Project:	A63 Castle Street Improvement, Hull		
Document title:	Additional Flood Risk Information Technical Note		
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Author:	Stephen Hughes	**Date:**	22/01/2019
Checker:	Jason Ball	**Date:**	28/02/2019
Approver:	John McKenna	**Date:**	01/03/2019

1 Summary

This document provides additional information on flood risk associated with the A63 Castle Street Improvement, Hull. The purpose of the document is to evaluate changes in flood depths and Flood Hazard Ratings as a result of the Scheme.

A review of the additional information confirms:

- There are relatively small areas of additional flood extent as a result of the Scheme, but there are also areas that no longer flood as a result of the Scheme. The precise extent and location of these changes in flood extent depends on the source and return period of flooding. Generally, flood extent is decreased to the north and north-west of the Scheme and increased to the east of the Scheme.
- Proportional changes in maximum flood depth are variable depending on the flooding scenario and the return period of flooding. Areas of proportional flood depth increase are generally to the east, south east and north east of the Scheme and are most pronounced for the 1 in 200 year and 1 in 1000 flood events from both the River Hull and Humber Estuary wave overtopping. The Humber wave overtopping 1 in 200 year plus climate change floods show large areas to the north of the Scheme would see moderate proportional reductions in maximum flood depth for both defended and undefended scenarios. The Scheme shows only negligible proportional change in maximum flood depth for pluvial flood events.
- There are areas of increase and decrease in Flood Hazard Rating as a result of the Scheme. The precise extent and location of these changes in flood extent depend on the source and return period of flooding. Generally, Flood Hazard Ratings are reduced to the north and west of the Scheme and on the A63 carriageway itself. Areas to the east of the Scheme and within the underpass generally show an increase in Flood Hazard Rating.
- In order to prevent flooding of the underpass, adjacent road levels would need to be raised to a minimum of 7.28m AOD plus a suitable freeboard allowance in order to prevent flood waters entering the underpass from the east. Such a significant

raising of road levels is not feasible as part of the Scheme and would substantially alter the transfer of flood risk to other receptors in Flood Zone 3.

- The Environment Agency propose to upgrade the flood defences on the north bank of the Humber Estuary to provide a standard of protection of 1 in 200 years and with an allowance for climate change to the year 2040. The upgraded defences will be completed by 2021. This will provide a benefit to the Scheme in terms of reduced risk of flooding from the Humber Estuary.
- Flood risk to and from temporary compounds during construction of the Scheme will be managed using best practice methods stipulated in the Outline Environmental Management Plan and will include requirements for robust emergency response plans to significant flood events.

2 Introduction

The purpose of this technical note is to provide and review additional flood risk information relevant to the Scheme. This technical note should be read in conjunction with Volume 3 Appendix 11.2 of the A63 Castle Street Improvement, Hull Environmental Statement HE514508-MMSJV-EWE-S0-RP-LE-000004. An agreement to provide this additional information was made in a meeting with the Environment Agency in August 2018 (see Volume 3 Appendix 11.9 of the A63 Castle Street Improvement, Hull Environmental Statement HE514508-MMSJV-EWE-S0-RP-LE-000013) and is summarised below:

- Plans showing comparisons of flood extents to identify additional areas of flooding or areas no longer at risk of flooding as a result of the Scheme (section 2.1)
- Plans or data tables showing changes in flood depth as a proportion of the existing (baseline) flood depth (section 2.2)
- Plans or figures highlighting areas of change in Flood Hazard (section 2.3)
- A review of road levels and flood depth information to identify the level at which the road must be constructed to manage flooding of the underpass from Humber wave overtopping or River Hull tidal flooding events (section 2.4)
- A review of the potential impacts of proposed flood defence upgrades as part of the Humber Hull Frontages scheme based on information on these upgrades to be supplied by the Environment Agency (section 2.5)

This technical note also includes responses to a letter from the Environment Agency to Highways England on 28 August 2018 (section 2.6). This letter mainly concerned flood risk posed to and from temporary construction compounds and also access to these compounds during a flood event.

2.1 Comparison of flood extents

Figures 1 to 8 provide plans comparing existing flood extents with the extent of flooding during operation of the Scheme. These figures show areas of flooding common to both the existing and Scheme conditions, areas that currently flood but would not flood during the operation of the Scheme and *vice versa*.

Figure 1 shows the extent of flooding as a result of a 1 in 100-year plus 30% climate change pluvial flood event would be largely unchanged by the presence of the Scheme.

Figure 2 shows areas to the north of the proposed underpass that would not flood as a result of the Scheme and areas to the east (the Fruit Market) and north-east (Queen's Gardens and High Street) that would flood during operation of the Scheme during a 1 in 200-year Humber wave overtopping event.

Figure 3 shows small, isolated areas around Princes Quay, Humber Dock and Queen's Gardens that would flood during operation of the Scheme during a 1 in 1000-year Humber wave overtopping event. Conversely, there are small, isolated areas around, and to the north of, the Scheme that would no longer flood during the operation of the Scheme.

Figure 4 shows that the extent of flooding would remain largely unchanged within the study area, during a 1 in 200-year plus climate change Humber wave overtopping event.

Figure 5 shows small isolated areas to the east (Princes Quay and Humber Dock) and north that would flood during operation of the Scheme during a 1 in 200-year undefended Humber Estuary tidal flooding event. Figure 5 also shows small, isolated areas around, and to the north of the Scheme that would no longer flood during operation. Figure 6 shows a similar pattern of change for a 1 in 200-year plus climate change undefended Humber Estuary tidal flooding event.

Figure 7 shows relatively large areas to the west and north that would no longer flood during operation of the Scheme during a 1 in 200-year River Hull tidal flood event should the Hull Tidal Surge Barrier fail to close. Small, isolated areas around Princes Quay, Humber Dock and the Fruit Market would flood. Figure 8 shows a similar pattern during a 1 in 1000-year River Hull tidal flood event although the area that no longer floods to the west and north is larger.

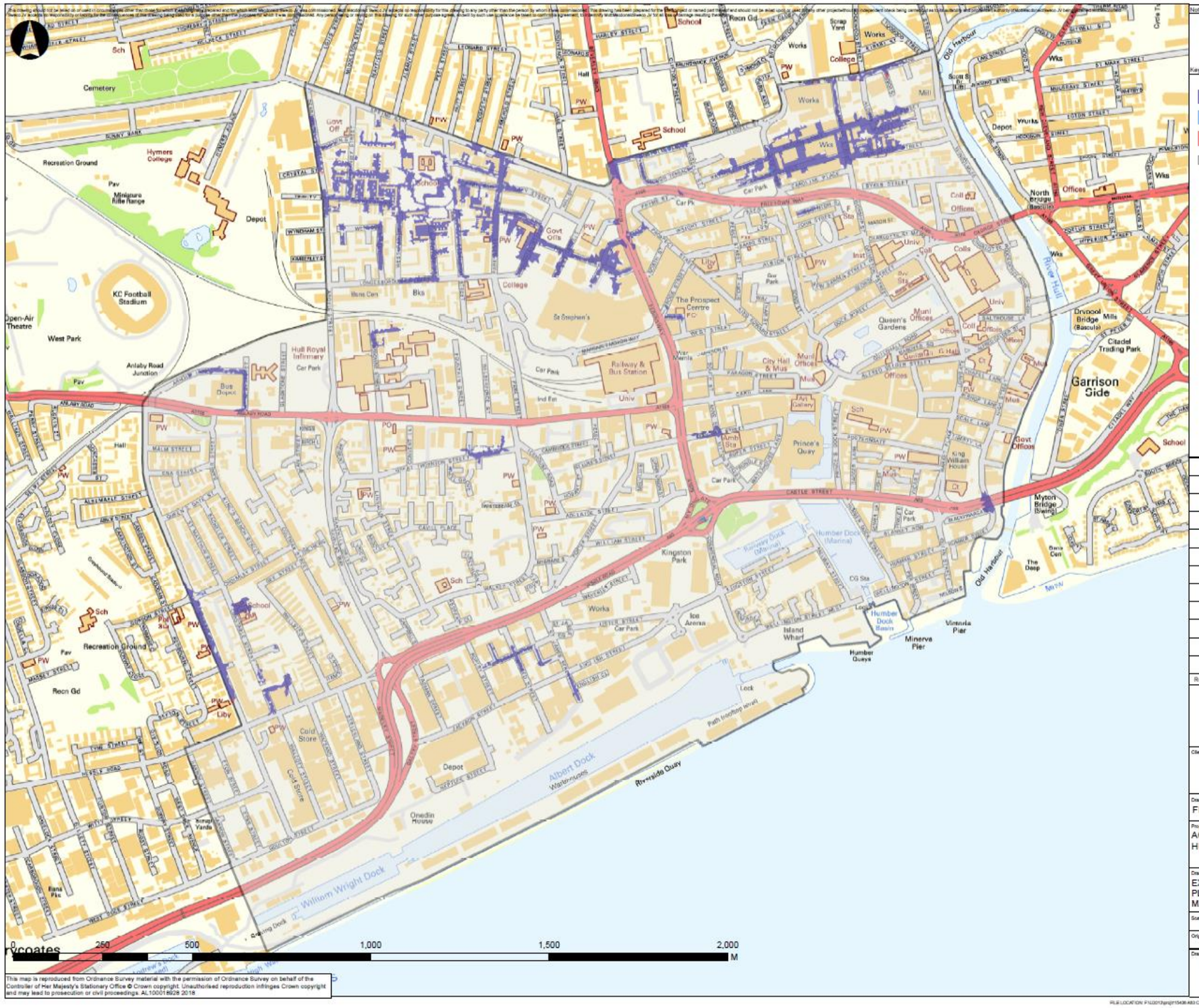


Figure 1: Difference in flood extents during a 1 in 100-year plus 30% climate change pluvial flood event

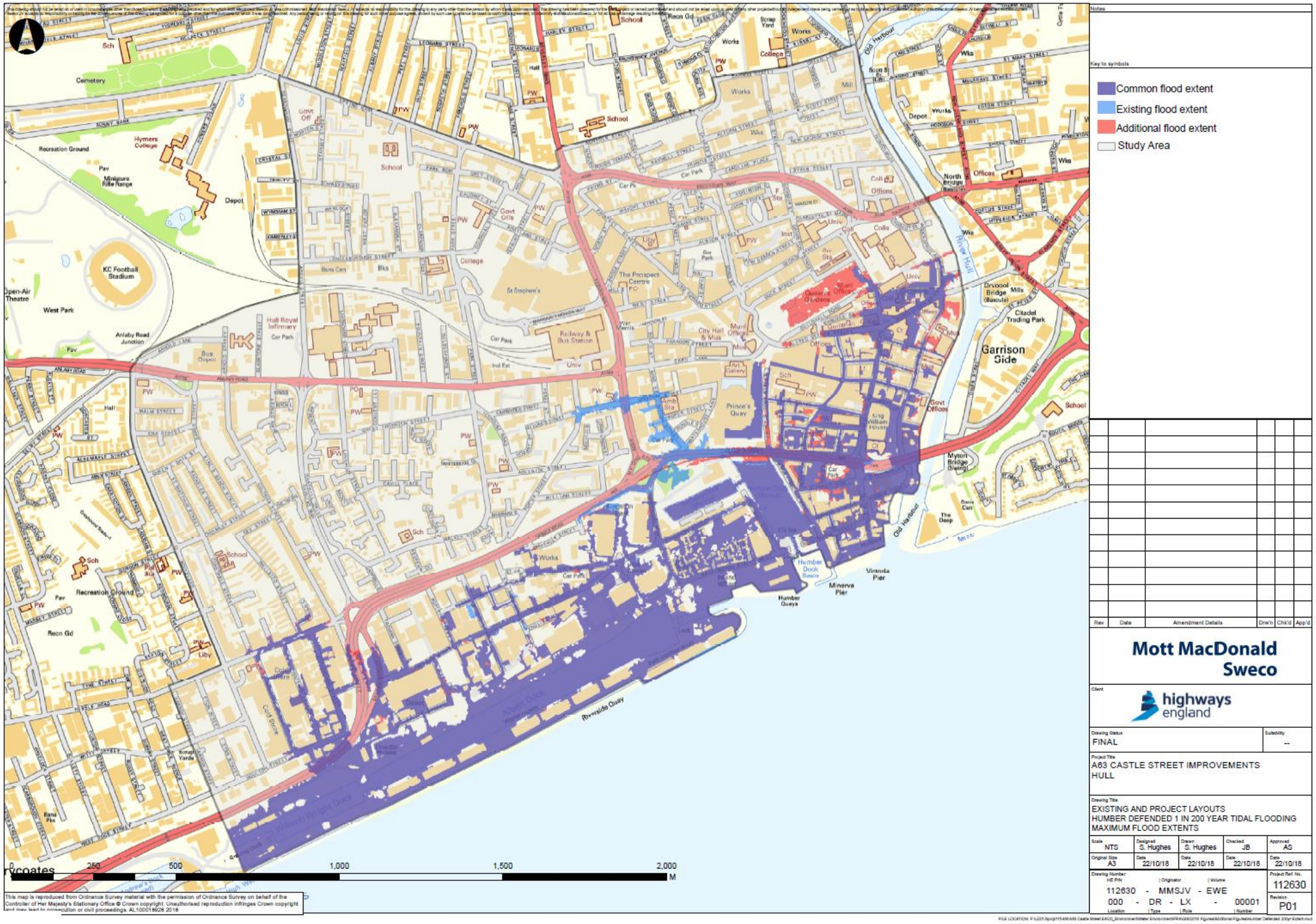


Figure 2: Difference in flood extents during a 1 in 200 year defended Humber Estuary wave overtopping flood event

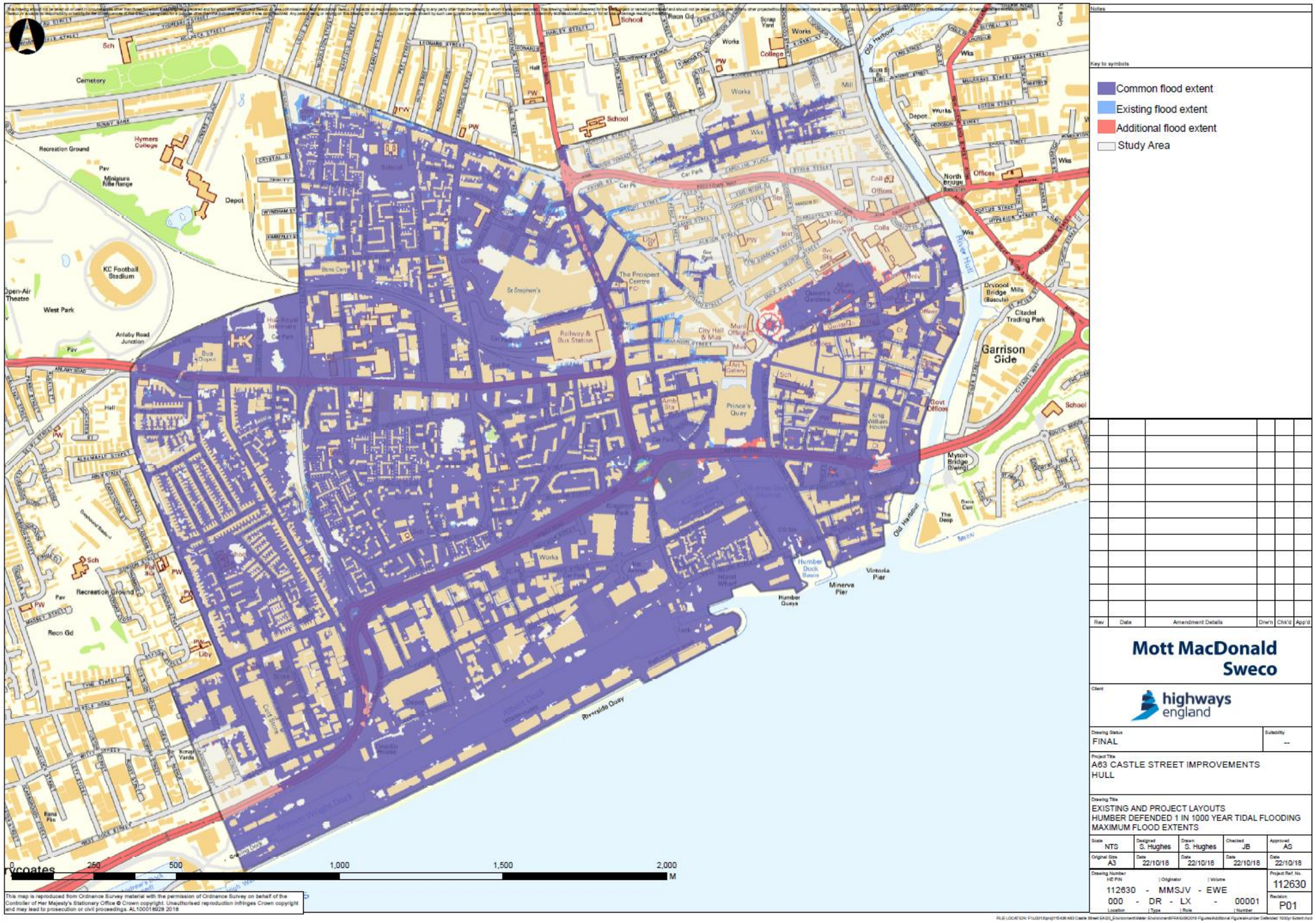


Figure 3: Difference in flood extents during a 1 in 1000 year defended Humber Estuary wave overtopping flood event

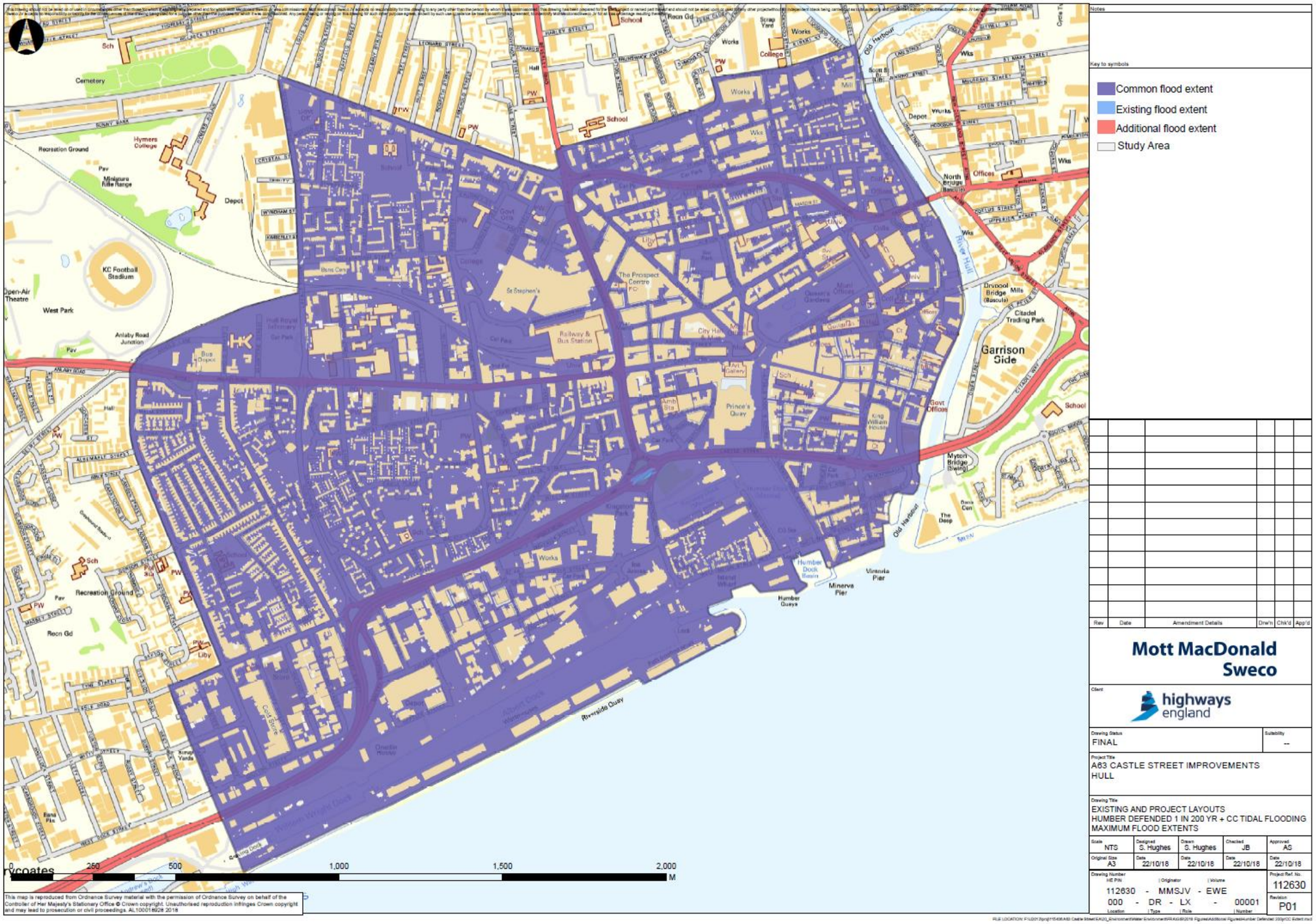


Figure 4: Difference in flood extents during a 1 in 200-year plus climate change defended Humber Estuary wave overtopping flood event

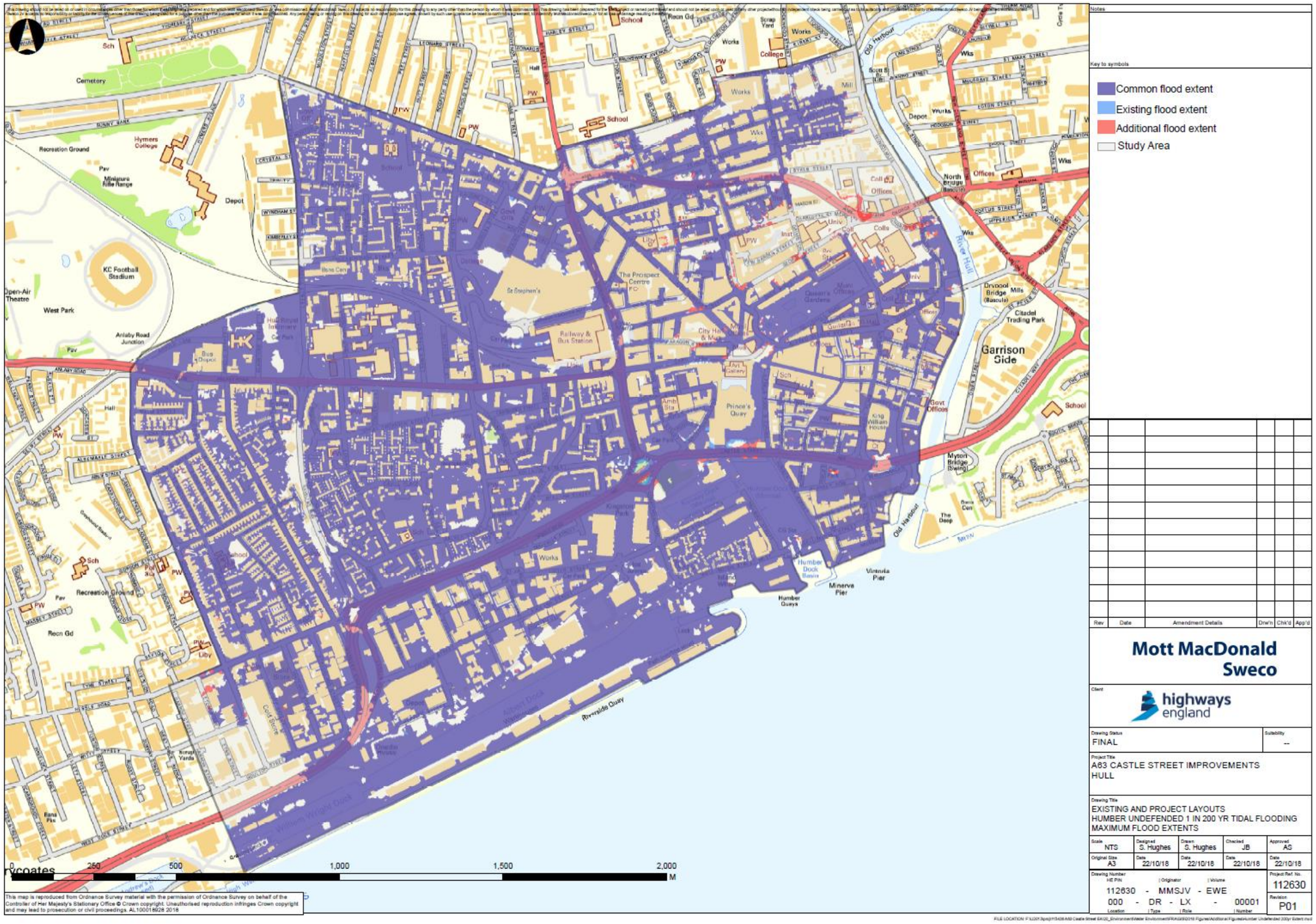
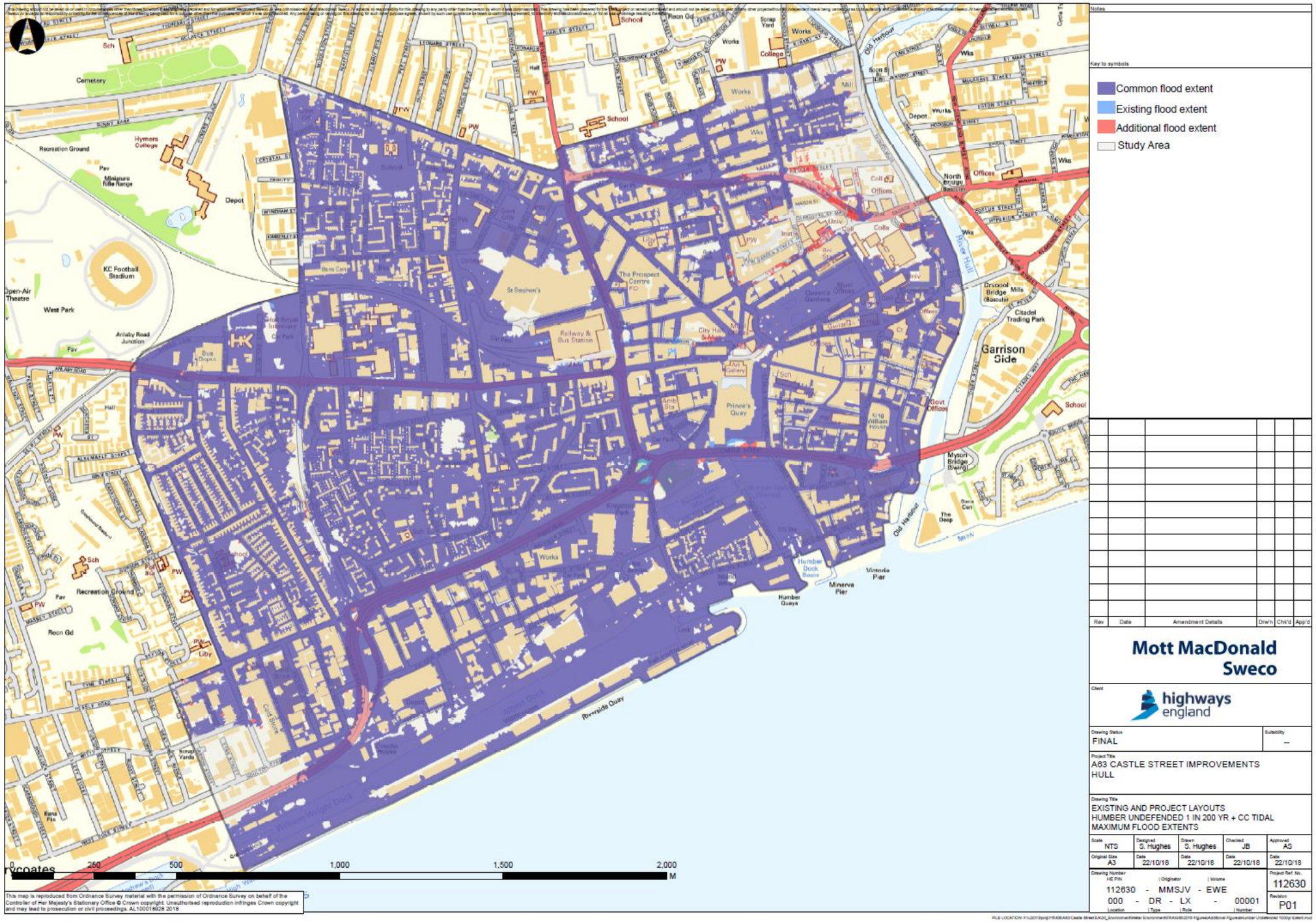


Figure 5: Difference in flood extents during a 1 in 200-year undefended Humber Estuary tidal flood event



Notes

Key to symbols

- Common flood extent
- Existing flood extent
- Additional flood extent
- Study Area

Rev	Date	Amendment Details	Drw'n	Chk'd	App'd

Mott MacDonald
Sweco

Client: highways england

Drawing Status: FINAL

Suitability: --

Project Title: A63 CASTLE STREET IMPROVEMENTS
HULL

Drawing Title: EXISTING AND PROJECT LAYOUTS
HUMBER UNDEFENDED 1 IN 200 YR + CC TIDAL
MAXIMUM FLOOD EXTENTS

Scale	Designed	Drawn	Checked	Approved
NTS	S. Hughes	S. Hughes	JB	AS
Original Size	Date	Date	Date	Date
A3	22/10/18	22/10/18	22/10/18	22/10/18

Drawing Number: HE PIN | Originator | Volume
112630 - MMSJV - EWE
000 - DR - LX - 00001
Location | Type | Role | Number

Project Ref. No.: 112630

Revision: P01

Figure 6: Difference in flood extents during a 1 in 200-year plus climate change undefended Humber Estuary tidal flood event

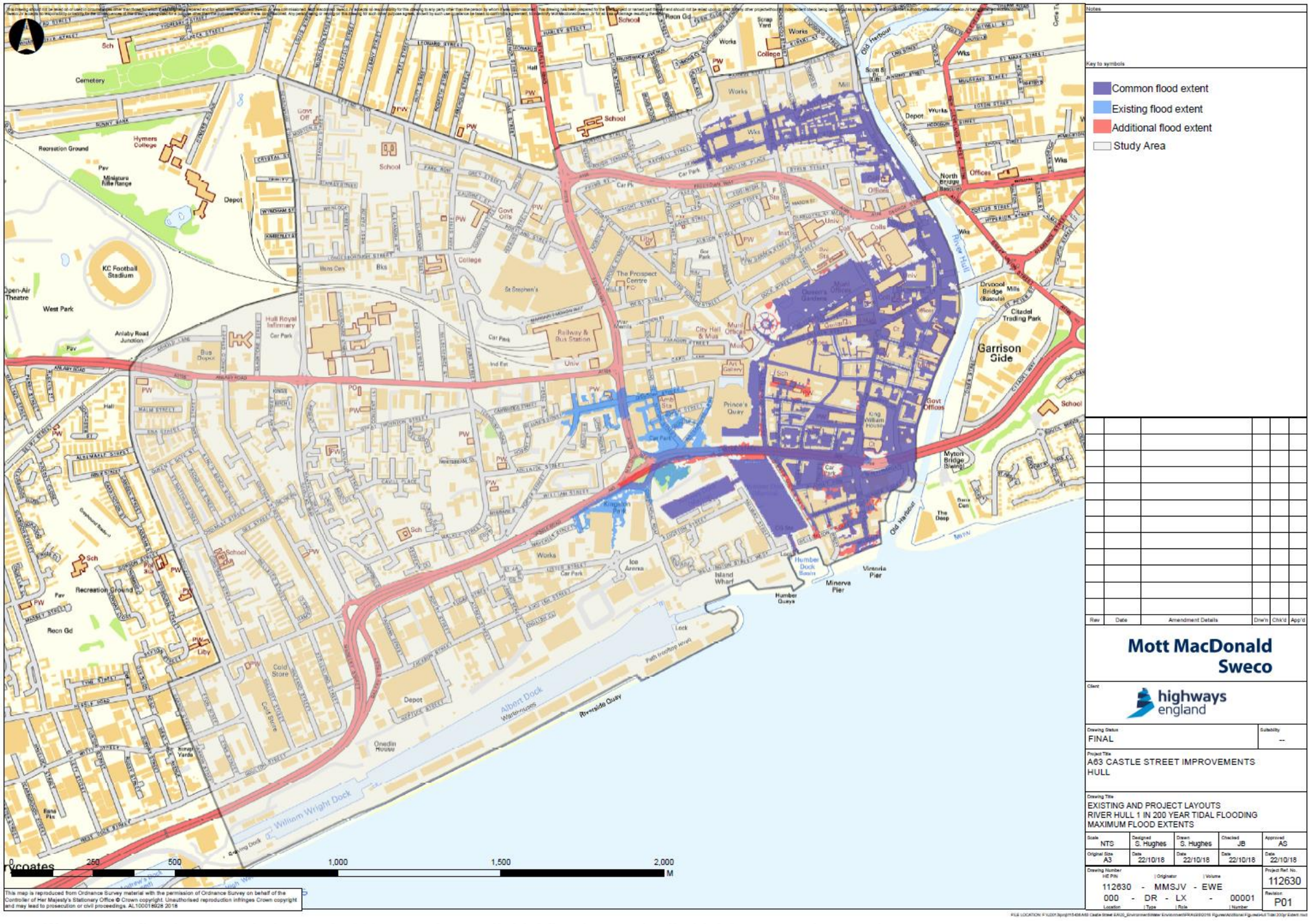


Figure 7: Difference in flood extents during a 1 in 200-year River Hull tidal flood event (Hull Tidal Surge Barrier open)

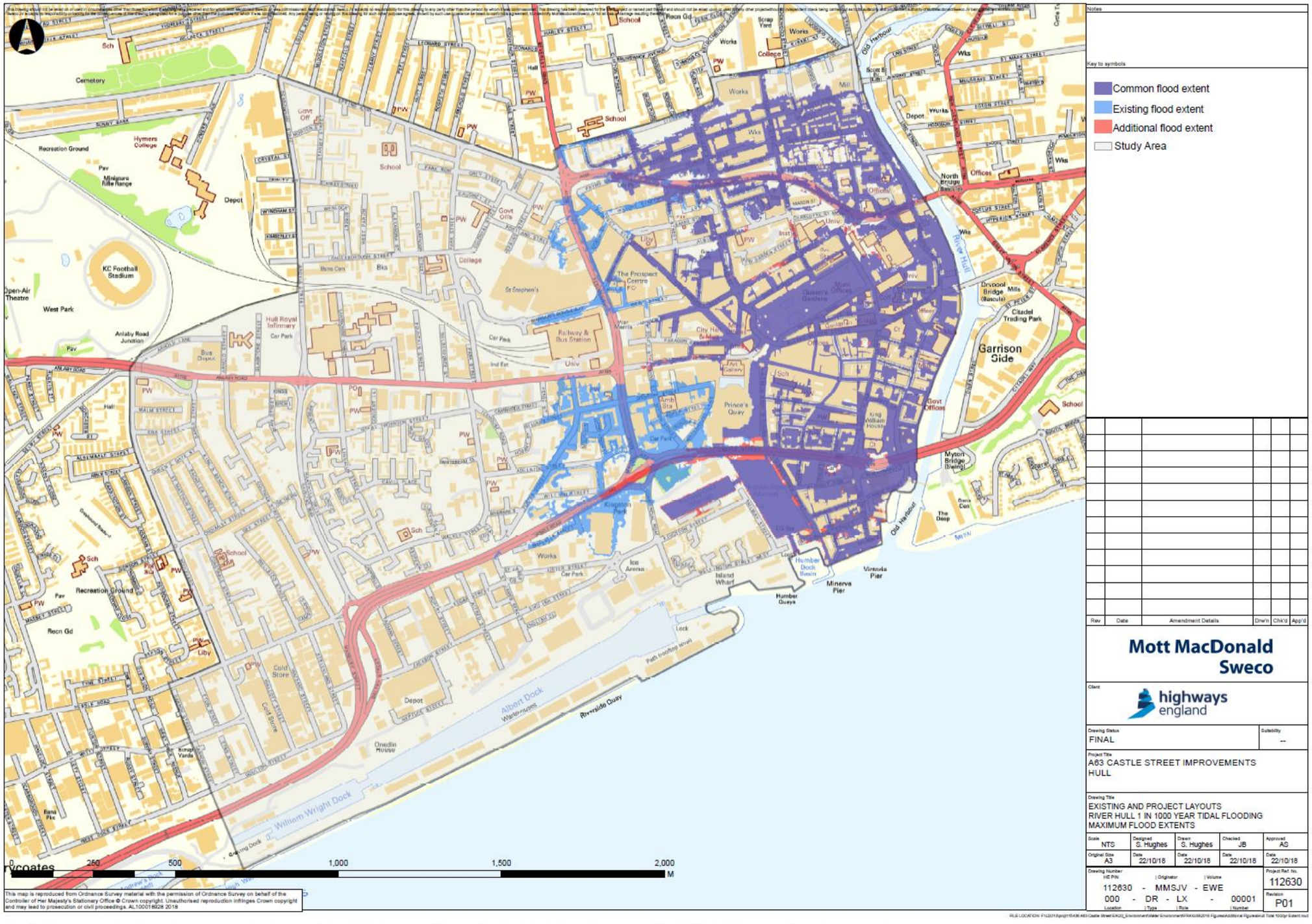


Figure 8: Difference in flood extents during a 1 in 1000-year River Hull tidal flood event (Hull Tidal Surge Barrier open)

2.2 Relative changes in flood depths

Figures 9 to 16 below summarise the proportional changes (expressed as percentages) in maximum modelled flood depths as a result of the Scheme. The maps show these differences according to the following equation:

% difference = (Scheme max flood depth (m) – existing max flood depth (m)) / existing max flood depth (m)

For comparison, the maps include depths of flooding below 0.05m although these shallow depths are excluded from the maximum flood depth maps provided in the Flood Risk Assessment (Volume 3 Appendix 11.2 of the A63 Castle Street Improvement, Hull Environmental Statement HE514508-MMSJV-EWE-S0-RP-LE-000004). As such, the extents shown are likely to differ between these two sets of figures as Figures 9 to 16 also highlight % changes at depths below 0.05m. Furthermore, these percentage difference maps only indicate change in areas that are flooded under both the existing and proposed Scheme conditions and so should be read in conjunction with Figures 1 to 8 above.

Figure 9 indicates no significant proportional change in maximum flood depths as a result of the Scheme during a 1 in 100 year plus 30% climate change pluvial flood event.

Figure 10 shows proportional changes in maximum flood depth during a 1 in 200-year wave overtopping event from the Humber Estuary. It should be noted that, if constructed, the Humber Hull Frontages defence scheme would protect the whole of Hull from flooding during such an event. However, the results indicate (that without the Humber Hull Frontages scheme), flood depths would increase between 1 and 100% in areas around the Fruit Market, Humber Dock, Railway Dock and Prince's Quay. Conversely, small areas to the west (around Kingston Park and English Street) would see proportional reductions in flood depths of between 50 and 100%.

Figure 11 shows proportional changes in maximum flood depth during a 1 in 1000-year wave overtopping event from the Humber Estuary. These maps indicate that areas to the east and south (including the docks, Fruit Market, Queen's Gardens, Kingston Park and English Street) would see increases in flood depths of generally around 1-10% although some areas would see increases of up to 50%. Conversely, large areas to the north west of the proposed underpass would see reductions in flood depths of between 1 and 25%.

Figure 12 shows proportional changes in maximum flood depth during a 1 in 200-year wave overtopping event from the Humber Estuary including an allowance for sea level rise due to climate change. The results indicate that areas to the north of the Scheme have marginally reduced flood depths (between 1 and 5%) whereas areas to the south and east of the Scheme (particularly around the docks and Fruit Market area) are relatively unaffected.

Figure 13 shows proportional changes in maximum flood depth during a 1 in 200-year tidal flooding event from the Humber Estuary (without existing defences). The results indicate mild increases in depth (generally 1-5%) to the west of the Scheme with areas to the east of the Scheme showing greater relative increases in flood depth (generally 10-25%).

Areas to the north of the proposed underpass show greater decreases in depth (5-25%) which then becomes a smaller decrease (1-5%) moving further north away from the Scheme.

Figure 14 shows proportional changes in maximum flood depth during a 1 in 200-year tidal flooding event from the Humber Estuary (without existing defences) and including an allowance for sea level rise due to climate change. The results indicate large areas to the north, west and south of the Scheme would have moderate proportional reductions in maximum flood depth of between 2 and 25%. A smaller area to the south east of the Scheme (around Queen Street and Humber Street) would have negligible proportional increases in maximum flood depth of between 1 and 5%.

Figure 15 shows proportional changes in maximum flood depth during a 1 in 200-year tidal flooding event from the River Hull (assuming the Hull Tidal Surge Barrier is open). The results indicate areas to the east of the Scheme would see proportional increases in maximum flood depth of between 25-50% (including Market Place, Blanket Row, Humber Street and the Humber and Railway Docks). Prince's Quay would see proportional depth increases of greater than 100%.

Figure 16 shows proportional changes in maximum flood depth during a 1 in 1000-year tidal flooding event from the River Hull (assuming the Hull Tidal Surge Barrier is open). The results indicate areas to the south east of the Scheme would see proportional increases in maximum flood depths of between 10-50%. Areas to the north east of the Scheme would see slightly lower proportional increase of between 2 to 10%. The Humber and Railway Docks would see larger proportional increases of greater than 100%. Areas further to the north of the Scheme (around the A165, Albion Street and Prospect Street) would see reductions of maximum flooded depth of between 1 and 50%.

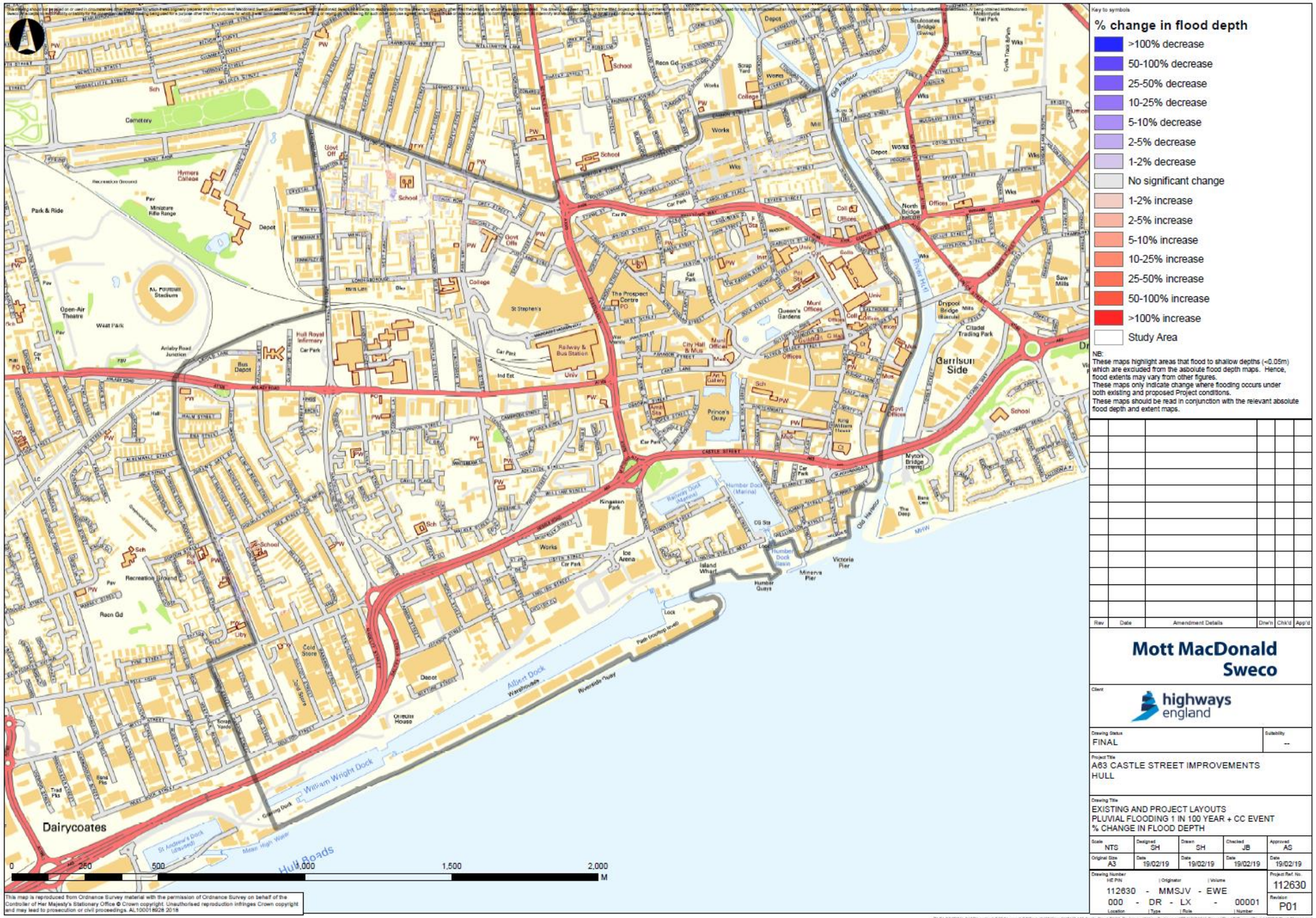


Figure 9: % change in maximum flood depth during a 1 in 100-year plus 30% climate change pluvial flood event

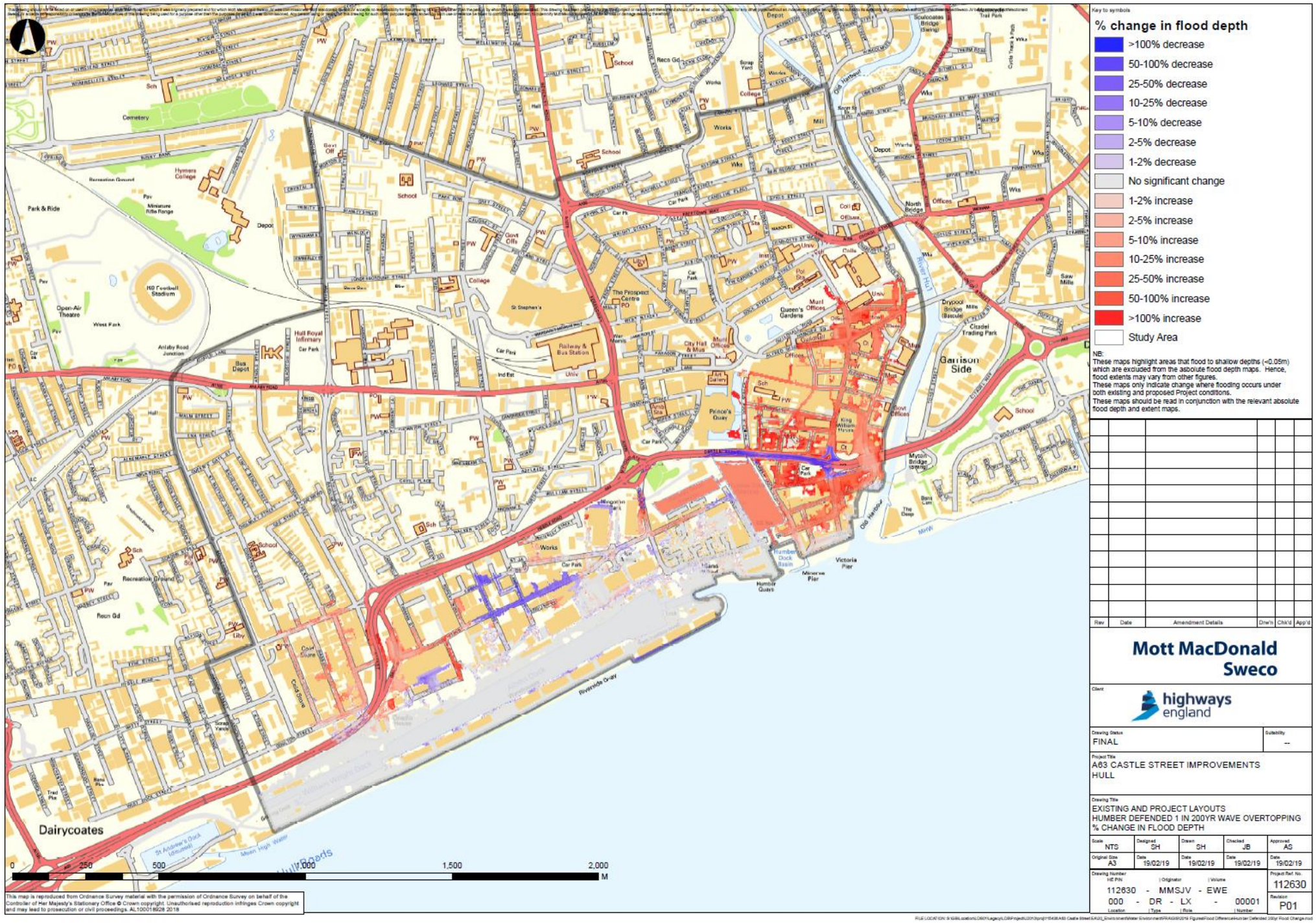


Figure 10: % change in maximum flood depth during a 1 in 200-year defended Humber Estuary wave overtopping flood event

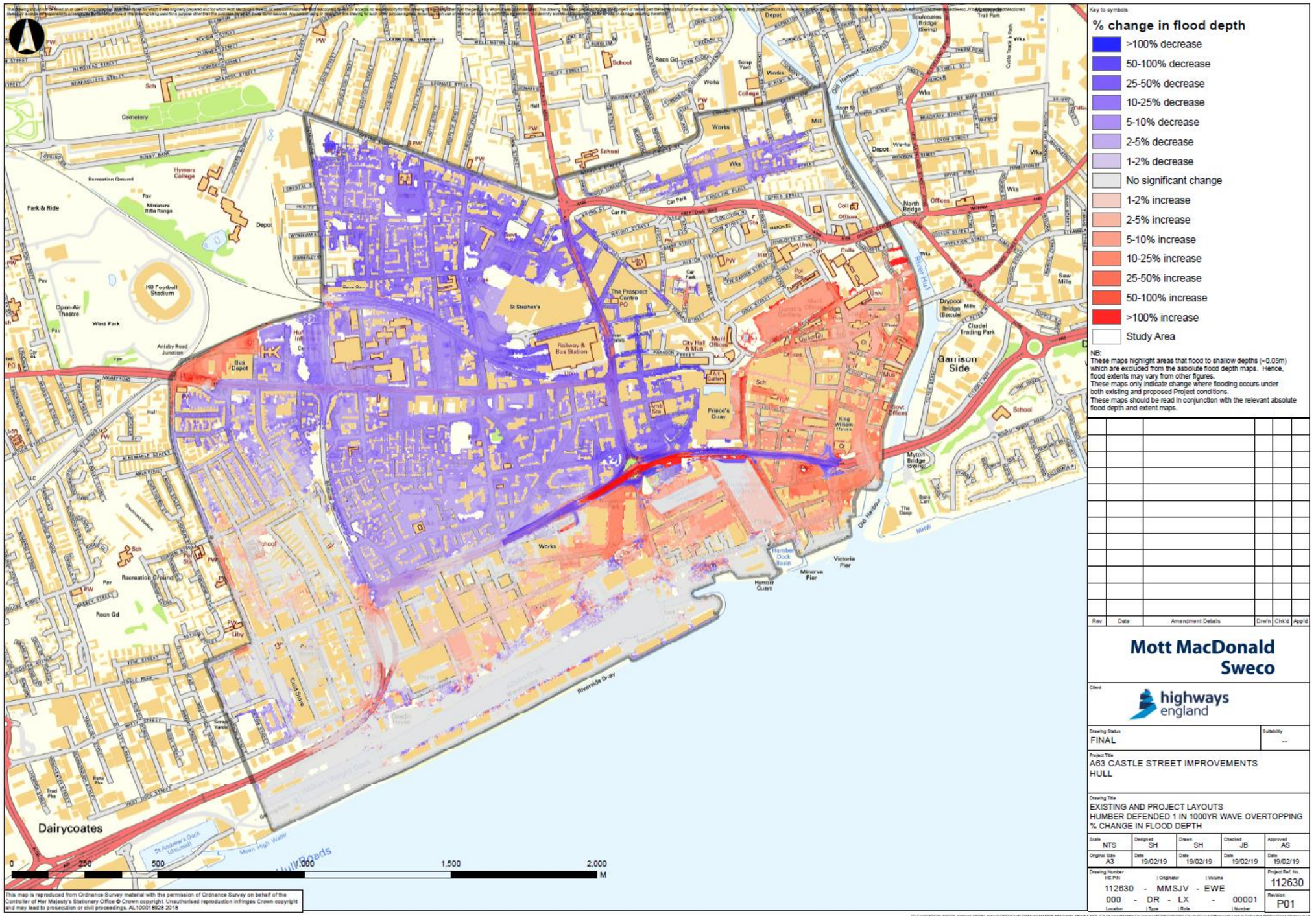


Figure 11: % change in maximum flood depth during a 1 in 1000-year defended Humber Estuary wave overtopping flood event

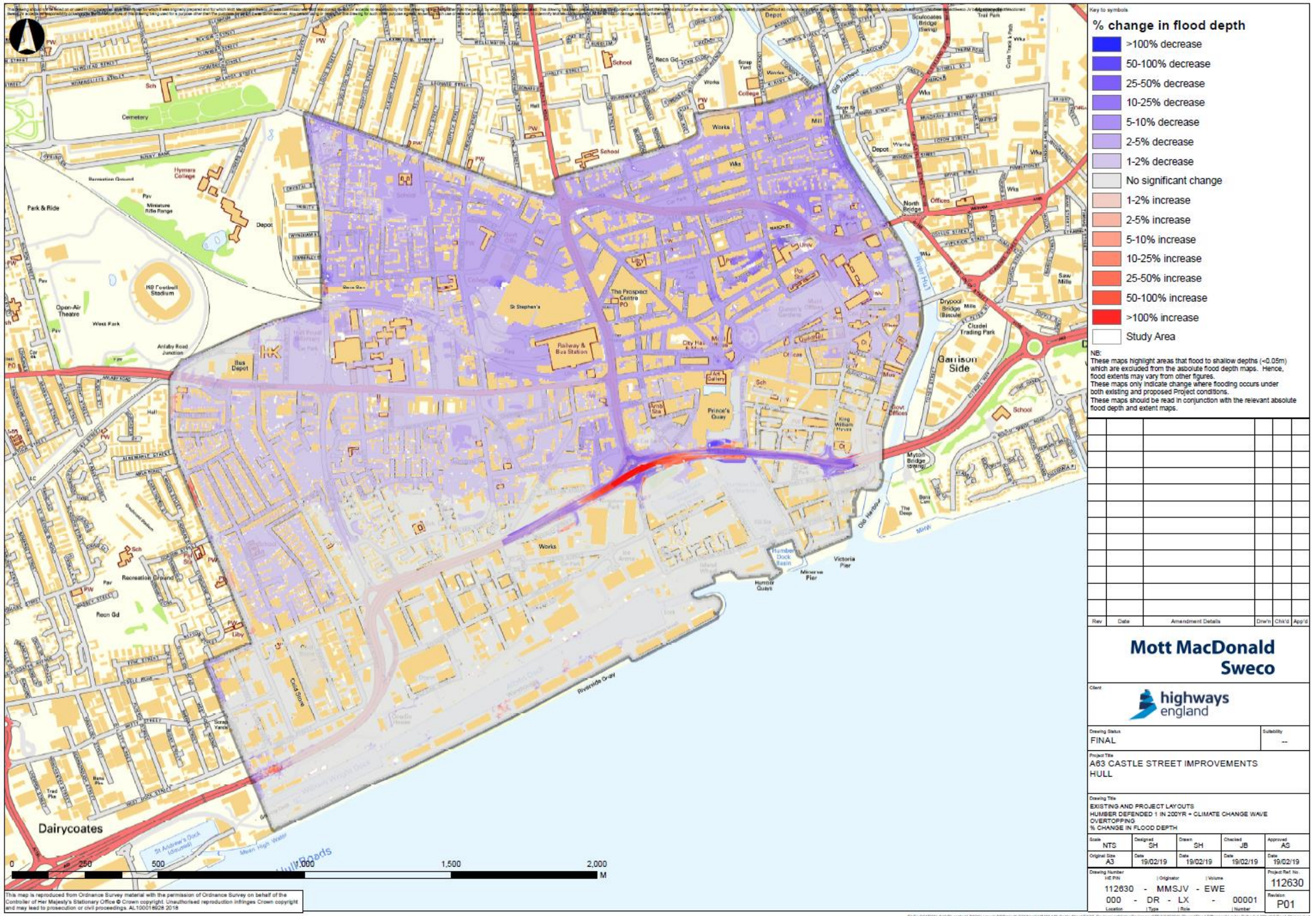


Figure 12: % change in maximum flood depth during a 1 in 200-year plus climate change defended Humber Estuary wave overtopping flood event

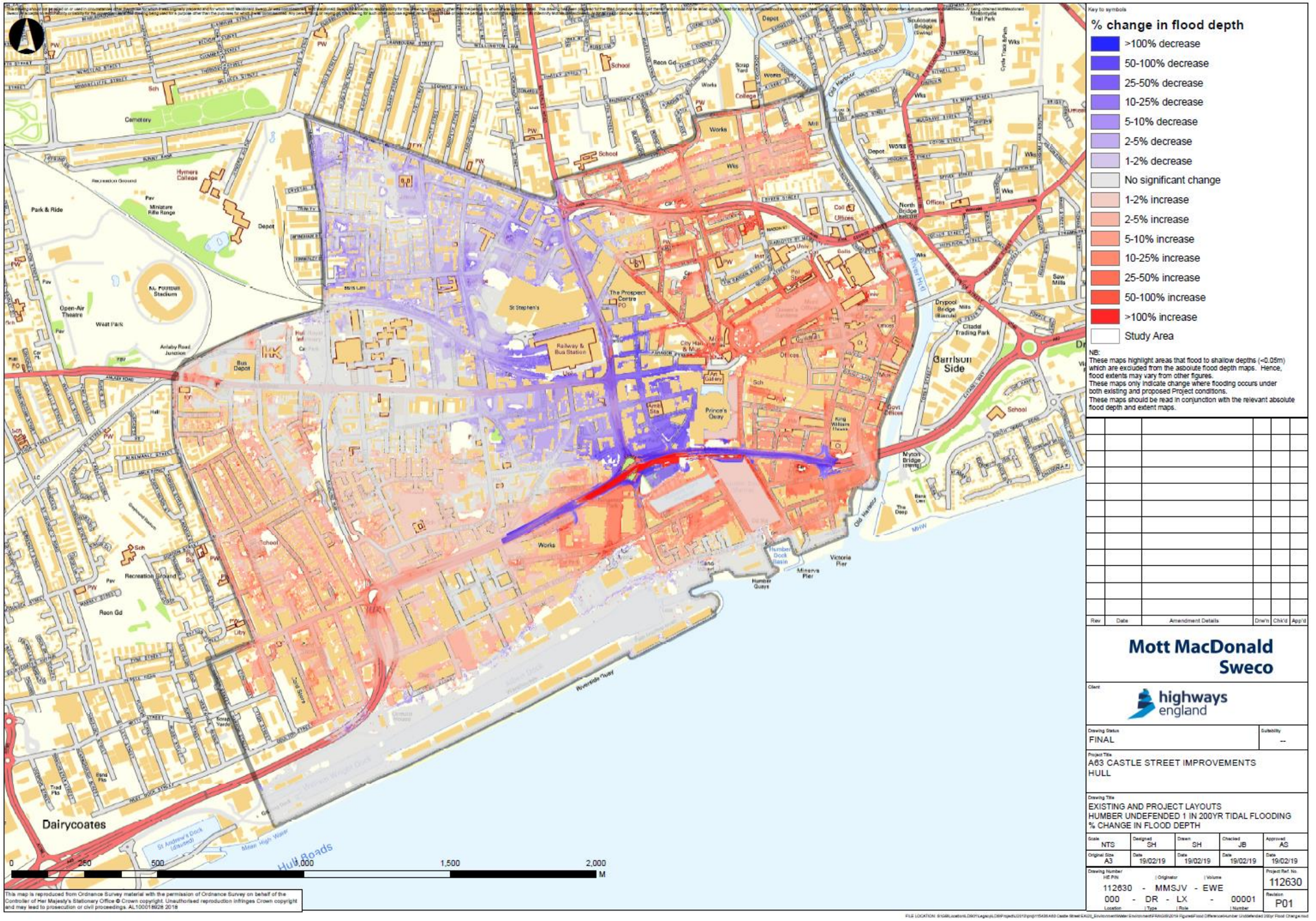


Figure 13: % change in maximum flood depth during a 1 in 200-year undefended Humber Estuary tidal flood event

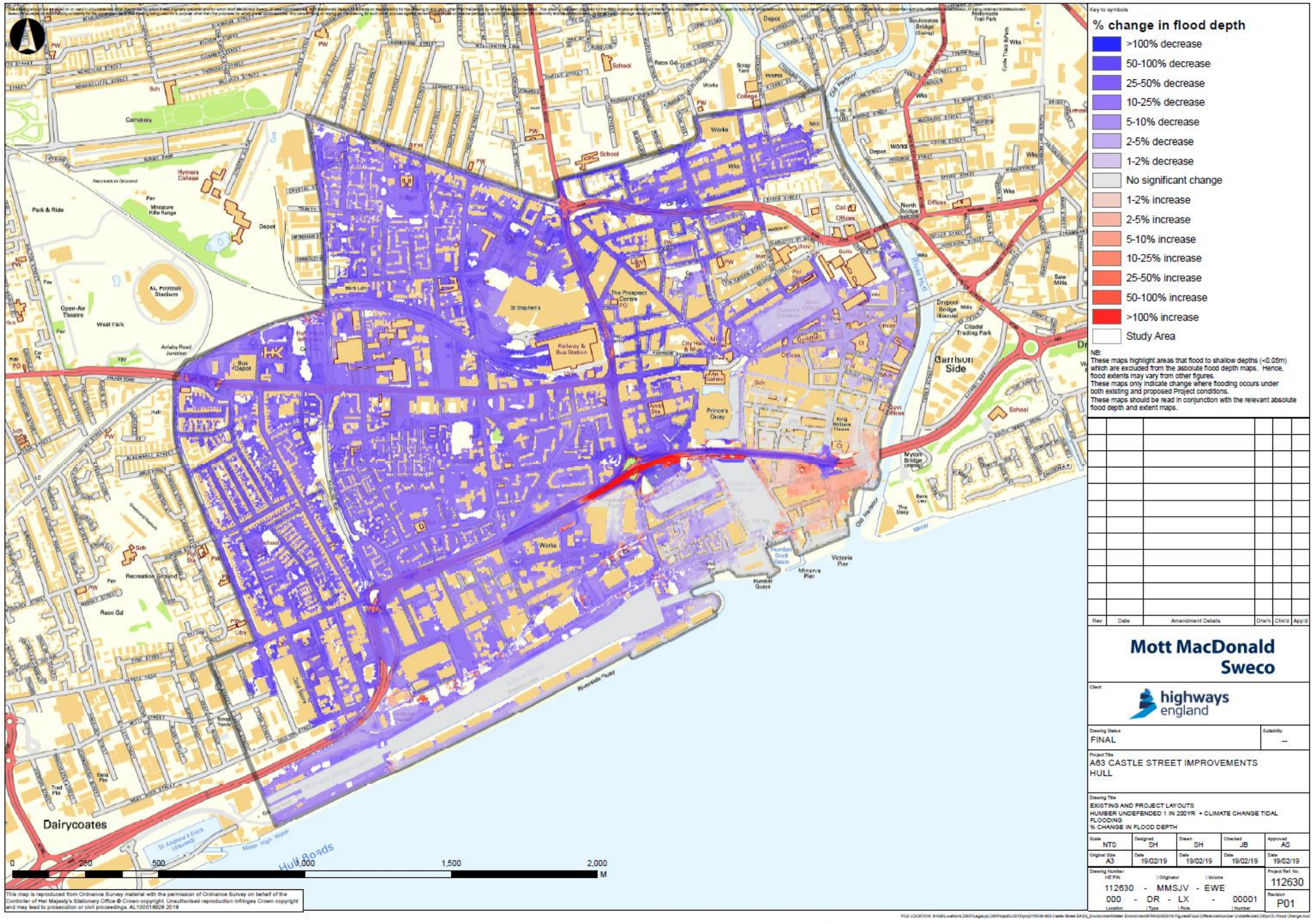


Figure 14: % change in maximum flood depth during a 1 in 200-year plus climate change undefended Humber Estuary tidal flood event

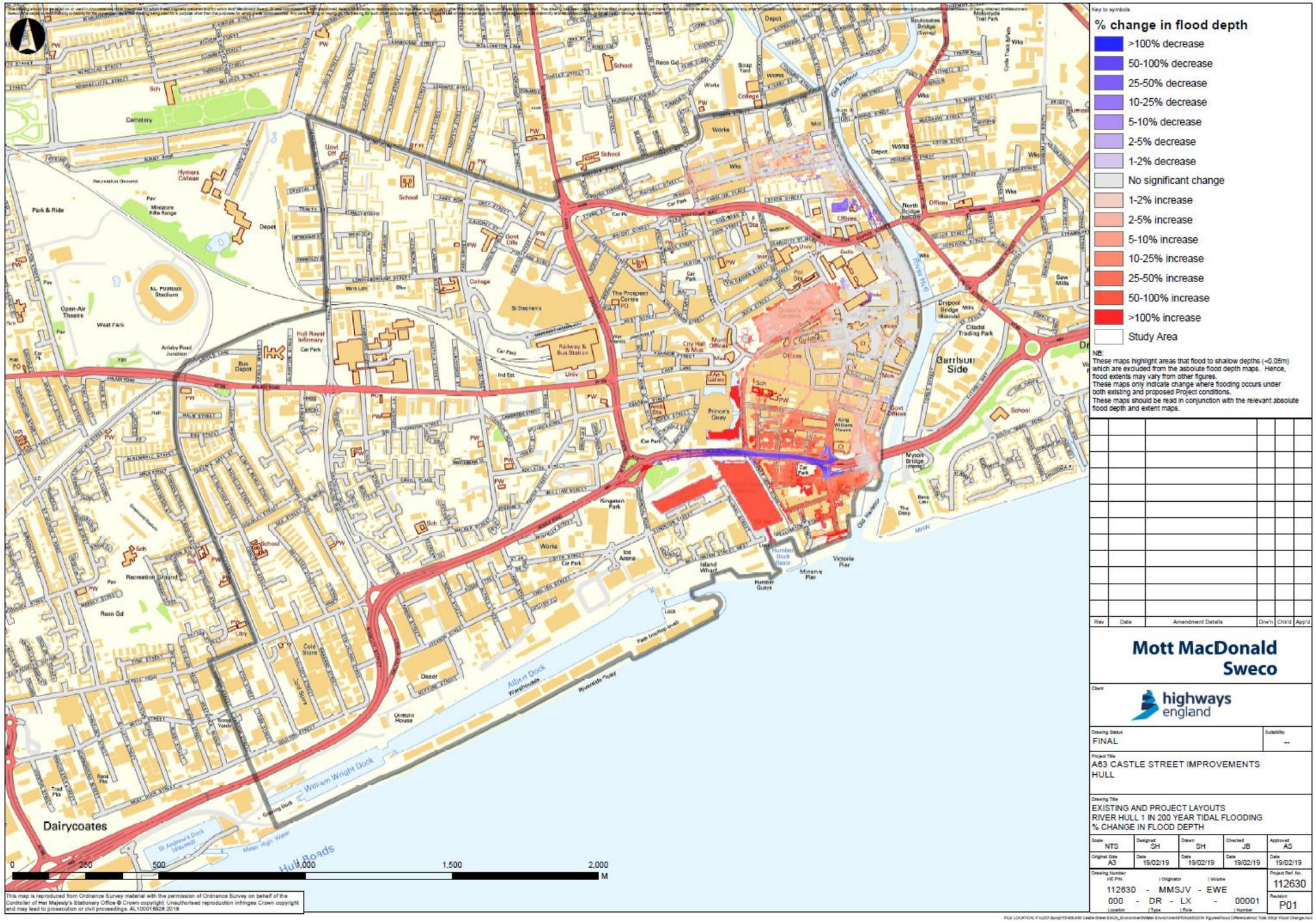


Figure 15: % change in maximum flood depth during a 1 in 200-year River Hull tidal flood event (Hull Tidal Surge Barrier open)

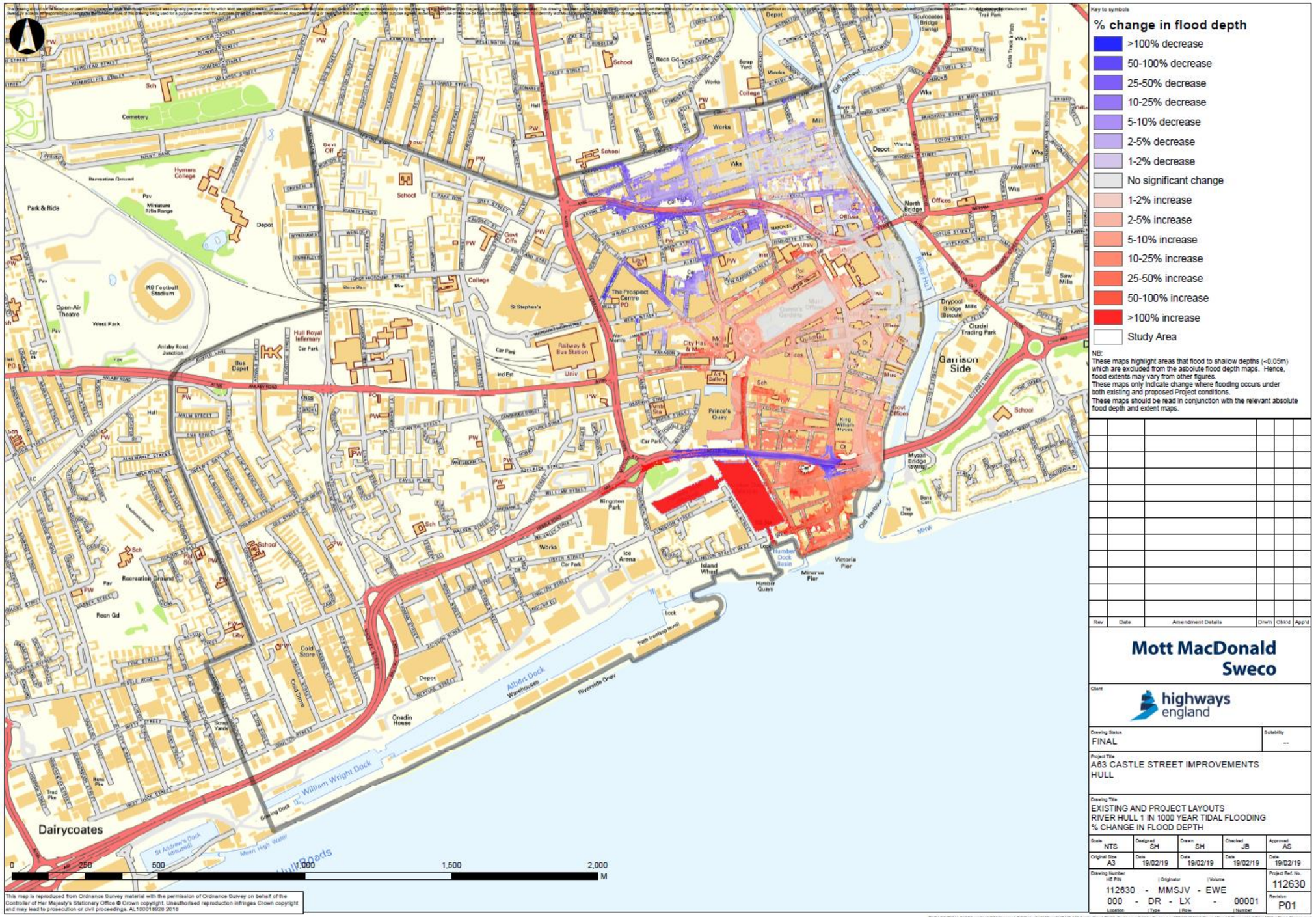


Figure 16: % change in maximum flood depth during a 1 in 1000-year River Hull tidal flood event (Hull Tidal Surge Barrier open)

2.3 Change in Flood Hazard Rating

Figures 17 to 24 provide plans showing change in Flood Hazard Rating as a result of the Scheme. A small increase or decrease indicates an increase or decrease in one level of Flood Hazard Rating (e.g. “no hazard” to “hazard to some”) and a moderate increase or decrease indicates an increase or decrease in two levels of Flood Hazard Rating (e.g. “no hazard” to “hazard to most”).

Figure 17 shows no alteration to Flood Hazard Ratings during operation of the Scheme for a 1 in 100-year plus 30% climate change pluvial flood event.

Figure 18 shows small increases of Flood Hazard Rating to the east of the Scheme (the docks and Fruit Market) and small to moderate reductions around the A63 carriageway itself east of the underpass, during a 1 in 200-year Humber wave overtopping flood event. Figure 19 shows small reductions in Flood Hazard Rating north and west of the Scheme and small, isolated areas of increased Flood Hazard Rating to the south, east and north-east of the proposed underpass during a 1 in 1000-year Humber wave overtopping flood event. Figure 20 shows no change in Flood Hazard Rating during a 1 in 200-year plus climate change Humber wave overtopping event.

Figure 21 shows a small reduction in Flood Hazard Rating to the east and north of the Scheme with only isolated areas immediately adjacent to the Scheme itself and in the Fruit Market and dock area showing an increase during a 1 in 200-year undefended Humber Estuary tidal flood event. Figure 22 shows a similar pattern of change in Flood Hazard Rating during a 1 in 200-year plus climate change undefended Humber Estuary tidal flood event.

Figure 23 shows generally small increases in Flood Hazard Rating to the east of the Scheme (Princes Quay, Humber Dock and the Fruit Market) with moderate increase associated with the proposed underpass during a 1 in 200-year River Hull tidal flood event when the Hull Tidal Surge Barrier fails to close. There are small to moderate decreases along the A63 east of the proposed underpass, Myton Street and Osborne Street for the same scenario. Figure 24 shows a larger area of reduced Flood Hazard Rating north of the Scheme and only isolated areas of increased hazard around the docks during a 1 in 1000-year River Hull tidal flood event.

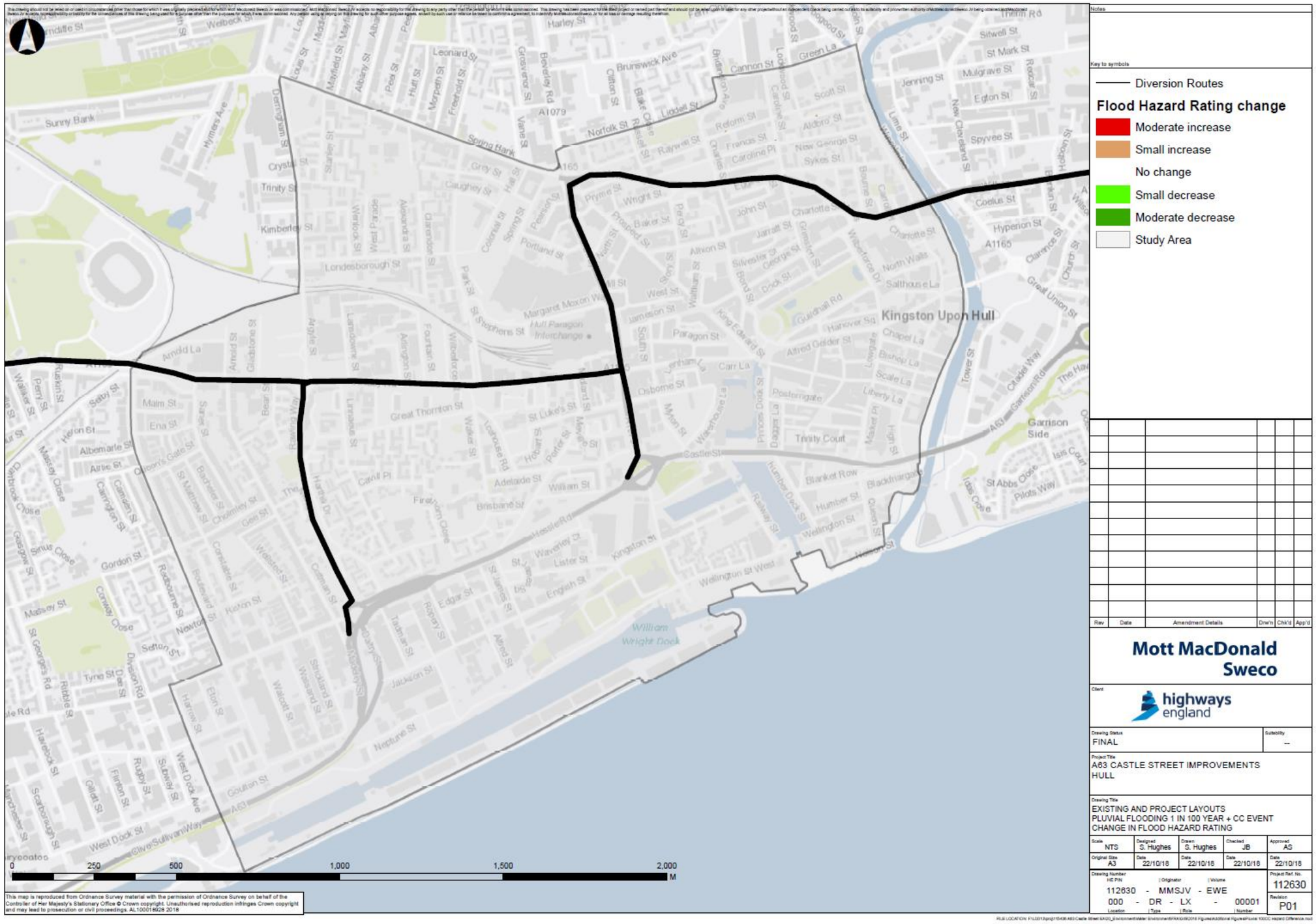


Figure 17: Change in Flood Hazard Rating during a 1 in 100-year plus 30% climate change pluvial flood event

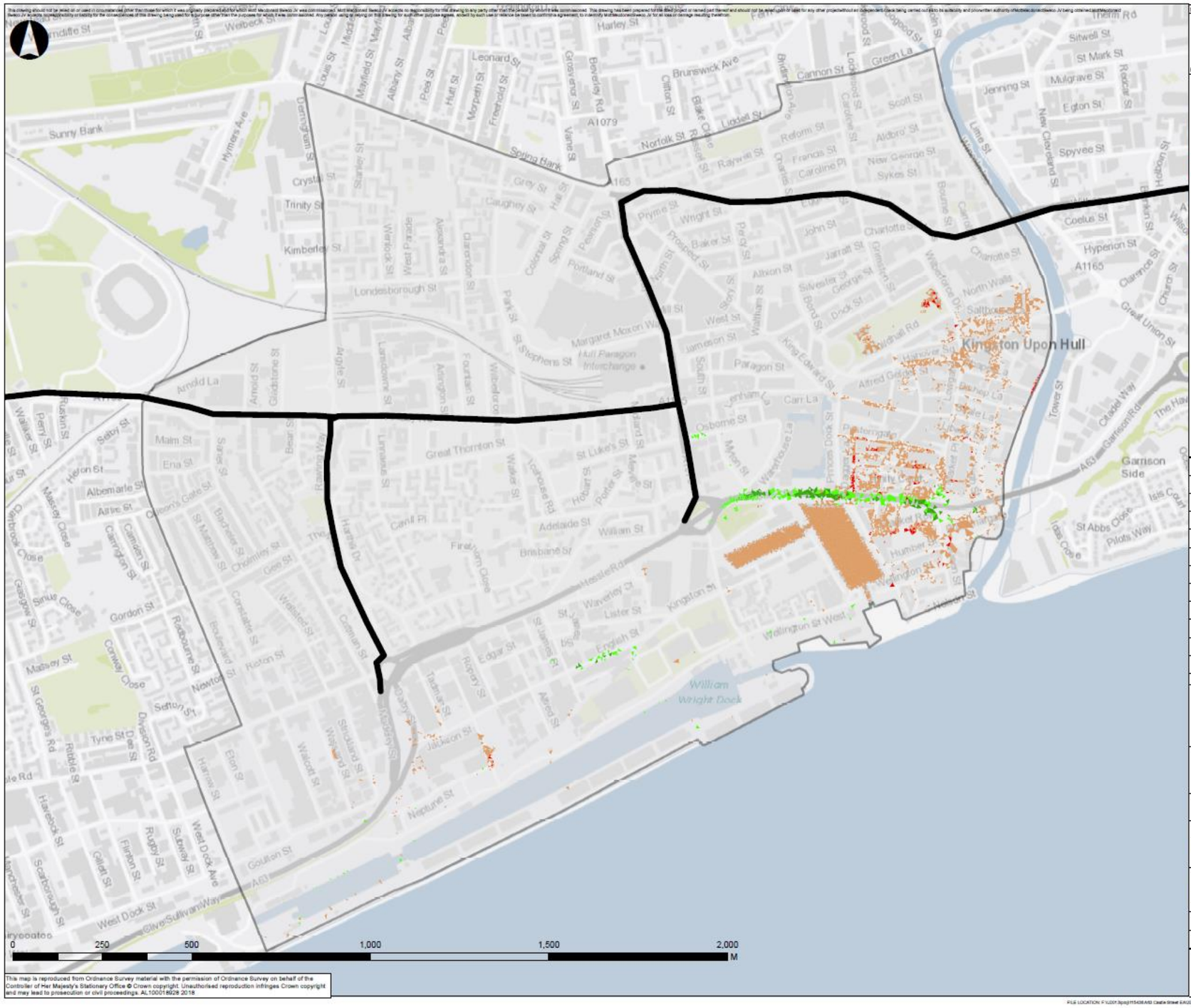


Figure 18: Change in Flood Hazard Rating during a 1 in 200-year defended Humber Estuary wave overtopping flood event

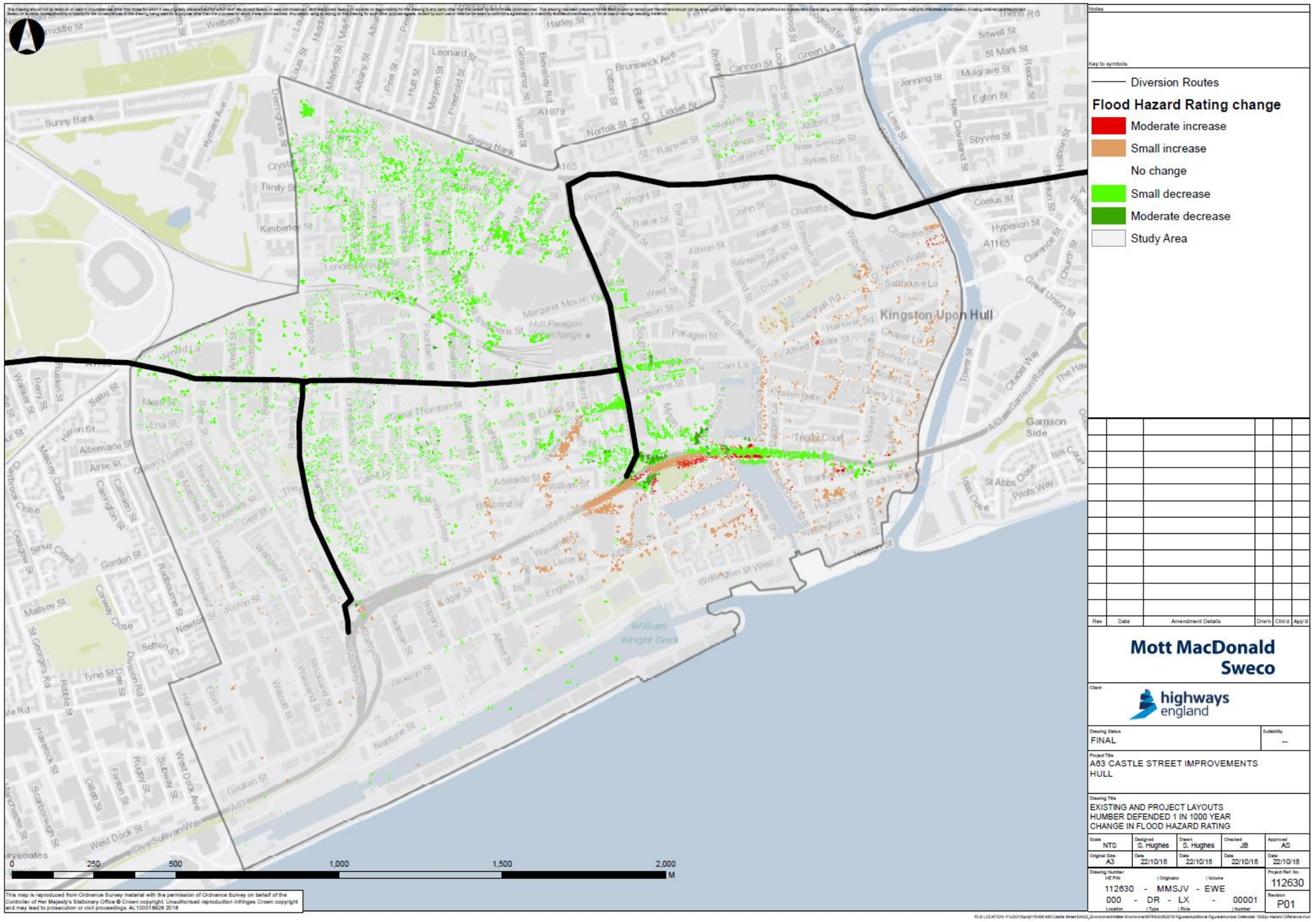


Figure 19: Change in Flood Hazard Rating during a 1 in 1000-year defended Humber Estuary wave overtopping flood event

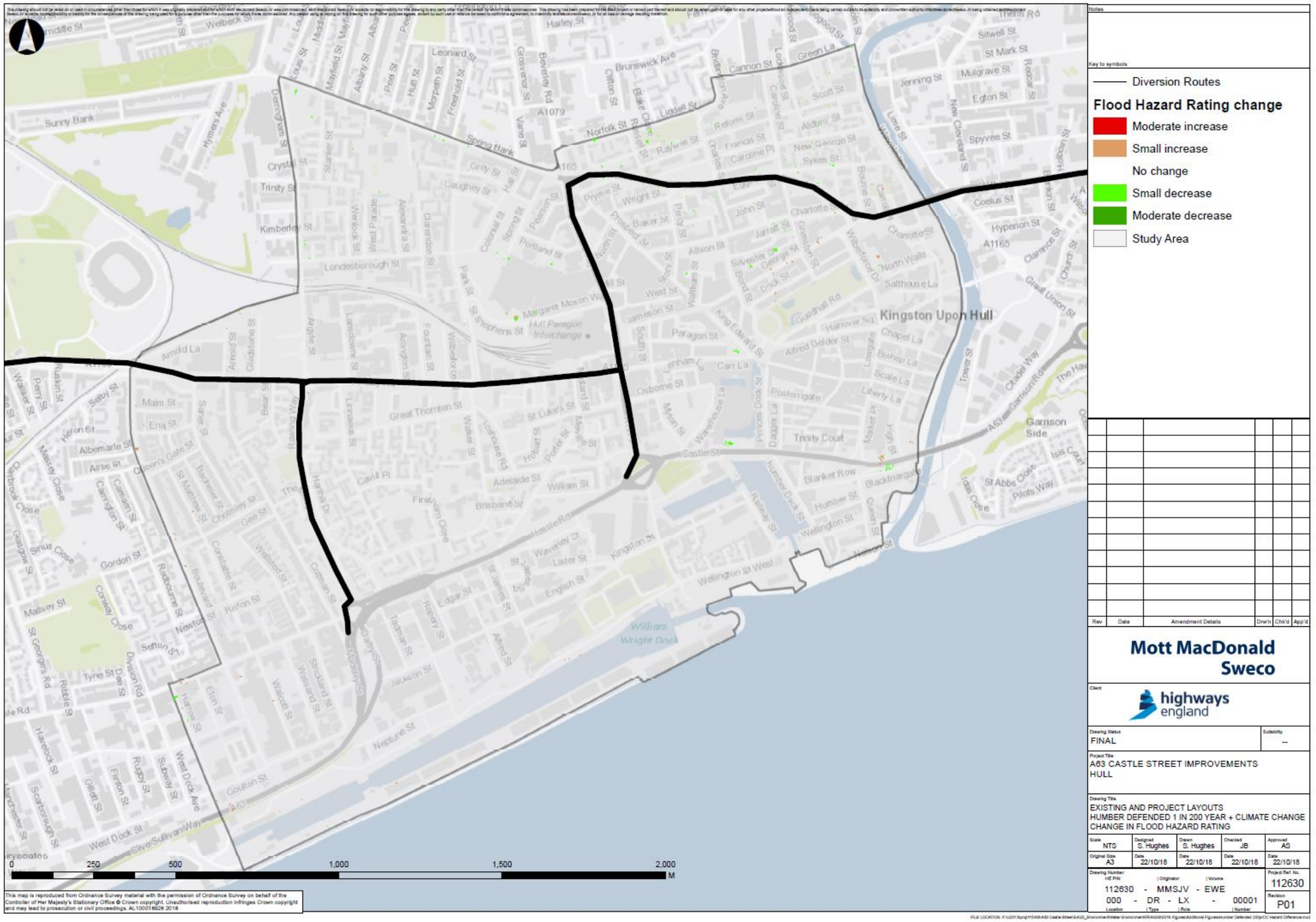
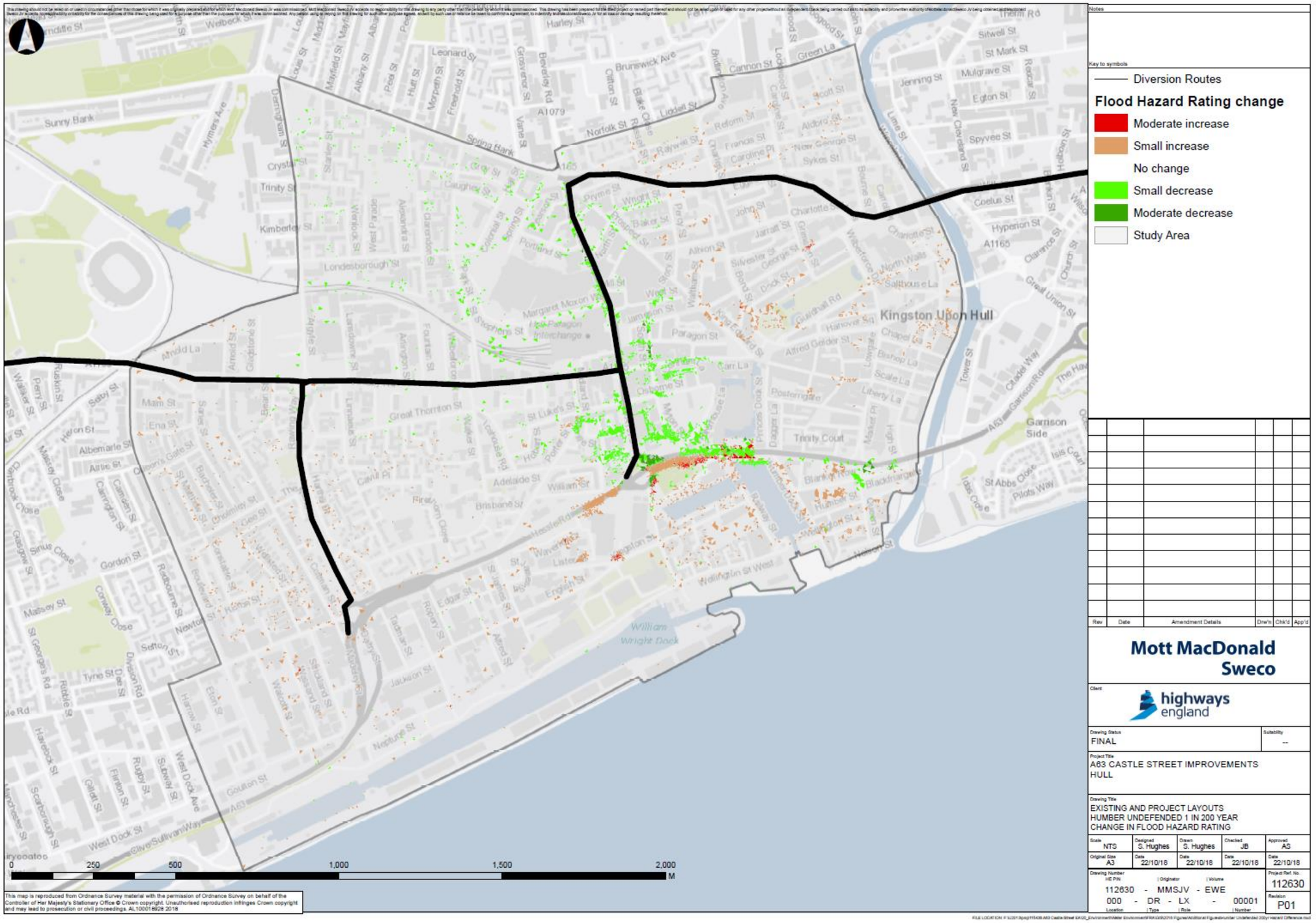


Figure 20: Change in Flood Hazard Rating during a 1 in 200-year plus climate change defended Humber Estuary wave overtopping flood event



Notes

Key to symbols

Diversion Routes

Flood Hazard Rating change

- Moderate increase
- Small increase
- No change
- Small decrease
- Moderate decrease
- Study Area

Rev	Date	Amendment Details	Drw'n	Chk'd	App'd

Mott MacDonald
Sweco

Client: highways england

Drawing Status: FINAL

Suitability: --

Project Title: A63 CASTLE STREET IMPROVEMENTS
HULL

Drawing Title: EXISTING AND PROJECT LAYOUTS
HUMBER UNDEFENDED 1 IN 200 YEAR
CHANGE IN FLOOD HAZARD RATING

Scale	Designed	Drawn	Checked	Approved
NTS	S. Hughes	S. Hughes	JB	AS
Original Size	**Date**	**Date**	**Date**	**Date**
A3	22/10/18	22/10/18	22/10/18	22/10/18

Drawing Number: HE P/N 112630 - Originator MMSJV - Volume EWE - Location 000 - Type DR - Role LX - Number 00001

Project Ref. No.: 112630

Revision: P01

Figure 21: Change in Flood Hazard Rating during a 1 in 200-year undefended Humber Estuary tidal flood event

highways england

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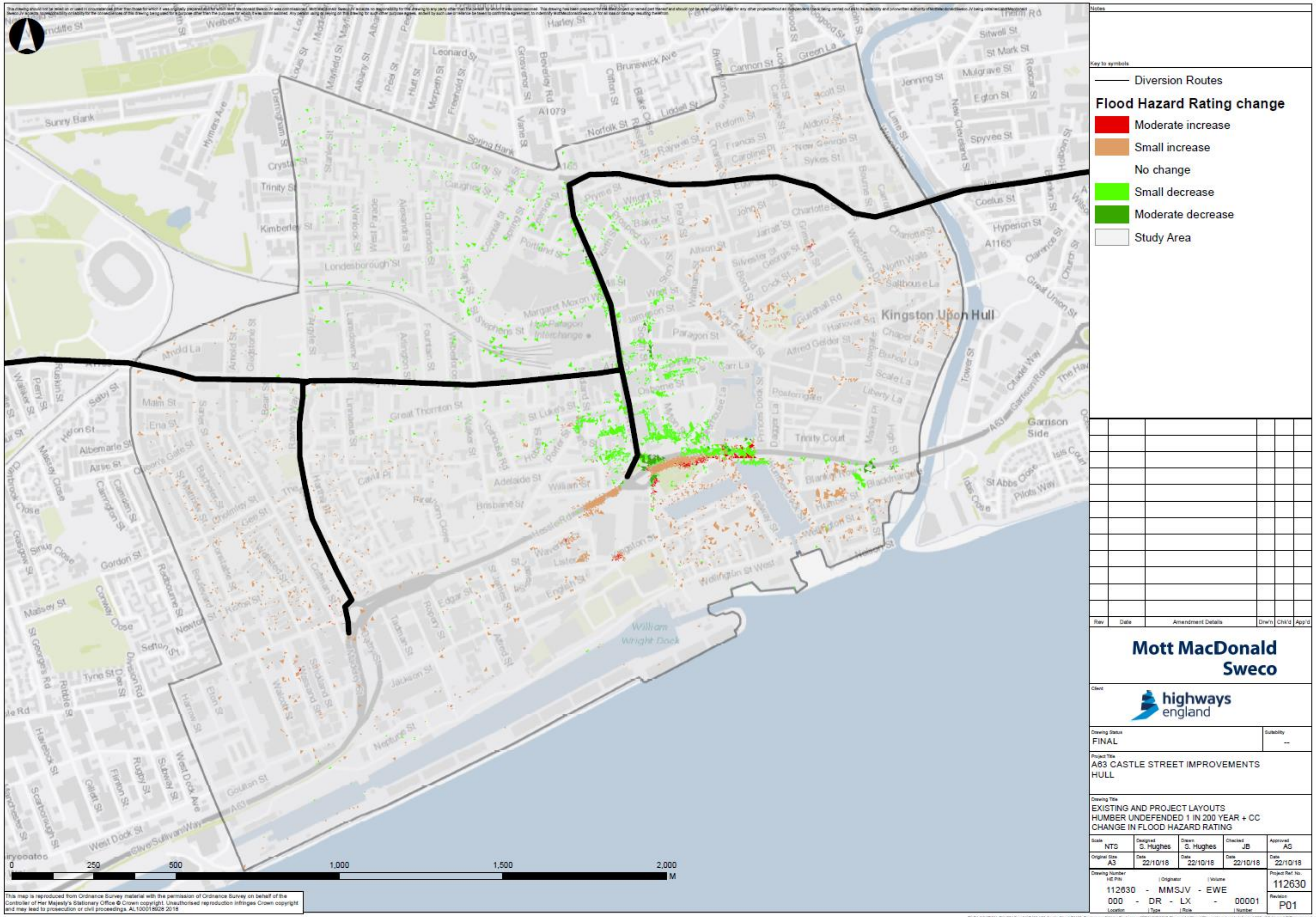

Figure 22: Change in Flood Hazard Rating during a 1 in 200-year plus climate change undefended Humber Estuary tidal flood event

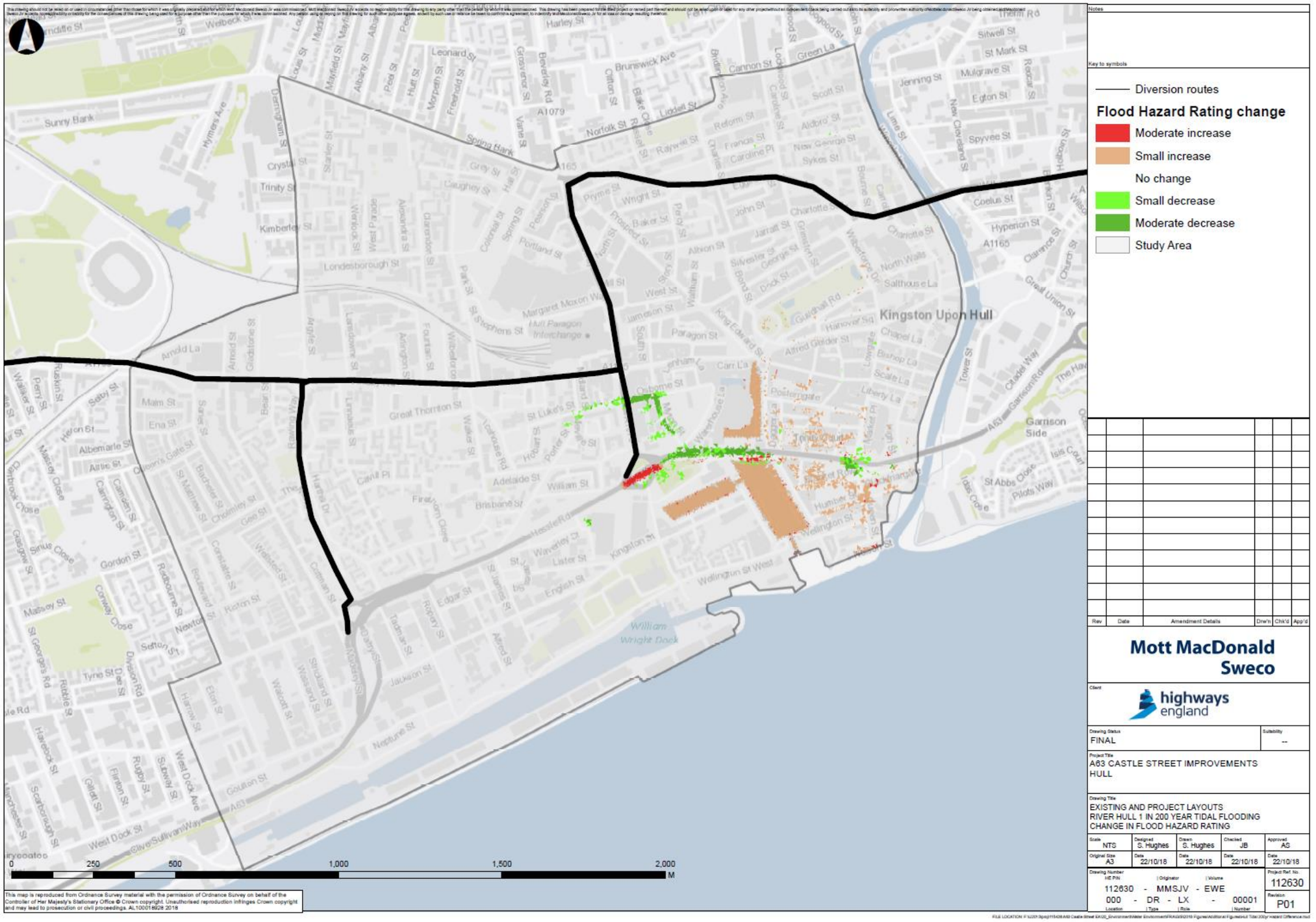

Figure 23: Change in Flood Hazard Rating during a 1 in 200-year River Hull tidal flood event (Hull Tidal Surge Barrier open)

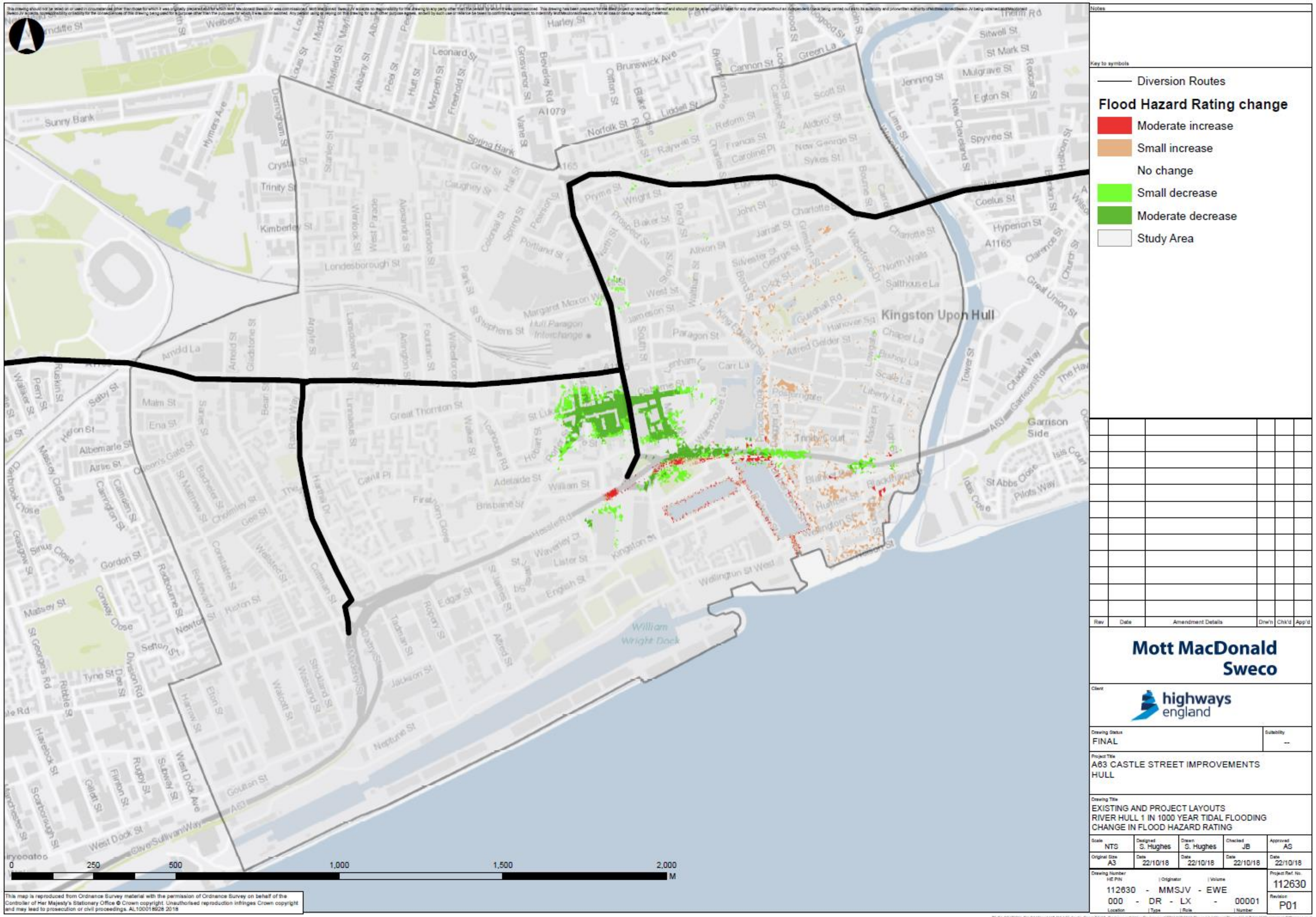

Figure 24: Change in Flood Hazard Rating during a 1 in 1000-year River Hull tidal flood event (Hull Tidal Surge Barrier open)

2.4 Review of peak flood levels along the length of the proposed underpass

This section provides a brief review of peak modelled flood levels along the length of the proposed underpass in order to understand the level at which the road would need to be constructed in order to prevent flooding of the underpass.

Figure 25 shows the extent of the results lines from which maximum modelled flood levels were extracted. The results show a maximum modelled flood level of 7.28m AOD along the westbound carriageway in the underpass for a 1 in 200-year plus climate change Humber wave overtopping (defended) flooding scenario. Flood elevations are at their greatest at the eastern extent of the underpass.

In order to ensure the proposed underpass would not flood, adjacent road levels to the east and west underpass entrances would need to be raised to a minimum of 7.28m AOD plus a suitable freeboard allowance (existing ground levels are between 3 and 4m AOD). Such a raising of road levels would not be practically achievable given the substantial constraints of the Scheme. Furthermore, raising of road levels to this extent would likely significantly affect the transfer of flood risk from the underpass to adjacent receptors within Flood Zone 3. It should be noted that the underpass drainage design for the Scheme allows for excess overland flow from contributing areas adjacent to the immediate highway catchment for a 1 in 100-year pluvial flood event (plus 30% for climate change). However, this allowance would not be sufficient to accommodate the additional flows during a tidal or wave overtopping flood event.

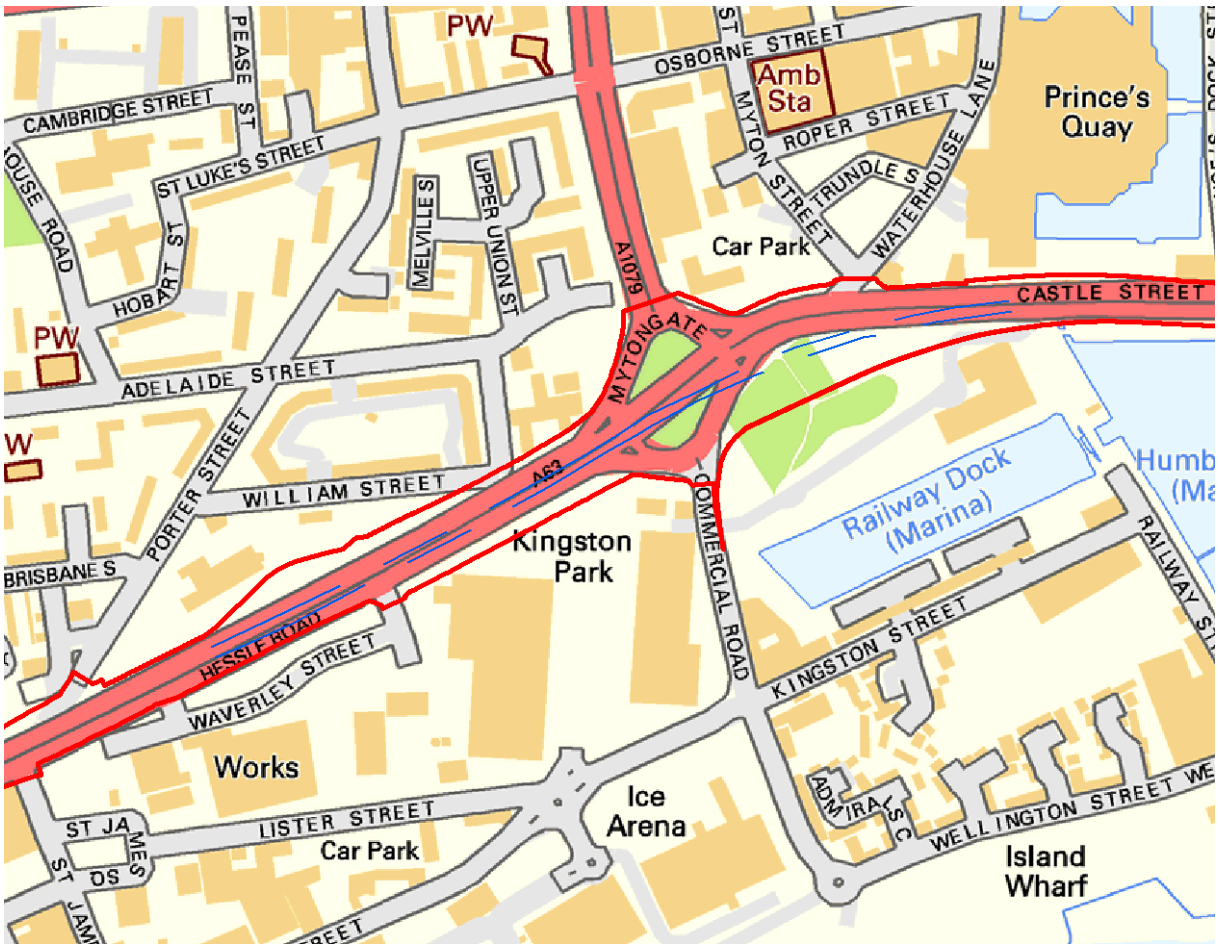

Figure 25: Proposed underpass results line locations (blue indicates results line, red indicate Scheme Site Boundary)

2.5 Review of the proposed Humber defence upgrades

The Environment Agency propose to upgrade the flood defences on the north bank of the Humber Estuary, known as the Humber Hull Frontages project. The proposals are to provide a standard of protection of 1 in 200 years with an allowance for climate change to the year 2040. The upgraded defences will be designed to be readily upgraded to provide additional protection beyond 2040; this is termed a 'managed adaptive approach'. To clarify, the Humber Hull Frontages project has not been considered as part of any of the detailed hydraulic modelling carried out as part of the Flood Risk Assessment.

The Humber Hull Frontages project was granted planning permission on 21 December 2018. It is estimated that the project will be completed by March 2021[1]. When completed, the upgraded defences will provide a benefit to the A63 Castle Street Improvement, Hull in terms of reduced risk of flooding from the Humber Estuary.

With the defences in place, the Scheme would not be at risk from a 1 in 200-year plus climate change wave overtopping flood event from the Humber Estuary. This would mean that the underpass would remain safe during use and the transfer of flood risk outlined above and in the Flood Risk Assessment would not occur.

[1] https://consult.environment-agency.gov.uk/yorkshire/humber-hull-frontages/

2.6 Review of flood risk to and from temporary construction compounds

A letter from the Environment Agency to Highways England (dated 28 August 2018) requested a consideration of flood risk to and from the temporary construction compounds during the construction and operation of the Scheme. Each of the Environment Agency's queries are outlined below with a relevant response:

'*The FRA will need to demonstrate that the compounds will not increase flood risk within the site, alter existing flood flow routes or transfer flood risk to others and if so, how this will be mitigated*':

Chapter 11 Road Drainage and Water Environment of the Environmental Statement notes the following:

- There is no predicted surface water flooding within the Scheme area or compound areas for a 1 in 100-year pluvial event including a 30% allowance for climate change.
- Proposed compounds at Arco, Staples, Wellington Street Island Wharf and the land south east of Mytongate Junction are all located within Flood Zone 3. The compound for the A63 eastbound recovery base is located in Flood Zone 2. The compound at Livingstone Road is partly within both Flood Zones 2 and 3.
- All of the compound locations are highlighted as benefitting from defences except the Livingstone Road compound site.
- The Scheme will involve demolition of a number of existing buildings (depending on the final location of the main working compound at either the Arco or Staples site). This has the potential to alter flood flow routes across and adjacent to the compound site. The removal of buildings from the floodplain would act to increase, albeit by a small amount, the amount of available floodplain storage volume. However, such an increase would likely have a negligible magnitude impact on the conveyance of flow.
- The temporary construction compounds and working areas would involve changes to impermeable areas of hardstanding which may in turn alter surface water runoff rates and potentially cause localised flooding. Mitigation measures are outlined in the Outline Environmental Management Plan (OEMP) including a requirement for the use of closed drainage systems incorporating SuDS features, where possible.
- The OEMP also includes a requirement for suitable emergency procedures to be outlined which account for all sources of flooding to the compounds including a plan for the evacuation of the construction footprint in the event of extreme flooding.

'*…consider the requirement for a place of safety for compound site users. Any proposed place of safety must be above the level shown in Figure 15 of the SFRA. The FRA must consider how this will be accessed during a flood. It is recommended that site users are signed up the Environment Agency flood warning service.*'

- Management of flood risk during construction is outlined in the OEMP and would explicitly require subscription to the Environment Agency's flood warning service.
- Flood evacuation plans would include provision for safe evacuation of personnel and protection or removal of plant and other sensitive material likely to be mobilised during a flood.
- Any flood sensitive temporary structures will be constructed in a flood resilient way, where appropriate.
- Figure 15 of the Hull City Council SFRA (see Figure 25 below) provides the following levels for places of safety:
  - 5.00m AOD for the Staples, Arco, and Myton Centre Parking compounds
  - 7.25m AOD for the Wellington Street Island Wharf, A63 eastbound recovery base, A63 westbound recovery base, the land south west of Mytongate Junction and the Neptune Street Set Down compounds
  - The Livingstone Road compound falls out with the Hull City Council SFRA study are and no place of safety level is available for this compound. The 2014 Interim Water Level Profile provides data at Hessle (location H215). The estimated water level for a 1 in 100-year event (as stipulated in the Hull City Council SFRA as a requirement for the place of safety) is 6.06m AOD at Livingstone Road. Therefore, the OEMP should include provision of a place of safety above this level.

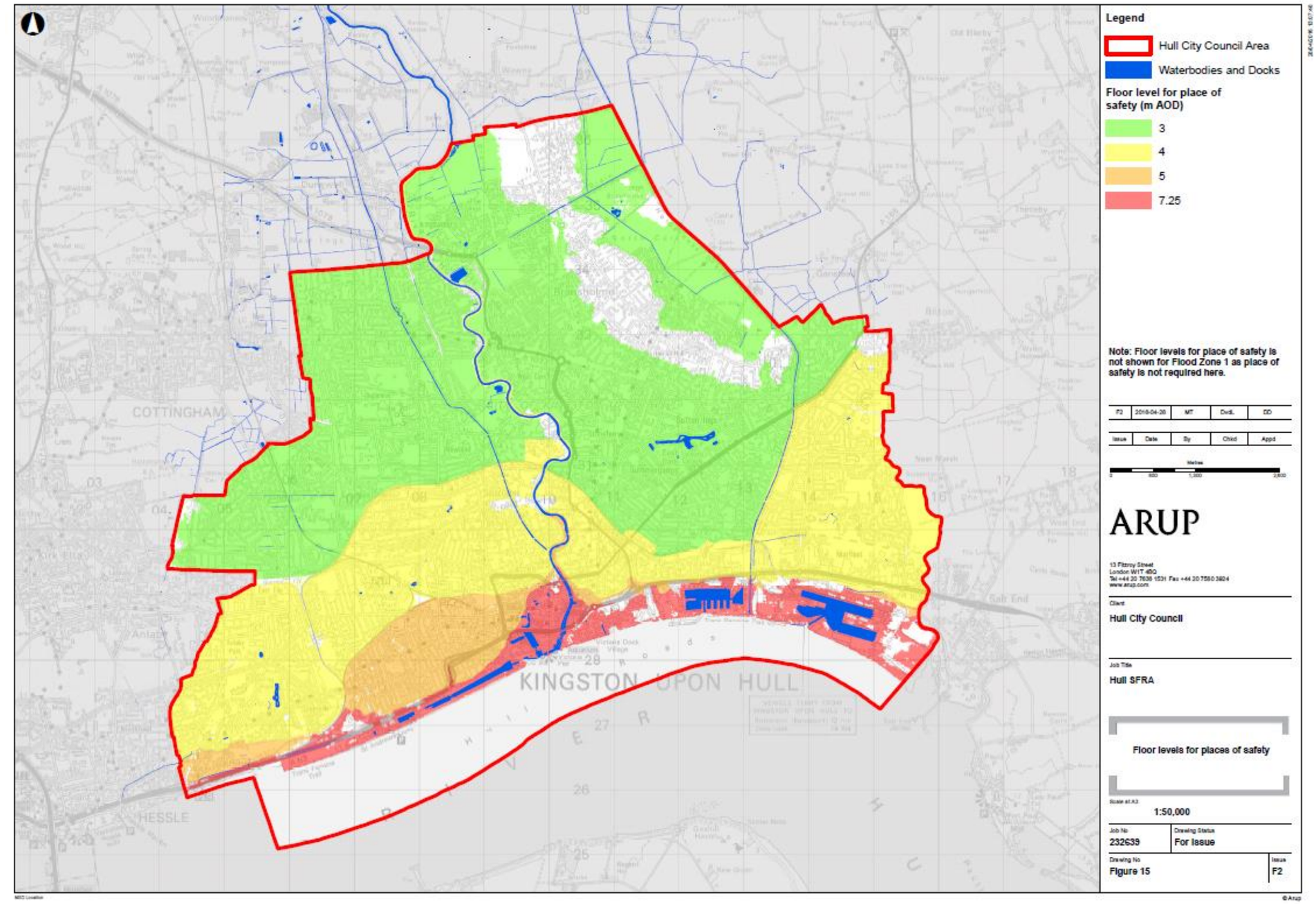

Figure 25: Copy of figure 15 from Hull City Council Strategic Flood Risk outlining required levels for places of safety during a flood

3 Conclusion

The purpose of this technical note was to provide and review additional information on flood risk associated with the proposed A63 Castle Street Improvement, Hull.

The information provided shows that the Scheme results in some small areas of additional flood extent and some areas of reduced flood extent. The magnitude and areas of these changes is dependent on the source of flooding. Additionally, the Scheme results in areas of increased and decreased Flood Hazard rating; this is also dependent on the source of flooding.

An analysis was carried out to evaluate changes in maximum flood depth post construction of the Scheme as a proportion of existing flood depth. The analysis concluded that areas to the east, south east and north east of the Scheme were most prone to the greatest proportional increases in maximum flood depth, particularly for the 1 in 200 year and 1 in 1000-year flooding events from both the River Hull (if the Hull Tidal Surge Barrier fails to close) and from wave overtopping from the Humber Estuary. Large areas to the north of the Scheme would receive moderate proportional reductions in maximum flood depth during a 1in 200-year Humber wave overtopping event (with climate change). The Scheme had only negligible impact on proportional changes in flood depth for pluvial flood events.

A review of maximum modelled flood levels along the length of the proposed underpass concluded that it would not be feasible to raise the proposed carriageway to a sufficiently high level in order to prevent flooding of the underpass. Furthermore, such raising of road levels would be likely to exacerbate the transfer of flood risk to other receptors adjacent to the Scheme.

There are proposals by the Environment Agency to upgrade flood defences on the north bank of the Humber south of the Scheme. These defences will reduce flood risk to the Scheme and provide protection from flood events up to a 1 in 200-year flood event with an allowance for climate change to the year 2040.

Flood risk arising to and from temporary compounds during the construction of the Scheme will be managed through best practice drainage measures, including SuDS where appropriate and robust plans to ensure an adequate response during a significant flood event. These requirements are given in the OEMP.