Site Name: Waste tip north of Sir Alf Ramsey Way										
Site ID:	IP0	03	Location:	W Si W	/aste tip north of ir Alf Ramsey /ay	of Area (ha):		1.46		
Current Use:	se: Commercial		Proposed Use:	Residential		Vulnerability Classification:		More Vulnerable		
Flood Zones ar	nd Hi	storic Flooding								
Flood Zone 1 Flood Zone 2 (<0.1% AEP): 6% (0.1% AEP): 16%		Flood Zone 3 (1% AEP): 78%	Flood Zone 3b (5% AEP): 0%		Area Benefiting from Defences: 87%		ting from 7%			

As it flows through Ipswich, the River Gipping becomes the River Orwell. A channel of the River Gipping / Orwell flows south along the western edge of the site and joins with another main channel of the River Orwell. There are further watercourses to the north and east of the site. At this location the River Gipping / Orwell is tidally influenced. Most of the site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. The site is shown to benefit from the presence of defences; there is a flood defence wall along the edge of the channel to the west of the site, and there is a tidal barrier further downstream on the River Orwell.

The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1939 and 1953 which is recorded on the Environment Agency Historic Flood Map. Ipswich BC also hold records of flood incidents in this location associated with surface water and highway flooding.



Fluvial Flood Risk – Lower Gipping

Modelling of the Lower Gipping (Mott MacDonald September 2020), shows that floodwater remains in bank in this part of Ipswich during the 5% AEP, 1% and 0.1% AEP events. However, in the future there is potential that the risk of flooding from the Lower Gipping could increase as a result of climate change, assuming no alterations are made to the flood defences. In this scenario, the site is shown to be at risk during the 1% AEP event including a 65% allowance for climate change, with flood levels varying from 3.45 - 4.8 m AOD on the western side of the site; and 3.17 - 3.68 m AOD on the eastern side. Flood depths on the site are approximately 0.25 m, and the hazard rating is Low. The hazard rating to the east of the site is Significant. The site is also shown to be at risk during the 0.1% AEP event including 25% allowance for climate change, with a flood level of 3.97 m AOD.



Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design flood (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk, i.e. in the event of failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate the flood hazard associated with this residual risk. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. Under this scenario, flood hazard of Low, Moderate and Significant is recorded on the site and to the east of the site. Flood depths range from 0 to 1.25 m.





Residual Flood Risk - Combined Flood Depth (0.5% AEP, 2118)



Surface Water Flood risk

The RoFSW mapping indicates that the site is at low and very low risk of surface water flooding. The RoFSW mapping identifies two important surface water flow paths to the north and east of the site which are watercourses.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 50%-75% is susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk from reservoir flooding.

Site Specific Recommendations

The site is shown to be at <u>actual risk</u> of fluvial flooding from the Lower Gipping in the future as a result of climate change, and at <u>residual risk</u> of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to mitigate the actual risk of fluvial flooding in the future, and to manage the residual risk of tidal flooding.

Finished Floor Levels

Finished floor levels should be set 300mm above the fluvial design flood level including an allowance for climate change. The flood level on the site for the 1% AEP event including 65% climate change varies across the site from 3.45 - 4.8 m AOD on the western side of the site; and 3.17 - 3.68 m AOD on the eastern side.

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment J is 3.61 – 3.7m AOD (Figure 7-4).

Access / Egress

During the fluvial design flood (1% AEP including 65% climate change) dry access/egress for the site is achievable to the south along West End Road. Dry access is not likely to be possible along Sir Alf Ramsey Way where the hazard rating is shown to be Significant.

In the event of a failure of the tidal flood defences, dry access/egress for the site may be achievable to the south of the site, along West End Road leading north. However, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

Safe refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, safe refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7mAOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the Environment Agency's flood warning service. Given the nature of fluvial flooding and the location of Ipswich at the lower end of the catchment, there is likely to be advanced warning of flooding associated with the River Gipping.

To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and place of safe refuge.

Reference to Appendix D outlines rate of onset and flood duration. This outlines that for flood compartment J, peak flood level could be reached on site within 2 hours from the breach. Flood water could remain within the flood compartment for 15hrs.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). The likely SuDS type for this site is attenuation.

Set-back Distance

All development should be set back 16m from the edge of the River Gipping. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m a Main River. Consent needs to be obtained from Suffolk County Council (in their capacity as the LLFA) for any works that may affect flow within the Ordinary Watercourse to the north of the site.

Site Name: Bus Depot, Sir Alf Ramsey Way									
Site ID:	IP00)4	Location:	Bi Ra	us Depot, Sir Alf amsey Way	Area (ha):		1.07	
Current Use:	Con	nmercial	Proposed Use:	R	esidential	Vulnerability Classification:		More Vulnerable	
Flood Zones ar	nd His	storic Flooding							
Flood Zone 1 (<0.1% AEP): 0%							t ing from 00%		

As it flows through Ipswich, the River Gipping becomes the River Orwell. A channel of the River Gipping / Orwell flows southeast close to the south western edge of the site, on the opposite side of the A137 West End Road. There is also a small unmodelled watercourse/ drain located to the north of the site. At this location the River Gipping / Orwell is tidally influenced. The site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. The site is shown to benefit from the presence of defences; there is a flood defence wall along the edge of the channel to the west of the site, and there is a tidal barrier further downstream on the River Orwell. The site is therefore at residual risk of fluvial or tidal flooding, in the event of a failure of these defences. This may require updating once the impact of the new modelling for the River Gipping is known.

The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1939 and 1953 which is recorded on the Environment Agency Historic Flood Map. Ipswich BC also hold records of flood incidents affecting the roads and pavements in this location.



Fluvial Flood Risk – Lower Gipping

Modelling of the Lower Gipping (Mott MacDonald September 2020), shows that floodwater remains in bank in this part of Ipswich during the 5% AEP, 1% and 0.1% AEP events. However, in the future there is potential that the risk of flooding from the Lower Gipping could increase as a result of climate change, assuming no alterations are made to the flood defences. In this scenario, the site is shown to be at risk during the 1% AEP event including a 65% allowance for climate change, with flood levels of 3.17m AOD on the site. Flood depths on the site are approximately 0.25 m – 1m, and the hazard rating is Low – Significant along the northern edge. The hazard rating to the east of the site is Significant. The site is also shown to be at risk during the 0.1% AEP event including 25% allowance for climate change, with a flood level of 3.97m AOD.



Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design flood (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk, i.e. in the event of failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the lpswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. In this scenario the site is exposed to a range of hazard rating from caution to danger to most with the highest category covering approximately a third of the site. Flood depths on site range from <1m to <0.25m.





Surface Water Flood Risk

The RoFSW mapping indicates that the site is at low and very low risk of surface water flooding. The RoFSW mapping identifies a surface water flow path to the north of the site, which is the course of a small watercourse.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 50%-75% is susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

The site is shown to be at <u>actual risk</u> of fluvial flooding from the Lower Gipping in the future as a result of climate change, and at <u>residual risk</u> of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to mitigate the actual risk of fluvial flooding in the future, and to manage the residual risk of tidal flooding.

Finished Floor Levels

Finished floor levels should be set 300mm above the fluvial design flood level including an allowance for climate change. The flood level on the site for the 1% AEP event including 65% climate change is 3.17m AOD.

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment J is 3.61 – 3.7m AOD (Figure 7-4).

Access / Egress

During the fluvial design flood (1% AEP including 65% climate change) dry access/egress for the site is achievable to the south along West End Road. Dry access may not be possible along the full length of Sir Alf Ramsey Way on the northern edge of the site where the hazard rating is shown to be Significant.

In the event of a failure of the tidal flood defences, dry access/egress for the site may be achievable to the south of the site, along West End Road leading north. However, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

Safe refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, safe refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7mAOD to 2118). This will also be adequate as a

safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the Environment Agency's flood warning service. Given the nature of fluvial flooding and the location of Ipswich at the lower end of the catchment, there is likely to be advanced warning of flooding associated with the River Gipping.

To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and place of safe refuge.

Reference to Appendix D outlines rate of onset and flood duration. This outlines that for flood compartment J, peak flood level could be reached on site within 2 hours from the breach. Flood water could remain within the flood compartment for 15hrs.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). The site is located within an area that is at high risk of groundwater flooding. The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Additional Information

A site-specific Flood Risk Assessment should confirm the level of flood risk posed to the site from the small unnamed watercourse flowing to the north of the site along the boundary of open space to the south of the Handford Road.

Site Name: Smart Street/Foundation Street										
Site ID:	IP01	l1b	Location:		Smart Street/Foundation Street			a (ha):	0.62	
Current Use:	Corr	nmercial	Propose Use:	d	Residential			nerability ssification:	More Vulnerable	
Flood Zones and Historic Records										
Flood Zone 1 Flood Zone 2 Flood Zone 3 (<0.1% AEP): 23% (0.1% AEP): 31% (1)				Flo (1%	ood Zone 3 % AEP): 47%	Flood Zone 3b (5%AEP): 0%		Area Benefit Defences: 5	t ing from 2%	

The tidal River Orwell is located approximately 250m to the south of the site. The southern part of the site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. This area is shown to benefit from the presence of defences; there is a flood defence wall and embankment along the edge of the River Orwell to the south of the site, and there is a tidal barrier further downstream on the River Orwell.

The Level 1 SFRA Figure 10 shows that this site is on the edge of the area that experienced flooding in 1953. Ipswich BC also hold records of flood incidents in this location associated with surface water flooding on the highway.



The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD.

Site Name: Smart Street/Foundation Street

Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. Under this scenario, only the very southern tip of the site is affected by flood hazard where there is a small area of 'caution' and danger to some. The flood risk is highest in the southwest. The flood depth for this site ranges between 0m and <0.5m. The overall flood depth for the site is low.



Residual Flood Risk - Combined Flood Hazard (0.5% AEP, 2118)

Residual Flood Risk - Combined Flood Depth (0.5% AEP, 2118)



Surface Water Flood Risk

Risk of Flooding from Surface Water (RoFSW)

The RoFSW mapping shows that the roads in this area are susceptible to overland flow and ponding. Whilst the site itself is shown to have a low risk of surface water flooding, the surrounding routes are at high risk.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk from this source.

Site Specific Recommendations

<u>In the future</u>, the site may be at <u>actual risk</u> of flooding from the Lower Gipping during an extreme flood. The site is at <u>residual risk</u> of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment H is 4 - 4.1 m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, dry access/egress for the site may be achievable around the northern edges of the site. Star Lane is shown to be flooded and would therefore not offer a dry route. However, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

Safe refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, safe refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7mAOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Site Name: Smart Street/Foundation Street

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and place of safe refuge.

Reference to Appendix D provides information on rate of onset and flood duration for compartment H which outlines that flood water could reach a peak within 2 hours of entering the flood compartment and could remain for over 12 hours.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water, especially given the risk of surface water flooding in the area surrounding the site. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). Attenuation storage is the most likely SuDS for the site.

Additional Information

The most likely flood receptor is the contribution to flooding at Key Street. Reducing the flood risk at this site is possible.

Site Name: Smart Street/Foundation Street											
Site ID:	IP011c	Location:		Smart Street/Foundation St			a (ha):	0.08			
Current Use:	Car park	Proposed U	se:	Residential			nerability ssification:	More Vulnerable			
Flood Zones and Historic Records											
Flood Zone 1 Flood Zone 2 Floo (<0.1% AEP): 100% (0.1% AEP): 0% (1%				od Zone 3 AEP): 0% Flood Zone 3b (5%AEP): 0%			Area Benefit	ting from Defences:			

The tidal River Orwell is located approximately 250m to the south of the site. The site is identified as Flood Zone 1. Areas to the southeast and south west of the site's boundary lie within Flood Zone 2.

The Level 1 SFRA Figure 2 shows that this site was not affected by flooding from the River Gipping in either 1939 or 1947 in addition the tidal surge of 2013 did not reach the site. The council do hold a record of a flood incident to the west of the site which may correlate with an area identified to be at high risk from surface water flooding.



The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). The site is also not at risk of flooding from the fluvial River Gipping during the *extreme* flood (0.1% AEP event including 25% allowance for climate change).

Site Name: Smart Street/Foundation Street

Tidal Flood Risk – River Orwell

The site is located within Flood Zone 1 and falls outside of any breach modelling inundation areas. The site is therefore not at residual risk of tidal flooding from the breach events modelled.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



Residual Flood Risk - Combined Flood Depth (0.5% AEP, 2118)



Site Name: Smart Street/Foundation Street

Surface Water Flood Risk

The RoFSW mapping shows that the site is at low risk of surface water flooding. However, the surrounding access routes are at high risk. An area of high risk located to the west of the site appears to correlate with a flood record.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence.

The risk of groundwater flooding in this area and potential for the use of infiltration suds should be further investigated during a site investigation survey.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk from this source. **Site Specific Recommendations**

The site is not at risk of flooding from the fluvial River Gipping. The site is not at residual risk of tidal flooding in the event of a failure of tidal flood defence infrastructure.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to consider the current risk of surface water flooding particularly in the northern part of the site, to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

Site Name: West End Road Surface Car Park										
Site ID:	IP0'	15	Location	Location:		West End Road Surface Car Park):	1.21	
Current Use:	Con	nmercial	Propose	Proposed Use:		Residential		oility:	More Vulnerable	
Flood Zones an	nd His	storic Reco	ords							
Flood Zone 1 Flood Zone 2 Flood Zone 2 (<0.1% AEP): 9% (0.1% AEP): 40% (1% AP)					c one 3 P): 51%	Flood Zone (5%AEP):	ə 3b 0%	Area Benefit Defences: 84	t ing from 4%	

As it flows through Ipswich, the River Gipping becomes the River Orwell. The watercourse flows east through Ipswich approximately 40m to the south of the site. At this location the watercourse is tidally influenced. Half of the site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. The site benefits from the presence of defences; there is a flood defence wall along the edge of the River Orwell channel to the south of the site, and there is a tidal barrier further downstream on the River Orwell. The site is therefore at residual risk of fluvial or tidal flooding, in the event of a failure of these defences. This may require updating once the impact of the new modelling for the River Gipping is known.

The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1939 and 1953 which is recorded on the Environment Agency Historic Flood Map. Ipswich BC also hold records of road and pavement flooding in this location.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD.

Site Name: West End Road Surface Car Park

Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. Under this scenario, parts of the site are classified as Low – Significant hazard, with depths up to 0.5m.

Residual Flood Risk - Combined Flood Hazard (0.5% AEP, 2118)



Site Name: West End Road Surface Car Park

Surface Water Flood Risk

Risk of Flooding from Surface Water (RoFSW)

The RoFSW mapping indicates that the site is at low risk of surface water flooding. The site is slightly elevated compared to the surrounding land, and there is just one area, in the east of the site, where the mapping suggests that surface water may pond, adjacent to Princes Street. However, council records show that the existing car park floods due to a lack of drainage and poor ground conditions. Flood water is currently pumped at Portman Road.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 4) shows that the site is located across two 1km squares of which <25% and between 50-75% are susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk from reservoir flooding.

Site Specific Recommendations

<u>In the future</u>, the site may be at <u>actual risk</u> of flooding from the Lower Gipping during an extreme flood. The site is at <u>residual risk</u> of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment J is 3.61 - 3.7m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, dry access/egress for the site may be achievable to the west along West End Road. However, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

Safe refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, safe refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Site Name: West End Road Surface Car Park

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and place of safe refuge.

Reference to Appendix D provides information on rate of onset and flood duration for compartment J which outlines that flood water could reach a peak within 2 hours of entering the flood compartment and could remain for over 12 hours.

Set-back Distance

All development should be set back 16m from the edge of the River Gipping. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m a Main River.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water, especially given the risk of surface water flooding in the area surrounding the site. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

The underling geology in this location is Lambeth Group which is permeable and may be suitable for infiltration techniques. However, the site is also located in an area which could be at risk of groundwater emergence (SFRA Appendix A Figure 13), therefore, the risk of groundwater flooding in this area should be further investigated during a site investigation survey to inform SuDS selection. It is considered that attenuation may be the most viable SuDS type for the site.

The existing car park floods due to a lack of drainage and poor ground conditions. Flood water is pumped at Portman Road. The surface water drainage strategy should consider drainage to the River Orwell.

Site Name: Land west of Greyfriars Road									
Site ID:	IP02	28b	Location:	Je G	ewsons, reyfriars Road	Are	a (ha):	0.9	
Current Use:	Com	nmercial	Proposed Use:	R	esidential	Vulnerability More		More Vulnerable	
Flood Zones an	nd His	storic Records							
Flood Zone 1 Flood Zone 2 Flood Zone 3 Flood Zone 3 Area Benefiting from (<0.1% AEP): 1% (0.1% AEP): 13% (1% AEP): 86% (5% AEP): 0% Defences: 91%								t ing from 1%	

As it flows through Ipswich, the River Gipping becomes the River Orwell. The river flows east approximately 300m to the south of the site. At this location the River Orwell is tidally influenced. Most of the site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. The site is shown to benefit from the presence of defences; there is an embankment along the edge of the channel to the south of the site and river walls upstream and downstream of the embankment, and there is a tidal barrier further downstream on the River Orwell. The site is therefore at residual risk of fluvial or tidal flooding, in the event of a failure of these defences.

The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1939 and 1953 which is recorded on the Environment Agency Historic Flood Map. Ipswich BC hold records of a number of flood incidents close to this site, associated with blocked and overflowing drains at the road junction with Star Lane.



The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD.

Site Name: Land west of Greyfriars Road

Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. Under this scenario, parts of the site are classified as Low – Significant hazard, with depths up to 1.0m.



Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)

Residual Flood Risk – Combined Flood Depth (0.5% AEP, 2118)



Site Name: Land west of Greyfriars Road

Surface Water Flood Risk

Risk of Flooding from Surface Water (RoFSW)

The RoFSW mapping indicates that the majority of the site is at low risk of surface water flooding. However, an area to the north west of the site may be susceptible to surface water ponding, along Wolsey Street and Cecelia Street.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 4) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

In the future, the site may be at <u>actual risk</u> of flooding from the Lower Gipping during an extreme flood. The site is at <u>residual risk</u> of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment J is 3.61 - 3.7m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, dry or low hazard access/egress for the site may be achievable to the north along Greyfriars Road towards the A1022. However, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

Safe refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, safe refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the

Site Name: Land west of Greyfriars Road

residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and place of safe refuge.

Reference to Appendix D provides information on rate of onset and flood duration for compartment J which outlines that flood water could reach a peak within 2 hours of entering the flood compartment and could remain for over 12 hours.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Additional Information

Ipswich BC has noted a potential risk to the site from combined sewers. Potential flood pathways and opportunities to reduce peak flows to the local sewer network though the use of SuDS should be included in the site design.

Site Name: 103-115 Burrell Road									
Site ID:	IP03	31	Location:	10 Ro	03-115 Burrell bad	Area	a (ha):	0.43	
Current Use:	Corr	nmercial	Proposed Use:	Re	esidential	Vulnerability A Classification:		More Vulnerable	
Flood Zones an	nd His	storic Records							
Flood Zone 1 (<0.1% AEP): 12	Flood Zone 2 (0.1% AEP): 7%	Flood Zone 3 (1% AEP): 81%		Flood Zone 3b Area Bene (5% AEP): 0% Defences:		Area Benefit Defences: 8	ti ng from 3%		

The tidal River Orwell flows east along the northern edge of the site. Most of the site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. The site is shown to benefit from the presence of defences; there is a flood defence wall along the edge of the River Orwell adjacent to the site, and there is a tidal barrier further downstream on the River Orwell.

On the south side of the River Orwell, where the site is located, there has historically not been any record of flooding. Ipswich BC hold some records of flood incidents to the east of the site where Burrell Road meets Bridge Street. The historical records indicate these incidents are related to the surface water drainage infrastructure being overwhelmed.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). The site is also not at risk of flooding from the fluvial River Gipping during the *extreme* flood (0.1% AEP event including 25% allowance for climate change).

Site Name: 103-115 Burrell Road

Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working.

In this modelled scenario, flood water is not shown to enter the site and there is no flood hazard shown on site.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)





Site Name: 103-115 Burrell Road

Surface Water Flood Risk

The RoFSW mapping identifies that the south western corner of the site and Burrell Road may be susceptible to surface water ponding. It is assumed that surface water drainage outfalls to the River Orwell in this location, and therefore surface water drainage may also be further hampered during high tide conditions.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk from this source.

Site Specific Recommendations

The site is not at risk of flooding from the fluvial River Gipping. The site may be at residual risk of tidal flooding in the event of a failure of tidal flood defence infrastructure.

Set-back Distance

All development should be set back 16m from the edge of the River Orwell. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m of the watercourse.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). The most likely SuDS to be used on this site is attenuation.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment D is 4m AOD (Figure 7-3). At this location, there is no relevant breach modelled and 4mAOD is applied as the maximum water level in the Orwell upstream of the barrier before flooding into compartment H occurs. The IFDMS is designed to prevent this in a 300 year return period event.

Access / Egress

In the event of a failure of the tidal flood defences close to the site, dry or low hazard access/egress for the site may not be achievable. However, depending on the time and location of the failure of the defences, there may not be sufficient

Site Name: 103-115 Burrell Road

time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

Safe refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, safe refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118).

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and place of safe refuge.

Site Name: 22 Stoke Street, IP2 8BX											
Site ID:	IP031b	Location:	22 Stoke Street, IP2 8BX	Area (ha):	0.18						
Current Use:	Unknown	Proposed Use:	Residential	Vulnerability Classification:	More Vulnerable						
Flood Zones an	nd Historic Records		· ·								
Flood Zone 1 (<0.1% AEP): 3	4% Flood Zone 2 (0.1% AEP): 26%	Flood Zone 3 (1% AEP): 40%	Flood Zone 3b (5% AEP): 0%	Area Benefi Defences: 4	t ing from 0%						
The tidal River C Flood Zones 2 a	Drwell is located approxim and 3. The south of the site	ately 10m to the no e is within Flood Zoi	rth of the site. The no ne 1. The north of the	orthern part of the si e site benefits from f	te is located in lood defences.						
The Level 1 SFF records of floodi	RA Figure 2 shows that thi ng to the east of the site a	s area has historica ssociated with the s	ally experienced flood surface water networl	ing in 1953. Ipswich k being blocked or c	BC also hold overwhelmed.						
B OUT OUT OUT OUT OUT OUT OUT OUT	0.07 0.11 0.14 Kilometers Kometers ta©Crown copyright and da forment Agency information@ ta©crown copyright and da forment Agency information@ ta©crown copyright and da forment Agency information@ tais Lewar Cipring	tabase right (2020).	FZ 3b — Main Rive FZ 3 — Ordinary FZ 2 ZZ Areas Be	ers Watercourses nefitting from Flood Defen	Current Site Other Sites						
Fluvial Flood R	isk – Lower Gipping										
T I											

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). The site is also not at risk of flooding from the fluvial River Gipping during the *extreme* flood (0.1% AEP event including 25% allowance for climate change).

Site Name: 22 Stoke Street, IP2 8BX

Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. In this scenario, the site is not shown to flood.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



Site Name: 22 Stoke Street, IP2 8BX

Surface Water Flood Risk

Risk of Flooding from Surface Water (RoFSW)

The RoFSW mapping shows that there are areas in the surrounding roads that are susceptible to overland flow and ponding. The site itself is has a low risk of surface water flooding.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk from this source.

Site Specific Recommendations

The site is not at risk of flooding from the fluvial River Gipping. The site may be at residual risk of tidal flooding in the event of a failure of tidal flood defence infrastructure.

Set-back Distance

All development should be set back 16m from the edge of the River Orwell. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m of the watercourse.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). The most likely SuDS to be used on this site is attenuation.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment D is 4m AOD (Figure 7-3). At this location, there is no relevant breach modelled and 4mAOD is applied as the maximum water level in the Orwell upstream of the barrier before flooding into compartment H occurs. The IFDMS is designed to prevent this in a 300 year return period event.

Access / Egress

In the event of a failure of the tidal flood defences close to the site, dry or low hazard access/egress for the site may not be achievable. However, depending on the time and location of the failure of the defences, there may not be sufficient

Site Name: 22 Stoke Street, IP2 8BX

time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

Safe refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, safe refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118).

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and place of safe refuge.

Site Name: Key Street/Star Lane/Burtons Site										
Site ID:	IP03	35	Location:		Key Street/Star Lane/Burtons Site		Area (ha):		0.54	
Current Use:	Con	nmercial	Proposed Use:		Residential		Vulnerability Classification:		More Vulnerable	
Flood Zones an	nd His	storic Rec	ords							
Flood Zone 1 Flood Zone 2 Flood Zone 2 (<0.1% AEP): 0% (0.1% AEP): 1% (1% AEP): 1%					2one 3 P): 99%	Flood Z (5%AE	Cone 3b P): 0%	Area Benefit Defences: 1	t ing from 00%	

The tidal River Orwell is located approximately 200m to the south of the site. The site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. This area is shown to benefit from the presence of defences; there is a flood defence wall and embankment along the edge of the River Orwell to the south of the site, and there is a tidal barrier further downstream on the River Orwell.

The Level 1 SFRA Figure 2 shows that this site is on the edge of the area that experienced flooding in 1953. Ipswich BC also hold records of flood incidents in this location associated with the surface water drainage systems being blocked or overwhelmed.



The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD.

Site Name: Key Street/Star Lane/Burtons Site

Tidal Flood Risk – River Orwell

Contains Environment Agency information©

Environment Agency and/or database right.

Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. In this scenario, tidal flood water inundates the site to depths of up to 1.25m resulting in a hazard rating of Significant (Danger to Most). The main access route along Star Lane is also affected.



Breach Locations

≤ 0.75

≤ 2.5

≤ 1

Residual Flood Risk - Combined Flood Hazard (0.5% AEP, 2118)

Site Name: Key Street/Star Lane/Burtons Site

Surface Water Flood Risk

The RoFSW mapping shows that the majority of the site is not located in an area of surface water flood risk, however, surrounding roads are at high risk of surface water flooding and ponding. Areas along Foundation Street, on the eastern edge of the site, and College Street along the south of the site, are at particular risk.



Environment Agency and/or database right.

Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

<u>In the future</u>, the site may be at <u>actual risk</u> of flooding from the Lower Gipping during an extreme flood. The site is at <u>residual risk</u> of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment H is 4 - 4.1m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, a low hazard access/egress route site may be achievable from the northern side of the site along Turret Lane. The route along College Street to the south of the site and Star Lane to the north are shown to have a hazard rating of Significant (Danger for Most) and would therefore not offer a safe route. Furthermore, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

Safe refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, safe refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Site Name: Key Street/Star Lane/Burtons Site

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and place of safe refuge.

Reference to Appendix D provides information on rate of onset and flood duration for compartment H which outlines that flood water could reach a peak within 2 hours of entering the flood compartment and could remain for over 12 hours.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water, especially given the risk of surface water flooding in the area surrounding the site. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible). Attenuation storage is the most likely SuDS for the site.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Additional Information

Ipswich BC have noted that there is a potential for flooding from the combined sewer at this location. Flood risk reduction should be possible by reducing peak flow to the sewer by using SuDS.

Site Name: Island Site											
Site ID:	IP03	37	Loc	cation:	Island Site	Area (ha):	6.02			
Current Use:	Corr	nmercial	Pro	oposed Use:	Residential	Vulnerat Classific	oility ation:	More Vulnerable			
Flood Zones an	nd His	storic Records	5								
Flood Zone 1 Flood Zone 2 Flood Zone 3 (<0.1% AEP): 0% (0.1% AEP): (1% AEP): 5% 95%					Flood Zone 3b (5% AEP): 0%		Area Benefiting f 57%	rom Defences:			

The site is located between the tidal River Orwell to the west and Neptune Marina to the east. Most of the site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. The site is shown to benefit from the presence of defences; there is a flood defence wall along the edge of the River Orwell channel to the west of the site, as well as the tidal barrier located in the narrow channel or the Orwell before it widens downstream. Water levels in the marina are managed, and there is a flood gate at the south of the marina. The site is therefore at residual risk of tidal flooding, in the event of a failure of the defences.

The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1953. Ipswich BC do not hold records of flood incidents on the site itself.



The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD.

Site Name: Island Site

Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the lpswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. In this scenario, the site is exposed to a range of hazard ratings with the highest being Significant (Danger to Most), covering approximately half of the site, with the remainder being Moderate (Danger to Some) and Low (Caution). The combined flood depth map shows that flood depths on site range from 0.25m to <1.25m, with the greatest depths in the north of the site.





Site Name: Island Site

Surface Water Flood Risk

Risk of Flooding from Surface Water (RoFSW)

The site is not shown to be at risk of surface water flooding or ponding on the Environment Agency RoFSW mapping.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations. The site location would lend itself to discharge to the River Orwell.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

In the future, the site may be at <u>actual risk</u> of flooding from the Lower Gipping during an extreme flood. The site is at <u>residual risk</u> of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment H is 4 - 4.1m AOD (Figure 7-4).

Access / Egress

Access to the site is currently from St Peter's Dock in the north, and Ship Launch Road in the south. Alternative access to the site could be achieved via the construction of a new bridge, e.g. to Mather Way. Depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

Safe refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, safe refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Site Name: Island Site

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and place of safe refuge.

Reference to Appendix D provides information on rate of onset and flood duration for compartment H which outlines that flood water could reach a peak within 2 hours of entering the flood compartment and could remain for over 12 hours.

The site is located within flood compartment H (refer to Figure 15 SFRA). Appendix D of the SFRA outlines that in this flood compartment the flood peak could be reached within 1.5hrs from breach and water may remain within the flood compartment for over 12 hours.

Due to the nature of the site, being an island, safe access may not be achievable. Consideration of the potential increase in pressure on emergency services should be included if the number of people in this location are to be increased. Consideration of the site vulnerability and development type and lifetime must be included in any proposals.

Safe refuge should be provided above the 0.1% AEP event tide level over the lifetime of the development. Assuming climate change to 2118 safe refuge must be provided above is 5.7mAOD.

Set-back Distance

All development should be set back 16m from the edge of the River Orwell. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m of the watercourse.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS.

Additional Information

Ipswich BC has outlined that the site is at risk of flooding from combined sewers, opportunities to reduce loading to the local sewer network should be sought.

Opportunities to plan a strategic new bridge to Mather Way linking to development of sites 50, 44 and 133 could be considered.

Site Name: Land between Gower Street and Great Whip Street											
Site ID:	IP03	39a	Locatior	1:	Land betwo Street and Street	een Gower Great Whip	Area (ha):		0.48		
Current Use:	Con	nmercial	Propose	d Use:	Residential		Vulnerability Classification:		More Vulnerable		
Flood Zones an	Flood Zones and Historic Records										
Flood Zone 1 Flood Zone 2 Fl (<0.1% AEP): 16% (0.1% AEP): 9% (1		Flood Z	Zone 3 Flood Zone 3 (5% AEP): 0		b Area Benef		ting from 2%				

The tidal River Orwell flows south east just to north east of the site. Most of the site is identified as Flood Zone 3, high probability of flooding from the tidal River Orwell, in the absence of flood defences. The site is shown to benefit from the presence of defences; there is a flood defence wall along the edge of the channel to the west of the site, and there is a tidal barrier further downstream on the River Orwell.

The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1953. Ipswich BC also hold records of flooding to the north of site where Vernon Street meets Bridge Street, associated with the surface water network being blocked or overwhelmed.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). The site is also not at risk of flooding from the fluvial River Gipping during the *extreme* flood (0.1% AEP event including 25% allowance for climate change).

Site Name: Land between Gower Street and Great Whip Street

Tidal Flood Risk - River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working.

In this scenario, the northern half of the site is affected by a range of hazards from Low (Caution) to Significant (Danger to Most). The south and west of the site is not shown to flood. Flood depths occur along the north east of the site and reach maximum depths of 1m.

Residual Flood Risk - Combined Flood Hazard (0.5% AEP, 2118)



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Main Rivers

≤ 0.25

≤ 1.75

≤ 2

≤ 2.25

≤ 2.5

≤ 4

≤ 5

Site Name: Land between Gower Street and Great Whip Street

Surface Water Flood Risk

Risk of Flooding from Surface Water (RoFSW)

The RoFSW mapping identifies the north eastern tip of the site to be at high risk of surface water flooding. A flow pathway appears to follow local highways around the site.



Groundwater Flood Risk

The AStGWF mapping (Level 1 SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk from this source.

Site Specific Recommendations

The site is at <u>residual risk</u> of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment C is 3.5m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, dry access/egress for the site may be achievable to the south of the site and onto Vernon Street. However, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

Safe refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, safe refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118).

Emergency planning

Site Name: Land between Gower Street and Great Whip Street

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and place of safe refuge.

Appendix D of the SFRA outlines that rate of onset to peak at this location (compartment C) is only 1.5 hour and flood water may remain on site for over 21hrs. This shows the importance of inclusion of a place of safe refuge.

Set-back Distance

All development should be set back 16m from the edge of the River Orwell. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m of a Main River.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to consider the current risk of surface water flooding particularly in the northern part of the site, to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

Additional Information

Low parts of the site and buildings in low areas within Dock St Pumping Station combined sewer catchment are the most likely flood receptors. A flood risk reduction should be possible by reducing peak flow to the sewer by using SuDS. Raising the ground and placing vulnerable buildings on higher parts of the site will improve its safety.

Site Name: Commercial Buildings, Star Lane										
Site ID:	IP043	Location:	Commercial Buildings, Star Lane	Area (ha):	0.7					
Current Commercial F Use: L		Proposed Use:	Residential	Vulnerability Classification:	More Vulnerable					
Flood Zones a	and Historic Re	ecords								
Flood Zone 1 (<0.1% AEP):	64% Flood 2 (0.1% 2	Zone 2 AEP): 16%	Flood Zone 3 (1% AEP): 21%	Flood Zone 3b (5%AEP): 0%	Area Benefiting from Defences: 18%					

The tidal River Orwell is located approximately 100m to the south of the site. The southern part of the site (21%) is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. This area is shown to benefit from the presence of defences; there is a flood defence wall and embankment along the edge of the River Orwell to the south of the site, and there is a tidal barrier further downstream on the River Orwell. The southern edge of the site is therefore at residual risk of tidal flooding, in the event of a failure of these defences.

The Level 1 SFRA Figure 2 shows that this site is on the edge of the area that experienced flooding in 1953. Ipswich BC also hold a number of records of flooding to the east of the site close to Bridge Street associated with the surface water drainage system being blocked or overwhelmed.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD.

Site Name: Commercial Buildings, Star Lane

Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. Under this scenario, parts of the site are classified as Low – Moderate hazard, with depths up to 0.5m. The hazard along Star Lane to the south of the site classified as Significant – Danger to Most.



Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)

Residual Flood Risk - Combined Flood Depth (0.5% AEP, 2118)



Site Name: Commercial Buildings, Star Lane

Surface Water Flood Risk

Risk of Flooding from Surface Water (RoFSW)

The RoFSW mapping shows that the roads in this area are susceptible to overland flow and ponding. Whilst the site itself is shown to have a low risk of surface water flooding, the surrounding routes are at high risk.



Groundwater Flood Risk

The AStGWF mapping (SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

<u>In the future</u>, the site may be at <u>actual risk</u> of flooding from the Lower Gipping during an extreme flood. The site is at <u>residual risk</u> of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment H is 4.0 - 4.1 m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, dry or low hazard access/egress for the site may be achievable to the north along Greyfriars Road towards the A1022. However, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

Safe refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, safe refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be adequate as

Site Name: Commercial Buildings, Star Lane

a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and place of safe refuge.

Reference to Appendix D provides information on rate of onset and flood duration for compartment H which outlines that flood water could reach a peak within 2 hours of entering the flood compartment and could remain for over 12 hours.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

Surface water discharge may be constrained at this site as the existing local surface water sewer is pumped to the combined sewer. Opportunities to reduce the loading on the existing sewer should be sought.

Additional Information

Flood pathways for the site include an overtopping event collapsing the defences, overland flow and sewer overflow. The site itself, adjacent buildings and roads and buildings around the Wet Dock especially adjacent Coprolite Street are the most likely flood receptors.

The site is sloping. Vulnerable buildings should be placed on the higher parts of the site or ground should be raised to make more areas higher. It should be ensured that ground raising does not increase flood risk elsewhere.

Site Name: Holywells Road (West)/Toller Road and Holywells Road (East)										
Site ID:	IP045 & IP064		Location:		Holywells Road /Toller Road		Area (ha):		West - 2.06 East - 1.2	
Current Use:	: Commercial		Proposed Use:		Residential		Vulnerability Classification:		More Vulnerable	
Flood Zones and Historic Records										
Site IP045										
Flood Zone 1 (<0.1% AEP): 0%		Flood Zone 2 (0.1% AEP): 17%		Flood Zone 3 (1% AEP): 83%		Flood Zone 3b (5% AEP): 0%		Area Benefiting from Defences: 100%		
Site IP064										
Flood Zone 1 (<0.1% AEP): 5	2%	Flood Zone (0.1% AEP	e 2): 19%	Flood Zo (1% AEP)	ne 3): 29%	Flood Zone 3k (5% AEP): 0%)	Area Benefi Defences: 3	ting from 30%	

The tidal River Orwell is located approximately 300m to the west of the sites.

Most of the West site and almost half of the East site are identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. This area is shown to benefit from the presence of defences; there is a flood defence wall along the edge of the River Orwell to the south of the site, and there is a tidal barrier on the River Orwell.

The Level 1 SFRA Figure 2 shows that this site is on the edge of the area that experienced flooding in 1953. Ipswich BC also hold records of road and pavement flooding in this location.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD.

Site Name: Holywells Road (West)/Toller Road and Holywells Road (East)

Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working.

IP045 Holywells Road 'west site' has a hazard rating ranging from Low to Extreme (Danger to All), with depths ranging from 1.5m in the south to <0.25 in the north. The western half of IP064 Holywells Road 'east site' is shown to be at Low -Significant hazard rating, with depths <1.25m.

Residual Flood Risk - Combined Flood Hazard (0.5% AEP, 2118)



Environment Agency and/or database right. Residual Flood Risk - Combined Flood Depth (0.5% AEP, 2118)



Danger to All

Site Name: Holywells Road (West)/Toller Road and Holywells Road (East)

Surface Water Flood Risk

The RoFSW mapping identifies:

- IP045 Holywells West there is a flow path crossing the southern quarter of the site and areas of higher surface water flood risk along Holywells road.
- IP064 Holywells East There appears to be a flow path crossing the central section of the site. This will need further consideration with regard to the location of new buildings and potential displacement of flood flows.



Environment Agency and/or database right.

Groundwater Flood Risk

The AStGWF mapping (SFRA Figure 13) shows that the site is located within a 1km square of which <25% is susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

In the future, the site may be at <u>actual risk</u> of flooding from the Lower Gipping during an extreme flood. The site is at <u>residual risk</u> of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in this part of compartment H, close to Breach 05 is 4.1 - 5.3m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, access/egress routes along Holywells Road may have a potential hazard rating of up to Significant ("Danger for most") and Extreme ("Danger for all"). Furthermore, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

Safe refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, safe refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be adequate as

Site Name: Holywells Road (West)/Toller Road and Holywells Road (East)

a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and place of safe refuge.

Reference to Appendix D provides information on rate of onset and flood duration for compartment H which outlines that flood water could reach a peak within 2 hours of entering the flood compartment and could remain for over 12 hours.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

Additional Information – both sites

As site plans progress, opportunities to reduce peak flows to the local sewer network should be sought as Ipswich BC are aware of frequent deep flooding of Holywells Road.

The risk of flooding due to collapsing embankments along the canal in Holywells park has been reduced since 2012/13 but there is still a major surface water flooding issue to resolve.

IP064 Holywells Road East

Caution should be applied to Holywells East IP064 as while mapping included in this proforma illustrates risk from the River Orwell, there is a raised canal to the east which has not been fully mapped.

The sloping areas of the site are mainly above Flood Zone 3. A high-level trunk sewer crosses the site. The embankment within the site is in poor condition, the outlet is likely to be too small. These risks require further consideration as part of a site-specific FRA.

Site Name: Land at Commercial Road									
Site ID:	IP047		Location:		Land at Commercial Road		Area (ha):		3.12
Current Use:	Current Use: Commercial		Proposed Use:		Residential		Vulnerability Classification:		More Vulnerable
Flood Zones and Historic Records									
Flood Zone 1 (<0.1% AEP): 0%		 Flood Zone 2 (0.1% AEP): 0% 		Flood Zone 3 (1% AEP): 100%		Flood Zone 3b (5% AEP): 0%		Area Benefiting from Defences: 100%	

As it flows through Ipswich, the River Gipping becomes the River Orwell. The watercourse flows east through Ipswich along the southern edge of the site. At this location the watercourse is tidally influenced. The site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. The site benefits from the presence of defences; there is a flood defence wall along the edge of the River Orwell channel, and there is a tidal barrier further downstream on the River Orwell.

The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1939 and 1953 which is recorded on the Environment Agency Historic Flood Map. Ipswich BC also hold records of flooding on the pavements and roads in this location associated with the surface water drainage network being blocked or overwhelmed.



Fluvial Flood Risk – Lower Gipping

The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). However, in the future, as a result of climate change, the site may be at risk of flooding during the *extreme flood* event. The flood level for the 0.1% AEP event including 25% allowance for climate change in this area is 3.97m AOD.

Site Name: Land at Commercial Road

Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design event (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk in the event of a failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the Ipswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. In this scenario the site is shown to have areas of Significant hazard (Danger to Most) at the eastern boundary, with depths up to 1.25m; and Moderate hazard (Danger to Some) in the west, with depths up to 1m. However, it should be noted that the modelling currently assumes ground raising across this site which has not been implemented, and therefore in the current situation depths are likely to be similar across the whole site and could be greater.

Residual Flood Risk - Combined Flood Hazard (0.5% AEP, 2118)



Residual Flood Risk - Combined Flood Depth (0.5% AEP, 2118)



Site Name: Land at Commercial Road

Surface Water Source

The RoFSW mapping indicates that the site is generally at low risk of surface water flooding. There may be some risk of surface water ponding on the northern edge of the site along Commercial Road.



Groundwater Flood Risk

The AStGWF mapping (SFRA Figure 13) shows that the site is located across two 1km squares of which <25% and between 25-50% are susceptible to groundwater emergence. The risk of groundwater flooding in this area should be further investigated during a site investigation survey.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

<u>In the future</u>, the site may be at <u>actual risk</u> of flooding from the Lower Gipping during an extreme flood. The site is at <u>residual risk</u> of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to manage these risks.

Finished Floor Levels

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment J is 3.61 – 3.7m AOD (Figure 7-4).

Access / Egress

In the event of a failure of the tidal flood defences, access/egress routes along Commerical Road / Grafton Way may have a potential hazard rating of up to Significant ("Danger for most") and Extreme ("Danger for all"). Furthermore, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

Safe refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, safe refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118). This will also be adequate as

Site Name: Land at Commercial Road

a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the warning service. To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and place of safe refuge.

The site is located within flood compartment J (refer to Figure 15 SFRA). Appendix D of the SFRA outlines that in this flood compartment the flood peak could be reached within 1.5hrs from breach and water may remain within the flood compartment for over 12 hours.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

Set-back Distance

All development should be set back 16m from the edge of the River Orwell. The Environment Agency need to be consulted and an Environmental Permit obtained for any works within 16m a Main River.

Site Name: Old Cattle Market site, Portman Road (South)									
Site ID:	IP051 L		Location:	Old Cattle Ma Road (South)	arket site, Portman	Area (ha):	2.21		
Current Use:	Commercial and car parking		Proposed Use:	Primarily offic and/or leisure as a seconda	ces; potential hotel e and/or car parking ary use.	Vulnerability Classification:	Hotel: More Vulnerable		
Flood Zones and Historic Flooding									
Flood Zone 1 (<0.1% AEP): 0%		Flood Zone 2 0% (0.1% AEP) :		Flood Zone 3 (1% AEP): 100%	Flood Zone 3b (5% AEP): 0%	Area Benefiti Defences: 10	ng from		

As it flows through Ipswich, the River Gipping becomes the River Orwell. The site is identified as Flood Zone 3, high probability of flooding from the Gipping / Orwell, in the absence of flood defences. The site benefits from the presence of defences; there are embankments and flood defence walls along the edge of the River Gipping / Orwell channel, and there is a tidal barrier further downstream on the River Orwell. The site is therefore at residual risk of fluvial or tidal flooding, in the event of a failure of these defences. This may require updating once the impact of the new modelling for the River Gipping is known.

The Level 1 SFRA Figure 2 shows that this area has historically experienced flooding in 1939 and 1953 which is recorded on the Environment Agency Historic Flood Map. Ipswich BC also hold records of flooding along Portman Road associated with blocked or overwhelmed drainage systems.



Fluvial Flood Risk – Lower Gipping

Modelling of the Lower Gipping (Mott MacDonald September 2020), shows that floodwater remains in bank in this part of Ipswich during the 5% AEP, 1% and 0.1% AEP events. However, in the future there is potential that the risk of flooding from the Lower Gipping could increase as a result of climate change, assuming no alterations are made to the flood defences. In this scenario, there is shown to be a risk of flooding along Sir Alf Ramsey Way and into the western edge of the site risk during the 1% AEP event including a 65% allowance for climate change, with flood levels of 2.67m AOD on the site. A small area of the is shown to flood, with depths of approximately 0.25 m, and a hazard rating of Low. The site is also shown to be at risk during the 0.1% AEP event including 25% allowance for climate change, with a flood level of 3.97m AOD.



Tidal Flood Risk – River Orwell

Modelling of the River Orwell shows that the site is protected from flooding during the design flood (0.5% AEP event) including an allowance for climate change due to the presence of the IFDMS. The risk of tidal flooding is therefore a residual risk, i.e. in the event of failure of the flood defence infrastructure.

A composite hazard map has been created to illustrate residual flood hazard. This assumes that the lpswich flood barrier is operating as designed and replicates maximum flood hazard should a breach occur at location BR05 and BR07 assuming that the pumping station at IP04 is not working. Flood hazard mapping shows most of the site to be located in an area classified as Significant 'danger to most'. Flood depth mapping shows most of the site to be located within an area which could experience flood depths of approximately 1.25m.

Residual Flood Risk – Combined Flood Hazard (0.5% AEP, 2118)



Residual Flood Risk - Combined Flood Depth (0.5% AEP, 2118)



Surface Water Flood Risk

The RoFSW mapping identifies there is a high risk of surface water flooding to the site and the surrounding area. Portman Road is shown to be a noticeable surface water flow path and area susceptible to surface water ponding.



Groundwater Flood Risk

The AStGWF mapping (SFRA Figure 13) shows that the site is located within a 1km square of which 50%-75% is susceptible to groundwater emergence.

The underlying geology in this location is the White Chalk subgroup which is not suitable for infiltration type drainage, regardless of ground water levels. Appendix A Figure 17 shows which areas of Ipswich are likely to have suitable ground for infiltration. The risk of groundwater flooding and possible use of infiltration SUDS in this area should be further investigated and informed by ground investigations.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

A small area of the site is shown to be at <u>actual risk</u> of fluvial flooding from the Lower Gipping in the future as a result of climate change. The site and surrounding area are shown to be at <u>residual risk</u> of tidal flooding in the event of a failure of the flood defence infrastructure. The following measures are recommended to mitigate the actual risk of fluvial flooding in the future, and to manage the residual risk of tidal flooding.

Finished Floor Levels

Finished floor levels should be set 300mm above the fluvial design flood level including an allowance for climate change. The flood level on the site for the 1% AEP event including 65% climate change is 2.67m AOD.

In relation to the residual risk of tidal flooding, finished floor levels for sleeping accommodation should be set above the maximum breach flood level, which in compartment J is 3.61 – 3.7m AOD (Figure 7-4).

Access / Egress

During the fluvial design flood (1% AEP including 65% climate change) dry access/egress for the site is achievable to the south along Great Gipping Street and Portman Road to the north, or Princes Street to the south east.

In the event of a failure of the tidal flood defences, the preferable access/egress for the site may be from the eastern side and onto Princes Street heading east. However, depending on the time and location of the failure of the defences, there may not be sufficient time to enable occupants to leave the site prior to a flood event and the safest course of action may be to remain within the development within a safe place refuge.

Safe Refuge

Safe refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, safe refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7mAOD to 2118). This will also be adequate as a safe place of refuge for the extreme fluvial flood, as the flood level for the 0.1% AEP event including 25% allowance for climate change is 3.97m AOD.

Emergency planning

The site is shown to be within the Environment Agency Flood Warning Area for the tidal River Orwell at Ipswich wet dock and waterfront, to upstream of Stoke Bridge; occupants should register to receive the Environment Agency's flood warning service. Given the nature of fluvial flooding and the location of Ipswich at the lower end of the catchment, there is likely to be advanced warning of flooding associated with the River Gipping.

To manage the residual risk of flooding associated with a failure of the flood defence measures in this area, Flood Response Plans should be prepared by occupants of the site including details of egress routes and place of safe refuge.

Reference to Appendix D outlines rate of onset and flood duration. This outlines that for flood compartment J, peak flood level could be reached on site within 2 hours from the breach. Flood water could remain within the flood compartment for 15hrs.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water during high tide conditions. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

Additional Information

Raising the site and providing an off-site safe access road to Civic Drive will improve the safety of the site. Raised areas should include the redevelopment of existing vulnerable housing to the north of the site.

Site Name: Land between Lower Orwell Street and Star Lane									
Site ID:	IP052	Location:		Land between Lower Orwell Street & Star Lane			rea (ha):	0.39	
Current Use:	Commercial	Proposed Use:		Residential		Vulnerability Classification:		More Vulnerable	
Flood Zones and Historic Records									
Flood Zone 1 (<0.1% AEP): 94%	Flood Zon 6 (0.1% AEP	Flood Zone 2 I (0.1% AEP): 5%		ne 3): 1%	Flood Zone 3b (5% AEP): 0%		Area Benefitin Defences: 0%	ig from	

The tidal River Orwell is located approximately 250m to the south of the site. The southern edge of the site is identified as Flood Zone 3, high probability of flooding, in the absence of flood defences. This area is shown to benefit from the presence of defences; there is a flood defence wall and embankment along the edge of the River Orwell to the south of the site, and there is a tidal barrier further downstream on the River Orwell. The site is therefore at residual risk of tidal flooding, in the event of a failure of these defences.

The Level 1 SFRA Figure 2 shows that this site is on the edge of the area that experienced flooding in 1953.



The site is not at risk of flooding from the fluvial Lower Gipping during the *design flood* (during either the present day or including for an allowance for climate change into the future). The site is also not at risk of flooding from the fluvial River Gipping during the *extreme* flood (0.1% AEP event including 25% allowance for climate change).

Site Name: Land between Lower Orwell Street and Star Lane

Tidal Flood Risk – River Orwell

The site is located largely within Flood Zone 1 and falls outside of any breach modelling inundation areas. The site is therefore not at residual risk of tidal flooding from the breach events modelled.





Site Name: Land between Lower Orwell Street and Star Lane

Surface Water Flood Risk

The RoFSW mapping shows that the site is at low risk of flooding from surface water, however, the roads serving the site are at high risk of overland flow and flooding.



Groundwater Flood Risk

The AStGWF mapping (SFRA Figure 13) shows that the site is located within a 1km square of which 25%-50% is susceptible to groundwater emergence.

The underling geology in this location is Lambeth Group which is permeable however, due to the high groundwater flood risk it is unlikely that infiltration techniques will be viable. The risk of groundwater flooding and use of infiltration SUDS in this area should be further investigated during a site investigation survey.

Other sources

The Environment Agency 'Risk of Flooding from Reservoirs' mapping shows that the site is not at risk.

Site Specific Recommendations

The site is not at risk of flooding from the fluvial River Gipping. The site is not at residual risk of tidal flooding in the event of a failure of tidal flood defence infrastructure.

Site Layout and Design

The drainage strategy for the site should be considered early in the site planning process to ensure adequate inclusion of SuDS and adequate provision for the management of surface water, especially given the high risk of surface water flooding in the area immediately surrounding the site and the potential flowpath through the site. SuDS should be considered in accordance with the hierarchy of SuDS (i.e. considering infiltration measures first wherever possible).

Access / Egress

In the event of flooding, safe access and egress away from the site would be to the north along Lower Orwell Street.

Safe Refuge

Safe refuge must be provided above the extreme flood level.

With respect to the residual risk of tidal flooding, safe refuge must be provided above the 0.1% AEP flood level including an allowance for climate change over the lifetime of the development (5.7m AOD to 2118).