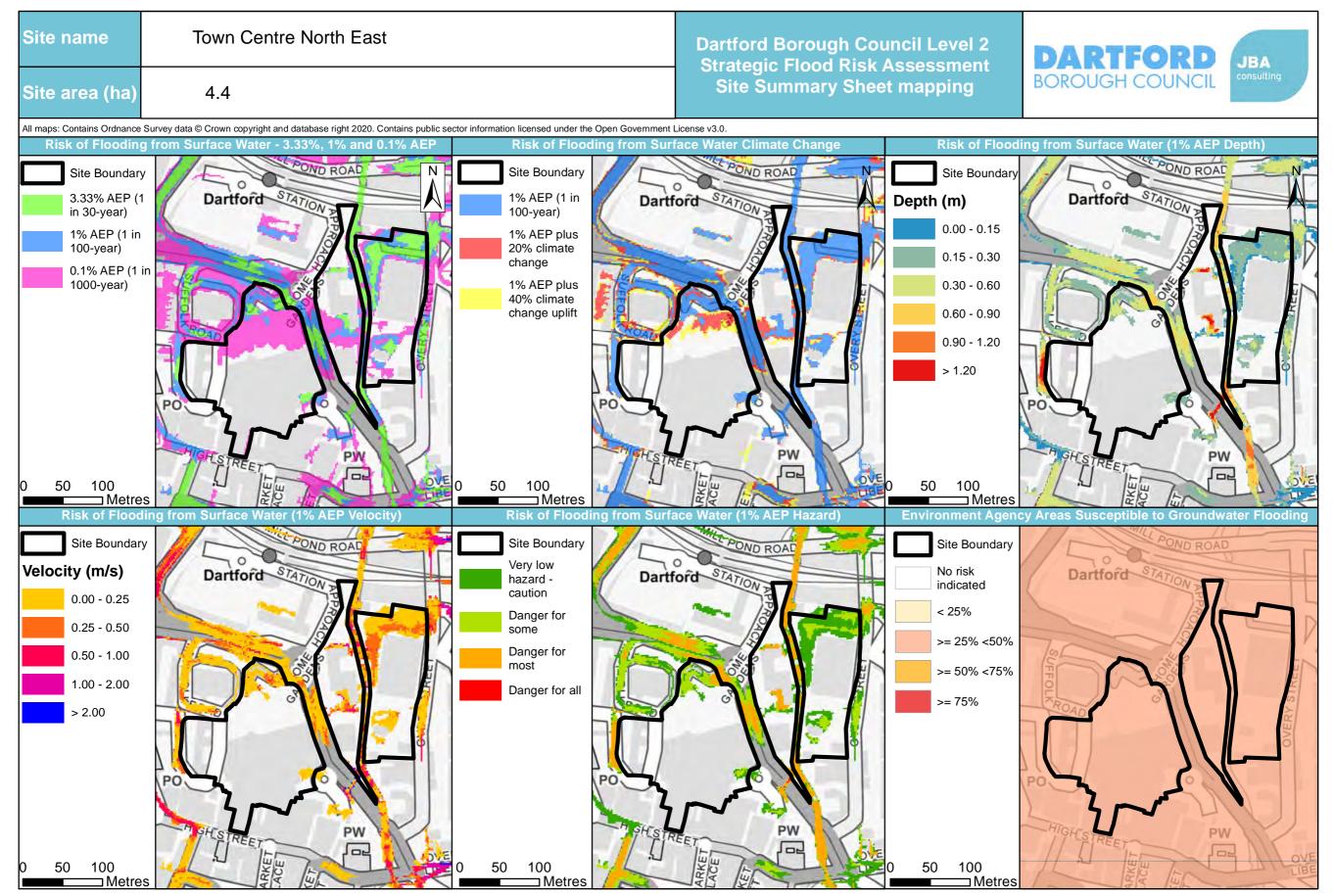
Site name **Prospect Place Dartford Borough Council Level 2** DARTFORD JBA **Strategic Flood Risk Assessment** BOROUGH COUNCIL **Site Summary Sheet mapping** Site area (ha) 4.44 All maps: Contains Ordnance Survey data @ Crown copyright and database right 2020. Contains public sector information licensed under the Open Government License v3.0. Modelled breach extent (2115 EPOCH) Modelled breach extents (0.5% AEP Present Day) Depth Modelled breach extents (Present Day) Site Boundary Site Boundary Site Boundary Modelled Modelled bread Depth (m) breach extents extents (0.5% (0.5% AEP -AEP - 2115) No risk Present Day) Modelled breach 0 - 0.5 extents (0.1% Modelled breach extents AEP - 2115) 0.5 - 1.0 (0.1% AEP -Present Day) 1.0 - 1.5 1.5 - 2.0 2.0 - 2.5 2.5 - 5.0 > 5.0 ROAD 90 45 45 ⊐Metres Modelled breach extents (0.5% AEP Present Day) Velocity Site Boundary Site Boundary Very low **Velocity** hazard -(m/s) caution No risk Danger for some 0 - 0.5 Danger for most 0.5 - 1Danger for all 1 - 1.5 1.5 - 2.0 > 2.0

Priory Shopping Centre Site name **Dartford Borough Council Level 2** JBA **Strategic Flood Risk Assessment BOROUGH COUNCIL Site Summary Sheet mapping** Site area (ha) 3.1 All maps: Contains Ordnance Survey data @ Crown copyright and database right 2020. Contains public sector information licensed under the Open Government License v3.0. ended Flood Depth (1% AEP / 0.5% AEP) Fluvial / Tidal Defended Flood Velocity (1% AEP/ 0.5% AEP Site Boundary Site Boundary Site Boundary PW PW Depth (m) Velocity (m3/s) Flood Zone 3b 0 - 0.2 0 - 0.5 PW PW Flood Zone 3a 0.2 - 0.50.5 - 1.0Flood Zone 2 0.5 - 1.0 1.0 - 1.5 1.0 - 1.5 1.5 - 2.0 1.5 - 2 2.0 - 2.5 >2.0 2.5 - 5.0 >5.0 STONE ROAL VO JONE ROAD 80 80 80 40 Fluvial / Tidal Defended Flood Climate Change (1% AEP / 0.5% AEP) **Environment Agency Recorded Flood Outlines** Site Site Boundary Site Boundary Boundary PW PO 1% AEP **Environment Hazard rating** +25% CC Agency Very low Recorded Flood PW 1% AEP hazard -Outlines +35% CC caution 1% AEP main river Danger for +70% CC some 0.5% AEP sea Danger for 2070 Higher most Central 0.5% AEP SPRING Danger for all SPRING 2070 Upper Estimate 0.5% AEP 2120 Higher Central STONE RO VO TONE ROAD VS JONE ROAD 0.5% AEP 2120 Upper Estimate 80 ⊐Metres ⊐ Metres 🔽

Priory Shopping Centre Site name **Dartford Borough Council Level 2** JBA **Strategic Flood Risk Assessment BOROUGH COUNCIL Site Summary Sheet mapping** Site area (ha) 3.1 All maps: Contains Ordnance Survey data @ Crown copyright and database right 2020. Contains public sector information licensed under the Open Government License v3.0. Risk of Flooding from Surface Water - 3.33%, 1% and 0.1% Risk of Flooding from Surface Water Climate Change Risk of Flooding from Surface Water (1% AEP Depth) Site Boundary Site Boundary Site Boundary 1% AEP (1 in 3.33% AEP (1 Depth (m) in 30-year) 100-year) 0.00 - 0.15 1% AEP (1 in 1% AEP plus 100-year) 20% climate 0.15 - 0.30 change 0.1% AEP (1 in 1000-year) 1% AEP plus 0.30 - 0.60 40% climate change uplift 0.60 - 0.90 0.90 - 1.20 SPRING > 1.20 VO JONE RO NS TONE ROA ONE R 80 ⊐Metres Risk of Flooding from Surface Water (1% AEP Hazard) Risk of Flooding from Surface Water (1% AEP Velocity) **Environment Agency Areas Susceptible to Groundwater Flooding** Site Boundary Site Boundary Site Boundary Very low Velocity (m/s) PO PO No risk hazard indicated caution 0.00 - 0.25 < 25% Danger for 0.25 - 0.50 some >= 25% <50% Danger for 0.50 - 1.00 most >= 50% < 75% 1.00 - 2.00 Danger for all >= 75% SPRING W > 2.00 STONE ROA VS JONE ROA 80 80 ⊐Metres ⊐Metres

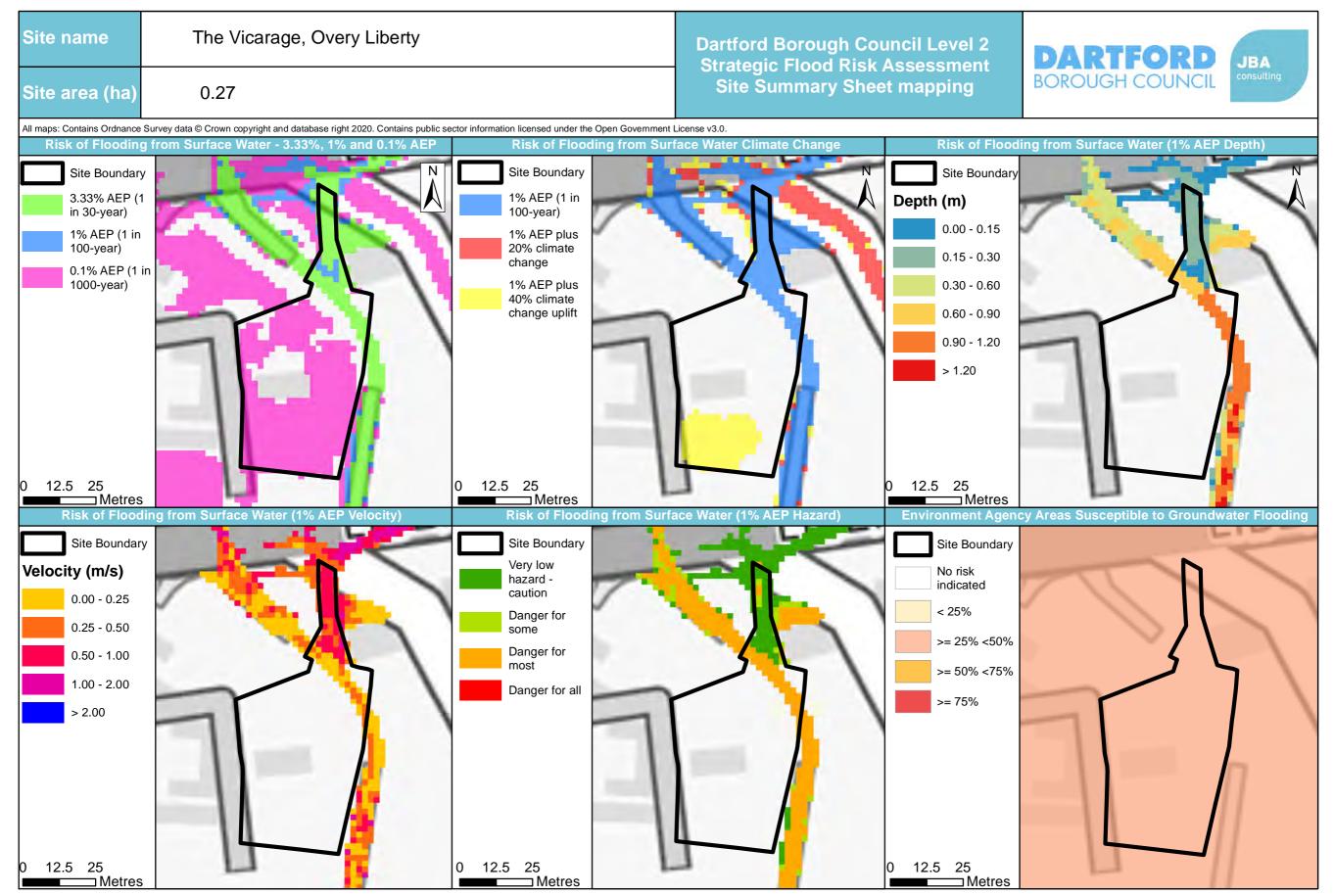
Priory Shopping Centre Site name **Dartford Borough Council Level 2** JBA **Strategic Flood Risk Assessment BOROUGH COUNCIL Site Summary Sheet mapping** Site area (ha) 3.1 All maps: Contains Ordnance Survey data @ Crown copyright and database right 2020. Contains public sector information licensed under the Open Government License v3.0. Modelled breach extent (2115 EPOCH) Modelled breach extents (Present Day) Modelled breach extents (0.5% AEP Present Day) Depth Site Boundary Site Boundary Site Boundary PW Modelled Modelled breach Depth (m) SPITAL STREET breach extents extents (0.5% PW PW PW (0.5% AEP -AEP - 2115) No risk Present Day) Modelled breach 0 - 0.5 extents (0.1% Modelled breach extents AEP - 2115) 0.5 - 1.0 (0.1% AEP -Present Day) 1.0 - 1.5 SPRING V 1.5 - 2.0 2.0 - 2.5 2.5 - 5.0 NO TONE ROAD VS JONE ROAD VS JONE ROAL > 5.0 80 80 80 40 40 80 ☐ Metres Modelled breach extents (0.5% AEP Present Day) Velocity Modelled breach extents (0.5% AEP Present Day) Hazard Site Boundary Site Boundary PW Very low **Velocity** hazard -(m/s) caution PW No risk Danger for some 0 - 0.5 Danger for most 0.5 - 1 Danger for all 1 - 1.5 SPRING VA 1.5 - 2.0 > 2.0 VS JONE ROAD VS JONE ROAD <u> Metres</u> ₹ 80 □Metres



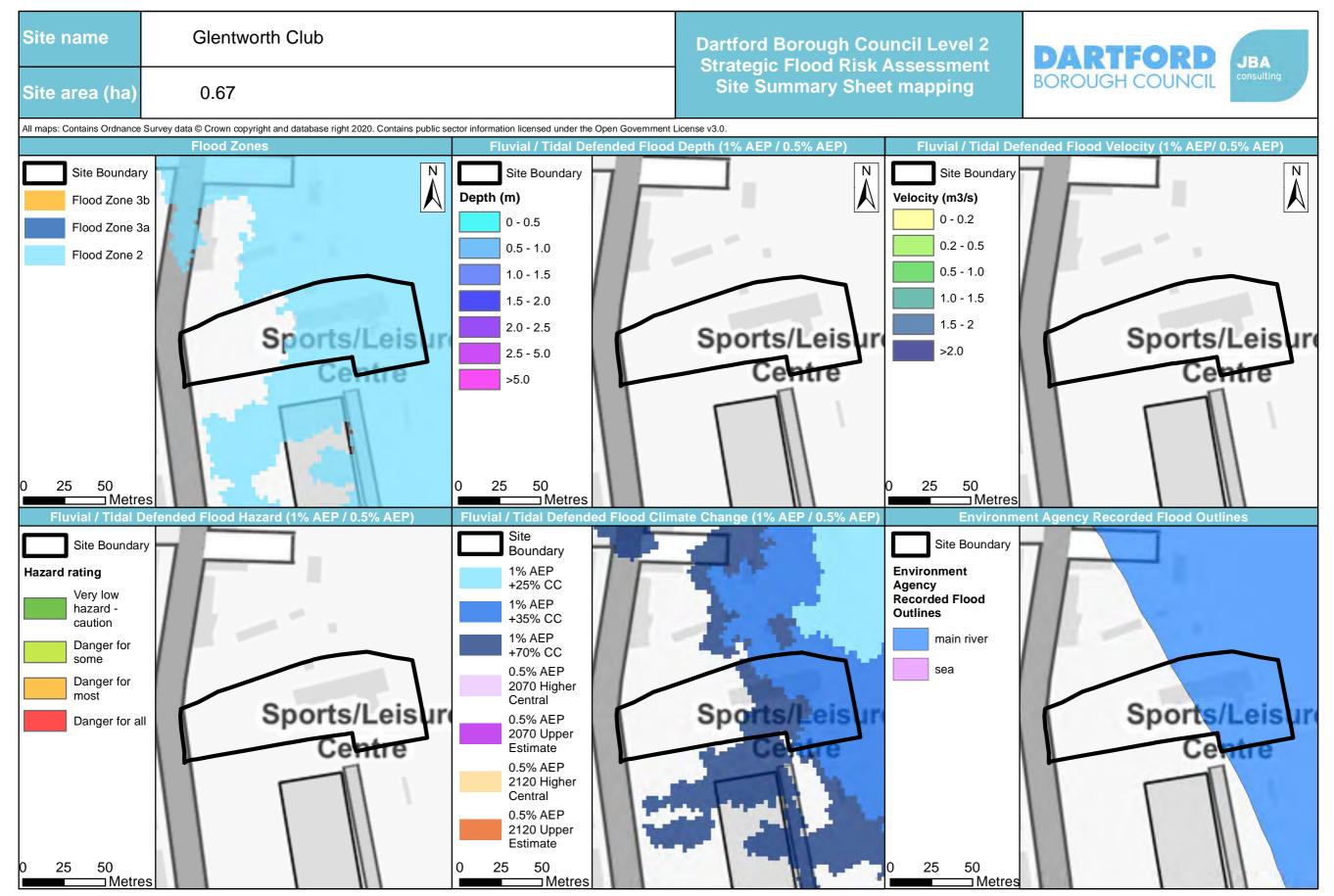


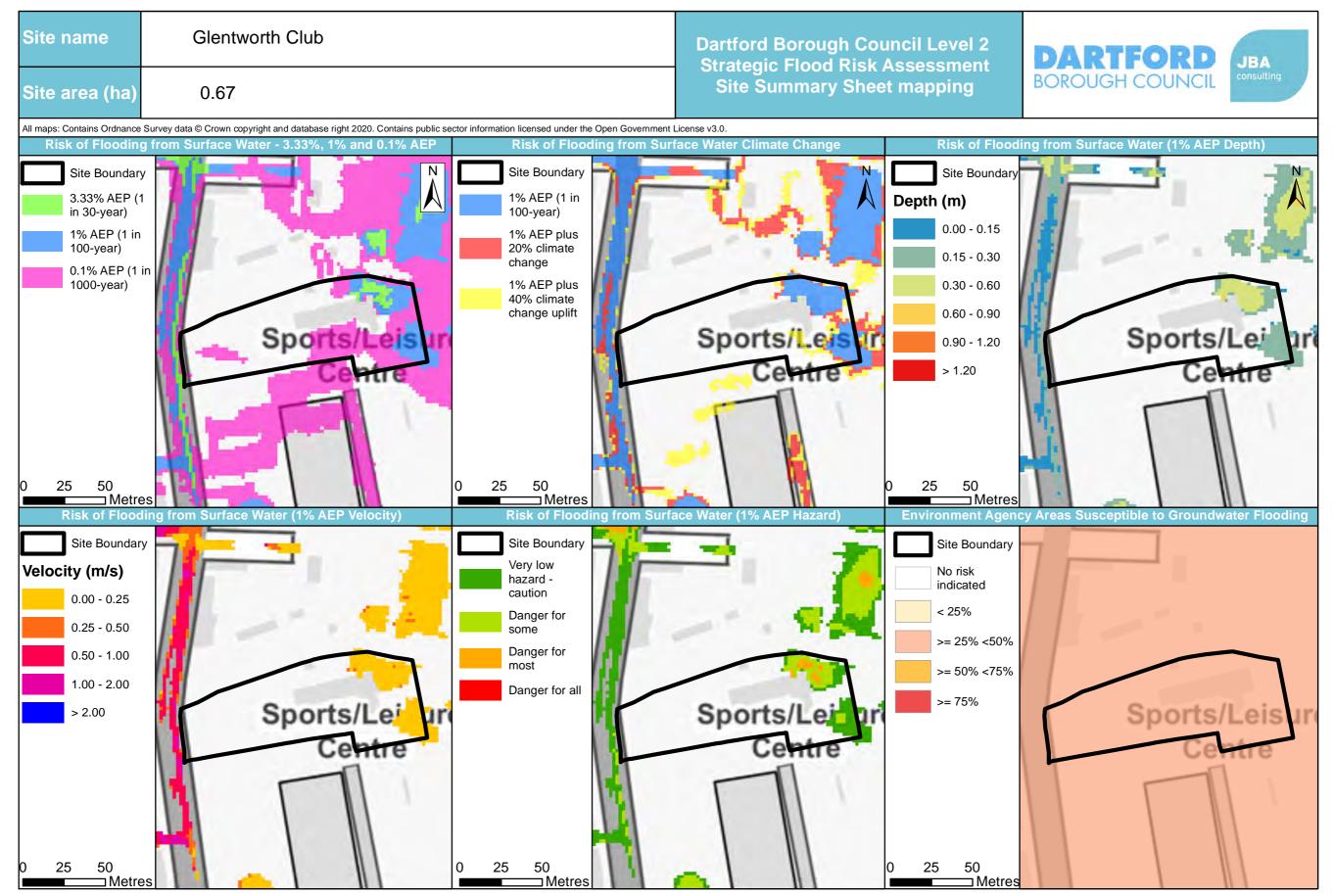
Town Centre North East Site name **Dartford Borough Council Level 2** JBA **Strategic Flood Risk Assessment BOROUGH COUNCIL Site Summary Sheet mapping** Site area (ha) 4.4 All maps: Contains Ordnance Survey data @ Crown copyright and database right 2020. Contains public sector information licensed under the Open Government License v3.0. Modelled breach extents (Present Day) Modelled breach extent (2115 EPOCH) Modelled breach extents (0.5% AEP Present Day) Depth ROAD Site Boundary Site Boundary Site Boundary Dartford STATION P Dartford STATION Dartford STATION Modelled Modelled breach Depth (m) breach extents extents (0.5% (0.5% AEP -AEP - 2115) No risk Present Day) Modelled breach 0 - 0.5 extents (0.1% Modelled breach extents AEP - 2115) 0.5 - 1.0 (0.1% AEP -Present Day) 1.0 - 1.5 1.5 - 2.0 2.0 - 2.5 2.5 - 5.0 > 5.0 PW PW 102 102 50 100 50 100 50 100 Modelled breach extents (0.5% AEP Present Day) Velocity Site Boundary Site Boundary ROAD ROAD Dartford STATION Very low **Velocity** Dartford STATION hazard -(m/s) caution No risk Danger for some 0 - 0.5 Danger for most 0.5 - 1 Danger for all 1 - 1.5 1.5 - 2.0 > 2.0 PW [2] 102 50 100 50 100

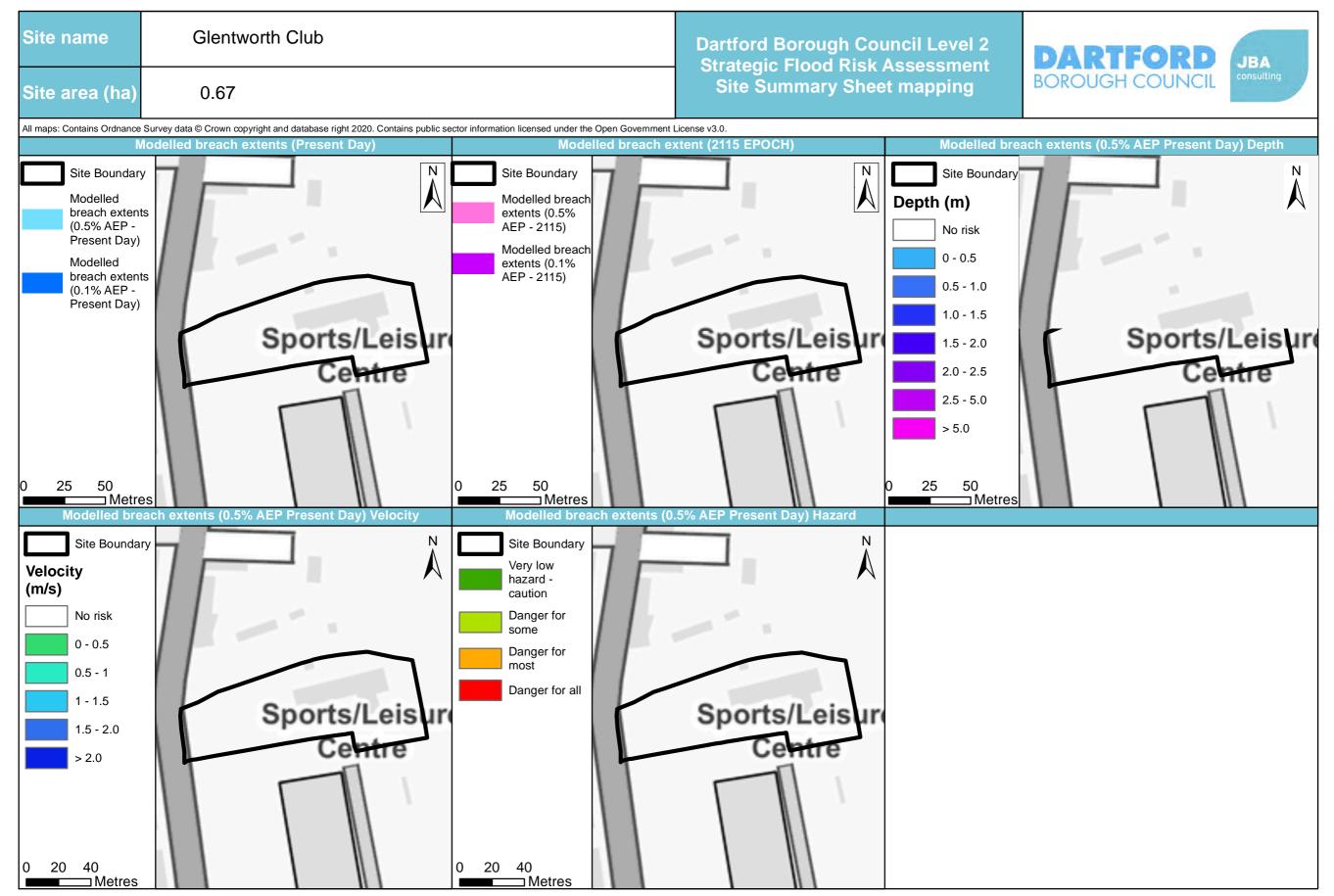
The Vicarage, Overy Liberty Site name **Dartford Borough Council Level 2 DARTFORD** JBA **Strategic Flood Risk Assessment BOROUGH COUNCIL Site Summary Sheet mapping** Site area (ha) 0.27 All maps: Contains Ordnance Survey data © Crown copyright and database right 2020. Contains public sector information licensed under the Open Government License v3.0. Fluvial / Tidal Defended Flood Velocity (1% AEP/ 0.5% AEP) Fluvial / Tidal Defended Flood Depth (1% AEP / 0.5% AEP) **Flood Zones** Site Boundary Site Boundary Site Boundary Depth (m) Velocity (m3/s) Flood Zone 3b 0 - 0.2 0 - 0.5 Flood Zone 3a 0.2 - 0.50.5 - 1.0Flood Zone 2 0.5 - 1.0 1.0 - 1.5 1.0 - 1.5 1.5 - 2.0 1.5 - 2 2.0 - 2.5 >2.0 2.5 - 5.0 >5.0 12.5 25 Metres 12.5 25 0 12.5 25 Fluvial / Tidal Defended Flood Hazard (1% AEP / 0.5% AEP) **Environment Agency Recorded Flood Outlines** Site Site Boundary Site Boundary Boundary 1% AEP **Hazard rating Environment** +25% CC Agency Very low Recorded Flood 1% AEP hazard -**Outlines** +35% CC caution 1% AEP main river Danger for +70% CC some 0.5% AEP sea Danger for 2070 Higher Central Danger for all 0.5% AEP 2070 Upper Estimate 0.5% AEP 2120 Higher Central 0.5% AEP 2120 Upper Estimate 12.5 25 0 12.5 25 12.5 25 ⊐ Metres Metres

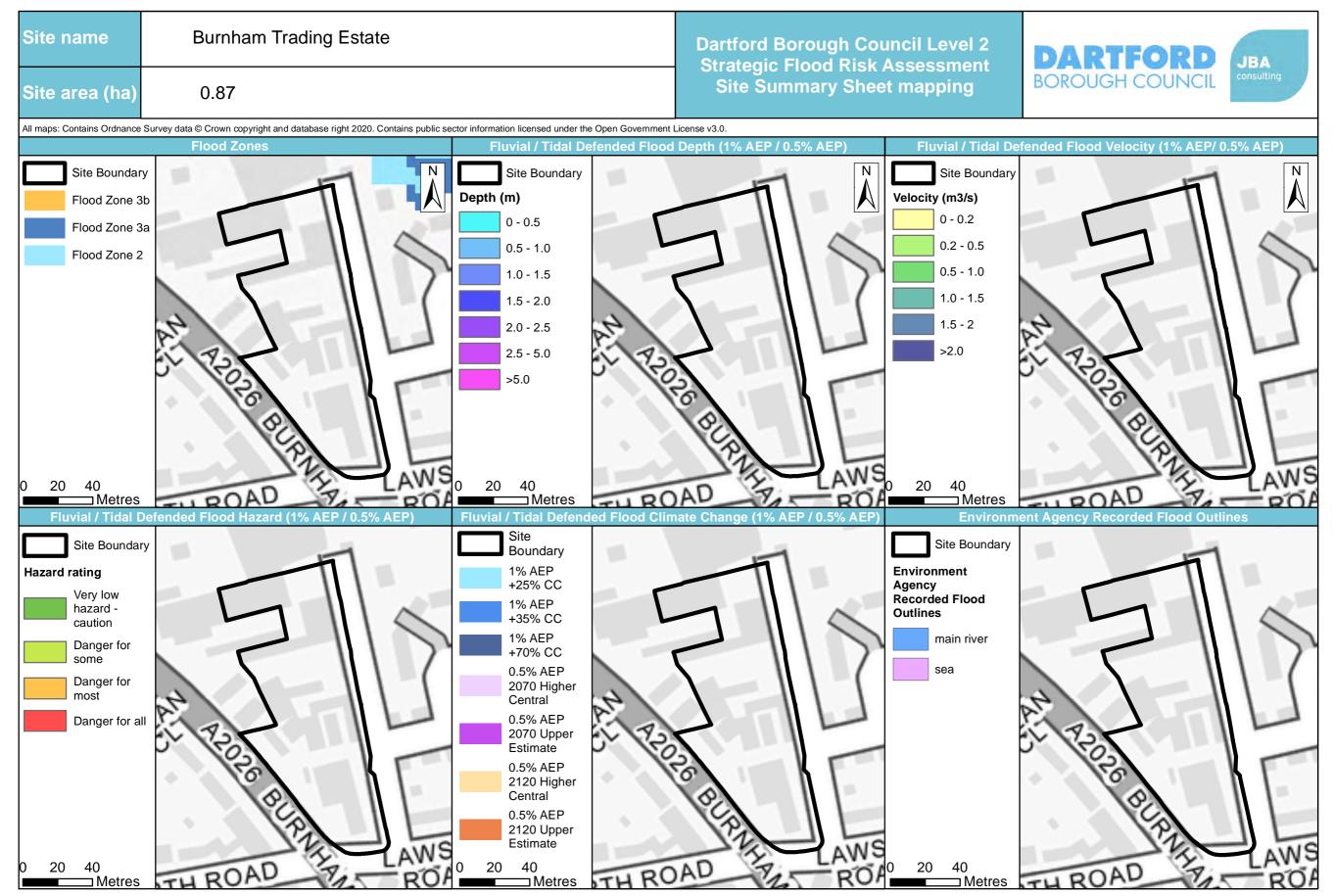


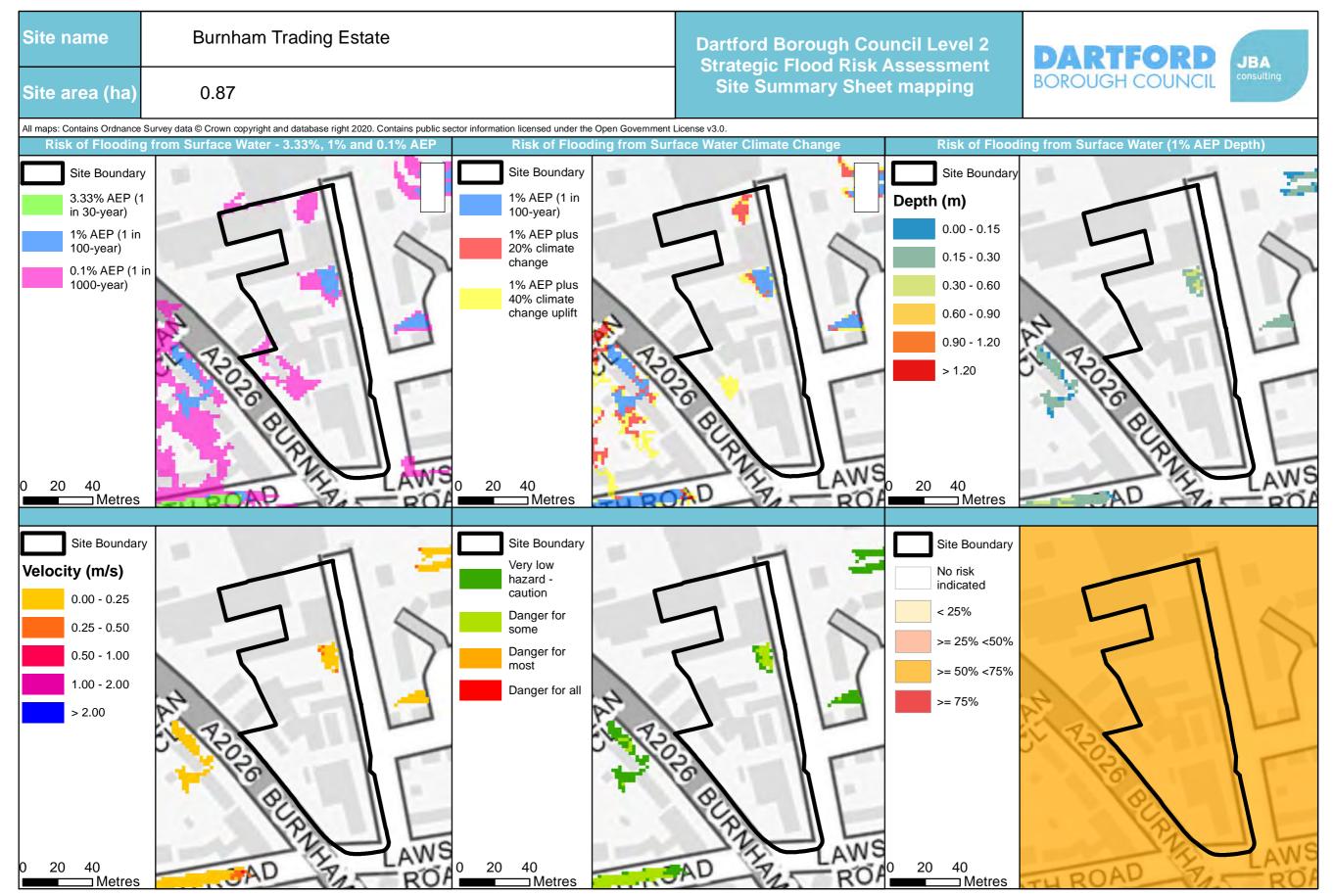
Site name The Vicarage, Overy Liberty **Dartford Borough Council Level 2 DARTFORD** JBA **Strategic Flood Risk Assessment BOROUGH COUNCIL Site Summary Sheet mapping** 0.27 Site area (ha) All maps: Contains Ordnance Survey data @ Crown copyright and database right 2020. Contains public sector information licensed under the Open Government License v3.0. Modelled breach extent (2115 EPOCH) Modelled breach extents (Present Day) Modelled breach extents (0.5% AEP Present Day) Depth Site Boundary Site Boundary Site Boundary Modelled Modelled breach Depth (m) breach extents extents (0.5% (0.5% AEP -AEP - 2115) No risk Present Day) Modelled breach 0 - 0.5 extents (0.1% Modelled breach extents AEP - 2115) 0.5 - 1.0 (0.1% AEP -Present Day) 1.0 - 1.5 1.5 - 2.0 2.0 - 2.5 2.5 - 5.0 > 5.0 0 12.5 25 Metres 12.5 25 Metres 12.5 25 _Metres Modelled breach extents (0.5% AEP Present Day) Velocity Modelled breach extents (0.5% AEP Present Day) Hazard Site Boundary Site Boundary Very low **Velocity** hazard -(m/s) caution No risk Danger for some 0 - 0.5 Danger for most 0.5 - 1Danger for all 1 - 1.5 1.5 - 2.0 > 2.0 0 12.5 25 0 12.5 25 Metres Metres











Burnham Trading Estate Site name **Dartford Borough Council Level 2 DARTFORD** JBA **Strategic Flood Risk Assessment** BOROUGH COUNCIL **Site Summary Sheet mapping** Site area (ha) 0.87 All maps: Contains Ordnance Survey data @ Crown copyright and database right 2020. Contains public sector information licensed under the Open Government License v3.0. Modelled breach extents (Present Day) Modelled breach extent (2115 EPOCH) Modelled breach extents (0.5% AEP Present Day) Depth Site Boundary Site Boundary Site Boundary Modelled Modelled breach Depth (m) breach extents extents (0.5% (0.5% AEP -AEP - 2115) No risk Present Day) Modelled breach 0 - 0.5 Modelled extents (0.1% breach extents AEP - 2115) 0.5 - 1.0 (0.1% AEP -Present Day) 1.0 - 1.5 1.5 - 2.0 2.0 - 2.5 2.5 - 5.0 > 5.0 20 40 FUROAD FUROAD ROAD __Metres ⊐ Metres Modelled breach extents (0.5% Modelled breach extents Site Boundary Site Boundary Very low **Velocity** hazard -(m/s) caution No risk Danger for some 0 - 0.5 Danger for most 0.5 - 1 Danger for all 1 - 1.5 1.5 - 2.0 > 2.0 Metres TH ROAD ⊐Metres

Lower Hythe Street and Central Road Site name **Dartford Borough Council Level 2** DARTFO JBA **Strategic Flood Risk Assessment BOROUGH COUNCIL** Site Summary Sheet mapping Site area (ha) 5.03 All maps: Contains Ordnance Survey data @ Crown copyright and database right 2020. Contains public sector information licensed under the Open Government License v3.0. Fluvial / Tidal Defended Flood Depth (1% AEP / 0.5% AEP) **Flood Zones** Fluvial / Tidal Defended Flood Velocity (1% AEP/ 0.5% AEP) N Site Boundary Site Boundary Site Boundary Depth (m) Velocity (m3/s) Flood Zone 3b 0 - 0.2 0 - 0.5 Flood Zone 3a 0.2 - 0.50.5 - 1.0Flood Zone 2 DALE 0.5 - 1.0 DALE DALE 1.0 - 1.5 1.0 - 1.5 1.5 - 2.0 1.5 - 2 2.0 - 2.5>2.0 2.5 - 5.0 >5.0 NILLIAM MUNDY WAY LIAM MUNDY WAY POND ROAD OND ROAD Dartford STATION P Dartford STATION E Dartford STAT 70 140 70 140 70 140 Fluvial / Tidal Defended Flood Climate Change (1% AEP / 0.5% AEP Fluvial / Tidal Defended Flood Hazard (1% AEP / 0.5% AEP **Environment Agency Recorded Flood Outlines** Site Site Boundary Site Boundary Boundary 1% AEP **Environment Hazard rating** +25% CC Agency Very low **Recorded Flood** 1% AEP hazard Outlines +35% CC caution 1% AEP main river Danger for DALE DALE +70% CC some 0.5% AEP Danger for 2070 Higher ETO most Central Danger for all 0.5% AEP 2070 Upper Estimate 0.5% AEP WILLIAM MUNDY WAY LIAM MUNDY WAY 2120 Higher Central 0.5% AEP 2120 Upper OND ROAD Estimate OND ROAD Dartford STATION PO Dartford STATION PO Dartford STATION P 140 140 70 140 Metres

Site name Lower Hythe Street and Central Road **Dartford Borough Council Level 2 DARTFORD** JBA **Strategic Flood Risk Assessment BOROUGH COUNCIL** Site Summary Sheet mapping Site area (ha) 5.03 All maps: Contains Ordnance Survey data @ Crown copyright and database right 2020. Contains public sector information licensed under the Open Government License v3.0. Risk of Flooding from Surface Water - 3.33%, 1% and 0.1% AEP Risk of Flooding from Surface Water Climate Change Risk of Flooding from Surface Water (1% AEP Depth) Site Boundary Site Boundary Site Boundary 1% AEP (1 in 3.33% AEP (1 Depth (m) 100-year) in 30-year) 0.00 - 0.151% AEP (1 in 1% AEP plus 100-year) 20% climate 0.15 - 0.30 change 0.1% AEP (1 in 1000-year) 1% AEP plus 0.30 - 0.60 40% climate change uplift 0.60 - 0.90 0.90 - 1.20 > 1.20 ILLIAM MUNDY WAY ILLIAM MUNDY WAY LIAM MUNDY WAY POND ROAD Dartford STATION P Dartford STATION P Dartford STATION 70 140 70 140 70 140 ⊐ Metresl Risk of Flooding from Surface Water (1% AEP Velocity) Risk of Flooding from Surface Water (1% AEP Hazard) **Environment Agency Areas Susceptible to Groundwater Flooding** Site Boundary Site Boundary Site Boundary Very low Velocity (m/s) No risk hazard indicated caution 0.00 - 0.25 < 25% Danger for 0.25 - 0.50 some >= 25% <50% ALE Danger for 0.50 - 1.00 most >= 50% < 75% 1.00 - 2.00 ETO Danger for all >= 75% > 2.00 NILLIAM MUNDY WAY LIAM MUNDY WAY OND ROAD OND ROAD Dartford STATION P Dartford STATION PD 140 70 140 70 140 Dartford STAT Metres

Lower Hythe Street and Central Road Site name **Dartford Borough Council Level 2** JBA **Strategic Flood Risk Assessment BOROUGH COUNCIL Site Summary Sheet mapping** Site area (ha) 5.03 All maps: Contains Ordnance Survey data @ Crown copyright and database right 2020. Contains public sector information licensed under the Open Government License v3.0. Modelled breach extents (Present Day) Modelled breach extent (2115 EPOCH) Modelled breach extents (0.5% AEP Present Day) Depth Site Boundary Site Boundary Site Boundary Modelled Modelled breach Depth (m) breach extents extents (0.5% (0.5% AEP -AEP - 2115) No risk Present Day) Modelled breach 0 - 0.5 Modelled extents (0.1% DALE DALE DALE breach extents AEP - 2115) 0.5 - 1.0 (0.1% AEP -Present Day) 1.0 - 1.5 ETO 1.5 - 2.0 2.0 - 2.5 2.5 - 5.0 ILLIAM MUNDY WAY > 5.0 Dartford STATION PO Dartford STATION Dartford STAT 70 140 70 140 70 140 ⊐Metres Modelled breach extents (0.5% AEP Present Day) Velocity Modelled breach extents (0.5% AEP Present Day) Hazard Site Boundary Site Boundary Very low **Velocity** hazard -(m/s) caution No risk Danger for some 0 - 0.5 DALE DALE Danger for most 0.5 - 1 Danger for all ETO 1 - 1.5 1.5 - 2.0 > 2.0 LLIAM MUNDY WAY LLIAM MUNDY WAY ROAD ROAD Dartford STATION P Dartford STATION PO 65 130 65 130 ⊐Metres

Ebbsfleet Central Site name **Dartford Borough Council Level 2** DARTFORD JBA **Strategic Flood Risk Assessment** BOROUGH COUNCIL **Site Summary Sheet mapping** Site area (ha) 125.13 All maps: Contains Ordnance Survey data @ Crown copyright and database right 2020. Contains public sector information licensed under the Open Government License v3.0. Fluvial / Tidal Defended Flood Velocity (1% AEP/ 0.5% AEP) Fluvial / Tidal Defended Flood Depth (1% AEP / 0.5% AEP) Flood Zones Site Boundary Ν Site Boundary Site Boundary Depth (m) Velocity (m3/s) Flood Zone 3b 0 - 0.2 0 - 0.5 Flood Zone 3a 0.2 - 0.50.5 - 1.0Flood Zone 2 0.5 - 1.0 1.0 - 1.5 1.0 - 1.5 1.5 - 2.0 1.5 - 2 2.0 - 2.5 >2.0 2.5 - 5.0 >5.0 310 620 310 620 310 620 ⊐Metres ⊐ Metres ⊐Metres Fluvial / Tidal Defended Flood Hazard (1% AEP / 0.5% AEP) Fluvial / Tidal Defended Flood Climate Change (1% AEP / 0.5% AEP **Environment Agency Recorded Flood Outlines** Site Site Boundary Site Boundary Boundary 1% AEP **Environment Hazard rating** +25% CC Agency Very low **Recorded Flood** 1% AEP hazard -Outlines +35% CC caution 1% AEP main river Danger for +70% CC some 0.5% AEP sea Danger for 2070 Higher Central Danger for all 0.5% AEP 2070 Upper Estimate 0.5% AEP 2120 Higher Central 0.5% AEP 2120 Upper Estimate 310 620 310 620 310 620 Metres Metres

Ebbsfleet Central Site name **Dartford Borough Council Level 2 DARTFORD** JBA **Strategic Flood Risk Assessment BOROUGH COUNCIL Site Summary Sheet mapping** Site area (ha) 125.13 All maps: Contains Ordnance Survey data @ Crown copyright and database right 2020. Contains public sector information licensed under the Open Government License v3.0. Risk of Flooding from Surface Water - 3.33%, 1% and 0.1% AEP Risk of Flooding from Surface Water Climate Change Risk of Flooding from Surface Water (1% AEP Depth) Site Boundary Site Boundary Site Boundary 1% AEP (1 in 3.33% AEP (1 Depth (m) in 30-year) 100-year) 0.00 - 0.15 1% AEP (1 in 1% AEP plus 100-year) 20% climate 0.15 - 0.30 change 0.1% AEP (1 in 1000-year) 1% AEP plus 0.30 - 0.60 40% climate change uplift 0.60 - 0.90 0.90 - 1.20 > 1.20 310 620 310 310 620 ⊐ Metres ⊐Metres **Environment Agency Areas Susceptible to Groundwater Flooding** Risk of Flooding from Surface Water (1% AEP Velocity) Risk of Flooding from Surface Water (1% AEP Hazard) Site Boundary Site Boundary Site Boundary Very low Velocity (m/s) No risk hazard indicated caution 0.00 - 0.25 < 25% Danger for 0.25 - 0.50 some >= 25% <50% Danger for 0.50 - 1.00 most >= 50% < 75% 1.00 - 2.00 Danger for all >= 75% > 2.00 310 620 310 620 310 620 ⊐ Metres □Metres Metres

Site name Swanscombe Peninsula **Dartford Borough Council Level 2 DARTFORD** JBA **Strategic Flood Risk Assessment BOROUGH COUNCIL Site Summary Sheet mapping** Site area (ha) 171.06 All maps: Contains Ordnance Survey data @ Crown copyright and database right 2020. Contains public sector information licensed under the Open Government License v3.0. Fluvial / Tidal Defended Flood Velocity (1% AEP/ 0.5% AEP) Fluvial / Tidal Defended Flood Depth (1% AEP / 0.5% AEP) **Flood Zones** Ν Site Boundary Site Boundary Site Boundary Depth (m) Velocity (m3/s) Flood Zone 3b 0 - 0.2 0 - 0.5 Flood Zone 3a 0.2 - 0.50.5 - 1.0Flood Zone 2 0.5 - 1.0 1.0 - 1.5 1.0 - 1.5 1.5 - 2.0 1.5 - 2 2.0 - 2.5 >2.0 2.5 - 5.0 >5.0 310 620 310 620 310 620 ⊐Metres ⊐ Metres □Metres Fluvial / Tidal Defended Flood Hazard (1% AEP / 0.5% AEP) **Environment Agency Recorded Flood Outlines** Site Site Boundary Site Boundary Boundary 1% AEP **Environment Hazard rating** +25% CC Agency Very low **Recorded Flood** 1% AEP hazard -**Outlines** +35% CC caution 1% AEP main river Danger for +70% CC some 0.5% AEP sea Danger for 2070 Higher most Central Danger for all 0.5% AEP 2070 Upper Estimate 0.5% AEP 2120 Higher Central 0.5% AEP 2120 Upper Estimate 310 620 310 620 310 620 ⊐ Metres ⊐ Metres

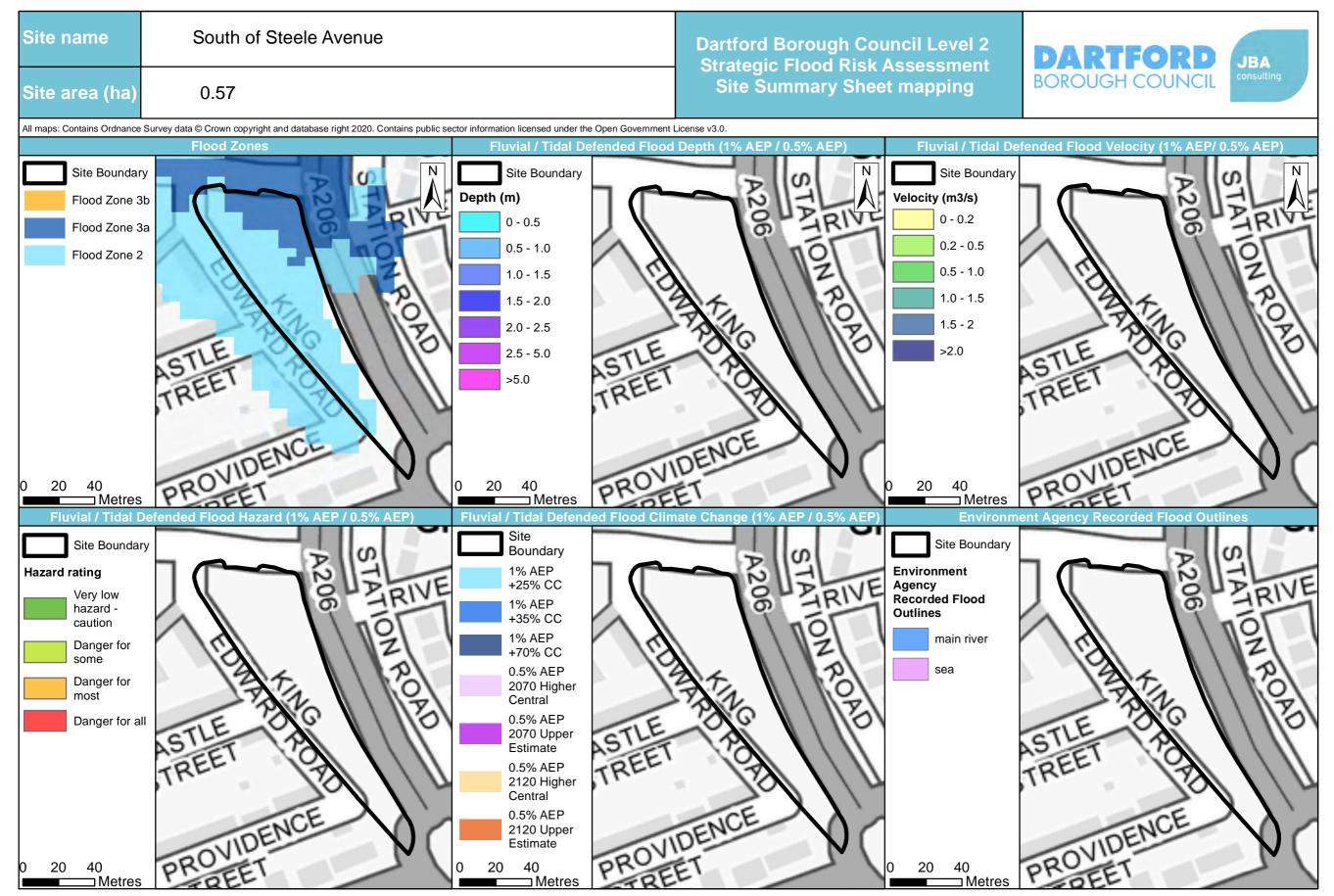
Swanscombe Peninsula Site name **Dartford Borough Council Level 2 DARTFORD** JBA **Strategic Flood Risk Assessment BOROUGH COUNCIL Site Summary Sheet mapping** 171.06 Site area (ha) All maps: Contains Ordnance Survey data @ Crown copyright and database right 2020. Contains public sector information licensed under the Open Government License v3.0. Risk of Flooding from Surface Water - 3.33%, 1% and 0.1% AEP Risk of Flooding from Surface Water Climate Change Risk of Flooding from Surface Water (1% AEP Depth) Site Boundary Site Boundary Site Boundary 1% AEP (1 in 3.33% AEP (1 Depth (m) 100-year) in 30-year) 0.00 - 0.151% AEP (1 in 1% AEP plus 100-year) 20% climate 0.15 - 0.30 change 0.1% AEP (1 in 1000-year) 1% AEP plus 0.30 - 0.60 40% climate change uplift 0.60 - 0.90 0.90 - 1.20 > 1.20 310 620 310 620 310 620 ⊐ Metres ⊐Metres ⊐Metres Risk of Flooding from Surface Water (1% AEP Velocity) Risk of Flooding from Surface Water (1% AEP Hazard) **Environment Agency Areas Susceptible to Groundwater Flooding** Site Boundary Site Boundary Site Boundary Very low Velocity (m/s) No risk hazard indicated caution 0.00 - 0.25 < 25% Danger for 0.25 - 0.50 some >= 25% <50% Danger for 0.50 - 1.00 most >= 50% < 75% 1.00 - 2.00 Danger for all >= 75% > 2.00 310 620 310 620 310 620 ⊐ Metres ⊐Metres Metres

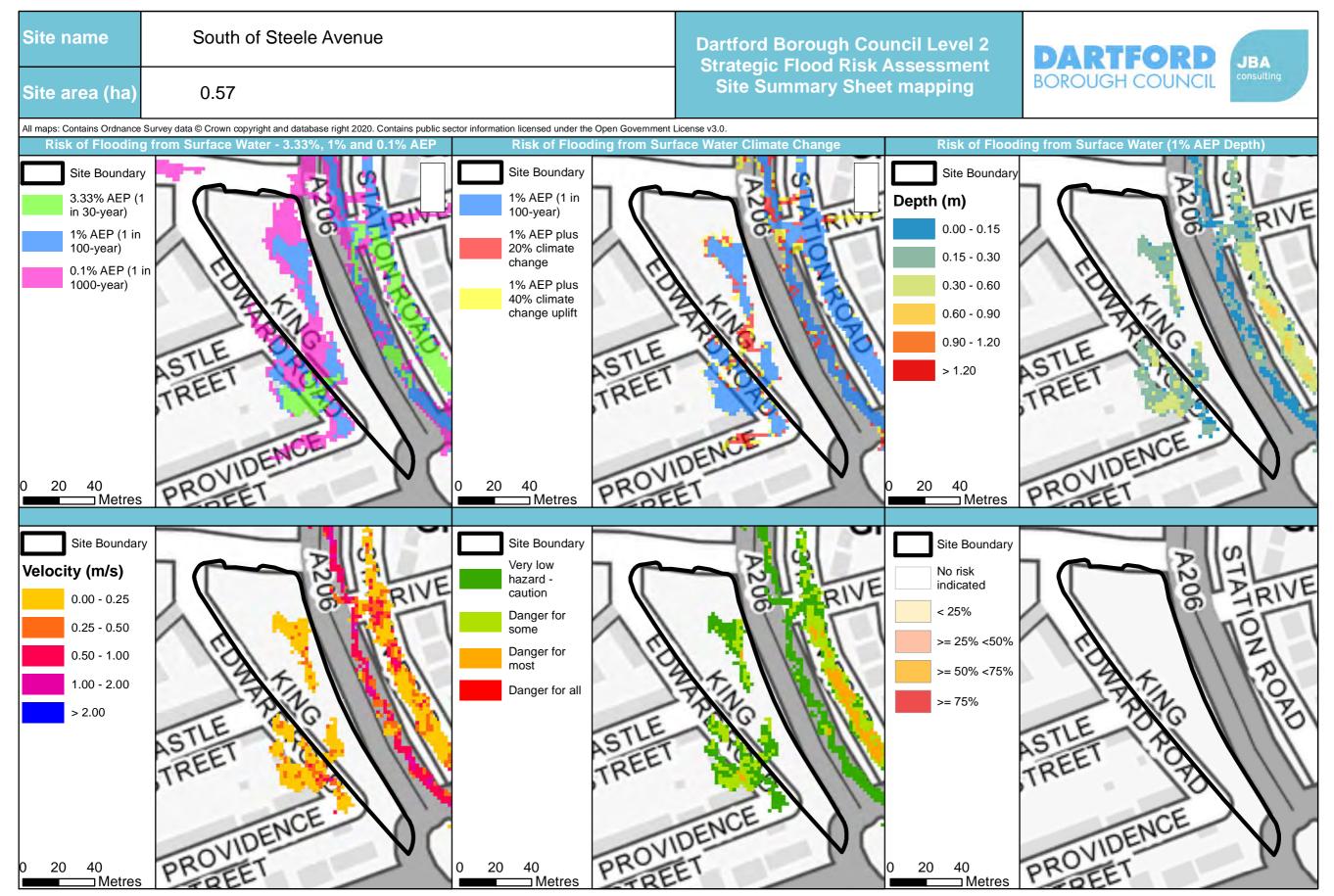
Site name Swanscombe Peninsula **Dartford Borough Council Level 2 DARTFORD** JBA **Strategic Flood Risk Assessment BOROUGH COUNCIL Site Summary Sheet mapping** 171.06 Site area (ha) All maps: Contains Ordnance Survey data @ Crown copyright and database right 2020. Contains public sector information licensed under the Open Government License v3.0. Modelled breach extent (2115 EPOCH) Modelled breach extents (0.5% AEP Present Day) Depth Modelled breach extents (Present Day) Site Boundary Site Boundary Site Boundary Modelled Modelled breach Depth (m) breach extents extents (0.5% (0.5% AEP -AEP - 2115) No risk Present Day) Modelled breach 0 - 0.5 extents (0.1% Modelled breach extents AEP - 2115) 0.5 - 1.0 (0.1% AEP -Present Day) 1.0 - 1.5 1.5 - 2.0 2.0 - 2.5 2.5 - 5.0 > 5.0 620 Metres 310 620 310 310 620 ⊐Metres ⊐ Metres Modelled breach extents (0.5% AEP Present Day) Velocity Modelled breach extents (0.5% AEP Present Day) Hazard Site Boundary Site Boundary Very low **Velocity** hazard -(m/s) caution No risk Danger for some 0 - 0.5 Danger for most 0.5 - 1Danger for all 1 - 1.5 1.5 - 2.0 > 2.0 300 600 300 600 ⊐Metres

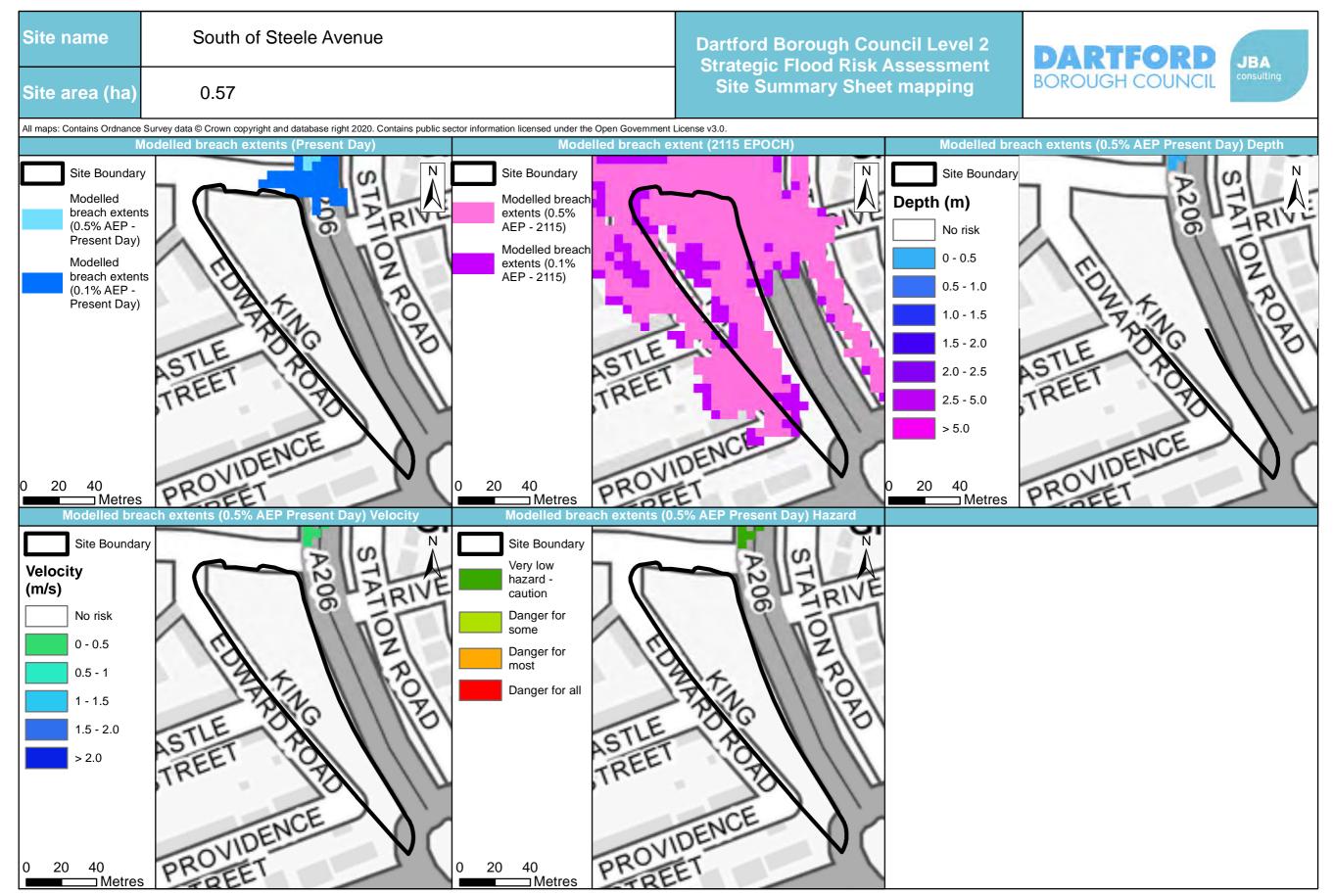
Former Littlebrook Power Station Site name **Dartford Borough Council Level 2 DARTFORD** JBA **Strategic Flood Risk Assessment BOROUGH COUNCIL Site Summary Sheet mapping** Site area (ha) 45.58 All maps: Contains Ordnance Survey data @ Crown copyright and database right 2020. Contains public sector information licensed under the Open Government License v3.0. Fluvial / Tidal Defended Flood Velocity (1% AEP/ 0.5% AEP) Fluvial / Tidal Defended Flood Depth (1% AEP / 0.5% AEP) **Flood Zones** N Site Boundary Site Boundary Site Boundary Depth (m) Velocity (m3/s) Flood Zone 3b 0 - 0.2 0 - 0.5 Flood Zone 3a 0.2 - 0.50.5 - 1.0Flood Zone 2 0.5 - 1.0 1.0 - 1.5 1.0 - 1.5 1.5 - 2.0 1.5 - 2 2.0 - 2.5 >2.0 2.5 - 5.0 DARTFORI >5.0 235 470 237.5 475 237.5 475 Fluvial / Tidal Defended Flood Hazard (1% AEP / 0.5% AEP) Fluvial / Tidal Defended Flood Climate Change (1% AEP / 0.5% AEP **Environment Agency Recorded Flood Outlines** Site Site Boundary Site Boundary Boundary Environment 1% AEP **Hazard rating** +25% CC Agency Very low Recorded Flood 1% AEP hazard -**Outlines** +35% CC caution 1% AEP main river Danger for +70% CC some 0.5% AEP sea Danger for 2070 Higher most Central Danger for all 0.5% AEP 2070 Upper Estimate 0.5% AEP 2120 Higher Central 0.5% AEP 2120 Upper Estimate 470 235 470 235 470 Metre: ⊐ Metres

Former Littlebrook Power Station Site name **Dartford Borough Council Level 2 DARTFORD** JBA **Strategic Flood Risk Assessment BOROUGH COUNCIL Site Summary Sheet mapping** Site area (ha) 45.58 All maps: Contains Ordnance Survey data @ Crown copyright and database right 2020. Contains public sector information licensed under the Open Government License v3.0. Risk of Flooding from Surface Water - 3.33%, 1% and 0.1% AEP Risk of Flooding from Surface Water Climate Change Risk of Flooding from Surface Water (1% AEP Depth) Site Boundary Site Boundary Site Boundary 1% AEP (1 in 3.33% AEP (1 Depth (m) 100-year) in 30-year) 0.00 - 0.15 1% AEP (1 in 1% AEP plus 100-year) 20% climate 0.15 - 0.30 change 0.1% AEP (1 in 1000-year) 1% AEP plus 0.30 - 0.60 40% climate change uplift 0.60 - 0.90 0.90 - 1.20 > 1.20 235 470 237.5 475 237.5 475 ⊐Metres Risk of Flooding from Surface Water (1% AEP Velocity) Risk of Flooding from Surface Water (1% AEP Hazard) **Environment Agency Areas Susceptible to Groundwater Flooding** Site Boundary Site Boundary Site Boundary Very low Velocity (m/s) No risk hazard indicated caution 0.00 - 0.25 < 25% Danger for 0.25 - 0.50 some >= 25% <50% Danger for 0.50 - 1.00 most >= 50% < 75% 1.00 - 2.00 Danger for all >= 75% > 2.00 470 235 470 235 470 ⊐Metres

Former Littlebrook Power Station Site name **Dartford Borough Council Level 2 DARTFORD** JBA **Strategic Flood Risk Assessment BOROUGH COUNCIL Site Summary Sheet mapping** Site area (ha) 45.58 All maps: Contains Ordnance Survey data @ Crown copyright and database right 2020. Contains public sector information licensed under the Open Government License v3.0. Modelled breach extents (Present Day) Modelled breach extent (2115 EPOCH) Modelled breach extents (0.5% AEP Present Day) Depth Site Boundary Site Boundary Site Boundary Modelled Modelled breach Depth (m) breach extents extents (0.5% (0.5% AEP -AEP - 2115) No risk Present Day) Modelled breach 0 - 0.5 extents (0.1% Modelled breach extents AEP - 2115) 0.5 - 1.0 (0.1% AEP -Present Day) 1.0 - 1.5 1.5 - 2.0 2.0 - 2.5 2.5 - 5.0 > 5.0 235 470 237.5 475 237.5 475 ⊐ Metres ⊐ Metres Modelled breach extents (0.5% AEP Present Day) Velocity Modelled breach extents (0.5% AEP Present Day) Hazard Site Boundary Site Boundary Very low **Velocity** hazard -(m/s) caution No risk Danger for some 0 - 0.5 Danger for most 0.5 - 1 Danger for all 1 - 1.5 1.5 - 2.0 > 2.0 230 460 230 460







SFRA: APPENDIX O SFRA USER GUIDE

Flood risk source/ information source	Relevant sections of this SFRA	Result	Level of concern	Recommendations	Sequential and Exception Tests
Fluvial / Tidal (Flood Zones)		Significant proportion (e.g. greater than 50%) of site in Flood Zones (2 and 3)	High	Residential development on a site in this zone is unlikely to be appropriate unless the site is in an area benefitting from defence and can be made safe for the intended lifespan.	Sites in these categories should be explicitly addressed in a Sequential Test and may require preparation of further evidence to substantiate that Exception
		A proportion (e.g. less than 50%) of site in Flood Zones (2 and 3)	Medium	Residential development may be appropriate, sequential approach should be applied to avoid developing in flood zones as far as reasonable. Parts of the site within flood zone 1 should also be reviewed against the criteria described below.	to demonstrate that the principle
		Site located in Flood Zone 1	Medium	Residential development is probably appropriate in this zone, however catchments <3km² in area are not covered by the Environment Agency Flood Zones and there may be a risk of flooding from small watercourses and/or other sources. These should be considered in conjunction with the DRN data and data on other sources of flooding. The surface water data in particular often highlights areas at risk of flooding from these smaller watercourses.	
Fluvial / Tidal - Climate change	5 - Climate change 6 - Sources of information used in preparing the SFRA 7- Understanding the risk in the	Significant proportion (e.g. greater than 50%) of site at risk of flooding from the future 1% AEP event	High	Residential development is unlikely to be appropriate unless the site is in an area benefitting from defence. Consideration should be given to the Standard of Protection of existing defences in relation to future climate change and any other measures necessary to provide appropriate standards of protection to proposed development.	Sites in these categories should be explicitly addressed in a Sequential Test and may require preparation of further evidence to substantiate that Exception
		A proportion (e.g. less than 50%) of site at risk of flooding from the future 1% AEP event	Medium	the control of the co	Test can be satisfied. Evidence from a Level 2 SFRA is required to demonstrate that the principle of development is supported.
		Site not at risk of flooding from the future 1% AEP event	Medium	Residential development is probably appropriate in this risk area, however this will depend on the present-day fluvial / tidal risk - refer to fluvial / tidal flood zone recommendations	
Fluvial / Tidal - Climate change proxy	5 - Climate change 6 - Sources of information used in preparing the SFRA 7- Understanding the risk in the study area	Significant proportion (e.g. greater than 50%) of site at risk of flooding from the 0.1% AEP event when used as a proxy for climate change	High	Residential development is unlikely to be appropriate unless the site is in an area benefitting from defence. Consideration should be given to the Standard of Protection of existing defences in relation to future climate change and any other measures necessary to provide appropriate standards of protection to proposed development.	Sites in these categories should be explicitly addressed in a Sequential Test and may require preparation of further evidence to substantiate that Exception Test can be satisfied. Evidence
		A proportion (e.g. less than 50%) of site at risk of flooding from the 0.1% AEP event when used as a proxy for climate change	Medium	Residential development may be appropriate, sequential approach should be applied to avoid developing in the areas at risk of flooding as much as reasonable. Consideration should be given to the Standard of Protection of any defences in relation to future climate change and the commitment to deliver the required standards.	from a Level 2 SFRA (including detailed modelling of the impact
		Site not at risk of flooding from the 0.1% AEP event when used as a proxy for climate change Significant proportion (e.g. >50%)	Low	Residential development is likely to be appropriate based on this criterion.	
Surface Water	6 - Sources of information used in preparing the SFRA 7 - Understanding the risk in the study area	of site is affected by surface water flooding (across all three surface water events)	High	Development on a site in this risk area is unlikely to be appropriate unless measures (including drainage) are in place to control overland flow.	Evidence may be required from a Level 2 SFRA to demonstrate that the principle of development is supported
		A proportion (e.g. <50%) of site is affected by surface water flooding (across all three surface water events)	Medium	Development may be appropriate and consultations should be held with the Lead Local Flood Authority.	
Surface Water - Climate change	5 - Climate change 6 - Sources of information used in preparing the SFRA 7 - Understanding the risk in the study area	No risk of surface water flooding Significant proportion (e.g. greater than 50%) of site at risk of surface water flooding from the future 1% AEP event A proportion (e.g. less than 50%)	Low	Development is likely to be appropriate based on this criterion. Development on a site in this risk area is unlikely to be appropriate unless measures (including drainage) are in place to control overland flow.	Evidence may be required from a Level 2 SFRA to demonstrate that the principle of development is
		of site at risk of surface water flooding from the future 1% AEP event Site not at risk of surface water	Medium	Development may be appropriate and consultations should be held with the Lead Local Flood Authority. Development may be appropriate in this risk area, however this will	supported
		flooding from the future 1% AEP event	Low	depend on the present-day flood risk - refer to surface water recommendations The effect of this will depend on the location and historic evidence of	
Groundwater	6 - Sources of information used in preparing the SFRA 7 - Understanding the risk in the study area	Historic records of groundwater flooding within or near a site	Medium	known problems - a site-specific FRA should consider overland flow paths once groundwater has emerged. It is unlikely that infiltration SuDS will be appropriate and groundwater monitoring should be recommended.	
		Risk of flooding from groundwater is not negligible	Medium	Development might be appropriate but a site-specific FRA should consider groundwater risk. A high likelihood may mean infiltration SuDS are not appropriate and groundwater monitoring should be recommended.	
		Negligible risk of flooding from groundwater	Low	Development is likely to be appropriate in this risk area, however as groundwater datasets are generally produced nationally it is recommended that ground investigations are carried out and reported on within a site-specific FRA where this is required (known to be a problem locally).	
Reservoir inundation	6 - Sources of information used in preparing the SFRA 7 - Understanding the risk in the study area	Maximum risk of flooding from reservoir inundation (is greater than 2m depth or 2m/s velocity)	High	Development on a site in this risk area might not be appropriate - this will be heavily dependent on the state of repair of the dam and the long term commitment to its management and maintenance. If development is considered, the local authority Emergency Planning team should be consulted to confirm that proposals can be safely implemented. Risk of flooding from reservoirs should not rule out development as the	Level 2 SFRA required to provide evidence that the principle of development is supported
		Maximum risk of flooding from reservoir inundation (is less than 2 m depth or 2 m/s velocity)		likelihood of reservoir breach is low, however risk should still be considered by the developer at site-specific FRA stage and an emergency plan is likely to be required. The local authority Emergency Planning team should be consulted.	
Historic flood map	6 - Sources of information used in preparing the SFRA 7 - Understanding the risk in the study area	No risk of reservoir inundation Any part of site within historic flood extents	Medium	Development is likely to be appropriate in this risk area. Sites located in areas that have historically flooded might be appropriate for Development, however further investigation will be required regarding the severity and frequency of the historic flooding and accuracy of the historic flood extent. This should be used alongside other information in the Level 1 SFRA to decide whether the site is appropriate for allocation. Technical work will be required to inform this at the site-specific FRA stage.	
Detailed River Network	7 - Understanding the risk in the study area	Any part of site within 20m of a watercourse (from the Detailed River Network dataset)	Medium	Development is likely to be appropriate based on this criterion. Sites located within 20m of the DRN line might be appropriate for development. Where the DRN goes through or adjacent to a site, the Flood Zones and surface water map should also be considered to further determine the effect on development. Where the DRN is located away from a site and land slopes down towards the site, development may be less appropriate than a site where land slopes down towards the watercourse and away from the site.	
		Site not within 20m of a watercourse (from the Detailed River Network dataset)	Low / Medium	Development is likely to be appropriate in this risk area, however not all watercourses are mapped on the Detailed River Network dataset, smaller drains may not be mapped and may need to be considered along with flood risk from other sources.	
Areas benefitting from flood defence	8 - Flood defences	Any part of the site is within an area benefiting from defence	Advisory	Development in this risk area is normally appropriate in principle, however, the performance of formal defences and residual flood risk will need to be considered and consideration given to the commitment and contributions required to maintain the appropriate standard of protection.	Level 2 SFRA required to provide evidence that the principle of development is supported
		The site is not in an area benefiting from defence	Low	Development is likely to be appropriate in this risk area if there is no risk of flooding from other sources on the site. See other recommendations if there is any risk of flooding. Development could be considered as appropriate, however, specific	
Cumulative impacts	13 - Level 1 Assessment	High - Any part of the site is within a High Cumulative Impact Zone	Medium	planning policy recommendations may need to be formulated. Drainage	Level 2 SFRA may be required to provide evidence that the principle of development is supported
		Medium - Any part of the site is within a Medium Cumulative Impact Zone (unless the site is also within a High Zone)	Low / <mark>Medium</mark>	Development is likely to be appropriate in these risk areas, however if a Medium score has been identified based on a high amount of development then specific planning policy recommendations may need to be formulated. Drainage and flood risk reduction opportunities may need to be considered further within these catchments that may have financial and/or land take implications for the site.	
		Low - Any site not partially or fully within either High or Medium Cumulative Impact Zones	Low	Development is likely to be appropriate in this risk area.	