TECHNICAL NOTE

JBA Project Code	2021s1436
Contract	Chichester SFRA
Client	Chichester District Council
Version / Date	v4 / November 2024
Author	Matthew Hird
Reviewer / Sign-off	Ed Hartwell
Subject	Arun to East Head, Undefended modelling updates

1 Introduction

As part of the review into the Chichester SFRA modelling, which was undertaken as part of the planning appeal for the housing development at Stubcroft Farm, it was found that there was an error in the setup of the Undefended model scenario. The Chichester SFRA covers the area of coast from Emsworth in the west to Bognor Regis in the east, as shown in Figure 1. The SFRA area was covered by two models, one for the open coast and one covering Chichester Harbour.

The error was found in the Arun to East Head (AtoEH) open coast model and did not affect the Chichester Harbour model. The AtoEH model covers the coast from West Wittering to Bognor Regis. It was found that the wave overtopping inflow lines were located on the beach and should have been moved further inland. The issue was in the original Environment Agency model from 2016, and it was not noticed when the model was re-used for the 2023 SFRA. In the defended model setup, the wave overtopping inflows are correctly placed towards the back of the beach behind the crest of the shingle beach. In the undefended model setup, the crest of the beach was removed but the location of the overtopping inflows was not changed, this meant the overtopping inflows were placed on the slope of the beach and most of the wave overtopping flowed back to sea, rather than towards the land.

This technical note records details of the model updates to rectify the issue and summarises the model results.

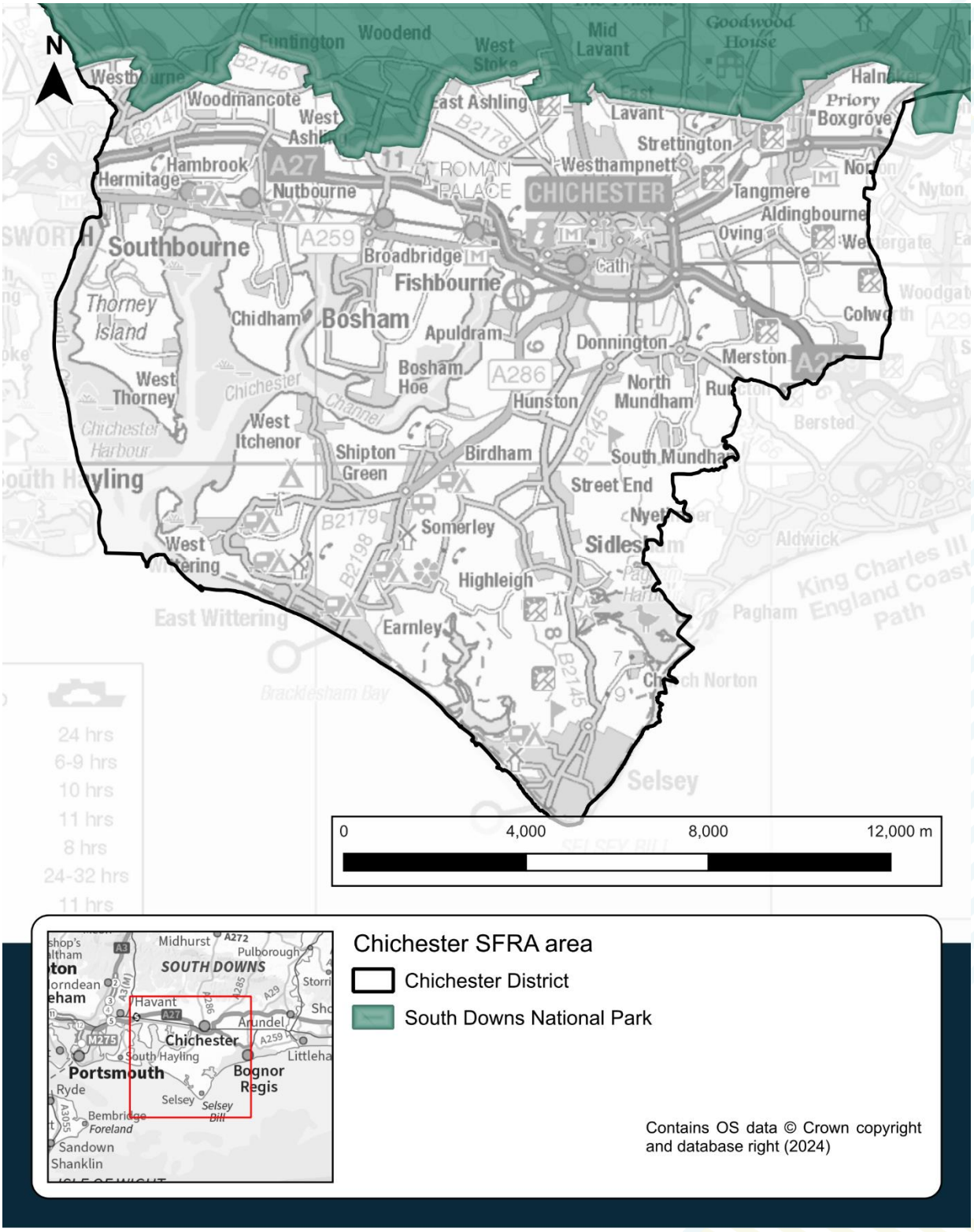

Figure 1: Chichester SFRA area

2 Wave Overtopping inflows

To correct the Undefended setup of the model, the wave overtopping inflow lines were moved onto the land at the back of the beach. In the defended scenario the wave overtopping inflow line is placed behind the crest of the beach or other flood defences that are present, such as walls or embankments. To remove defences for the undefended scenario, a polygon was drawn around the defences in GIS software. This polygon interpolates the ground levels from either side of the defence to lower the crest and create a smooth slope between the seaward side and landward side of the defence removal polygon. In some places the overtopping inflow lines were inside the defence removal polygon, which meant the inflows were being placed on the smoothed slope, so all wave overtopping was running back down the beach and out to sea. To rectify the issue, a new wave overtopping inflow line was created for the undefended scenario, and this was moved back onto the flatter land at the back of the beach to allow water to flow into the domain, if the topography allowed. An example of the overtopping line placement is shown in Figure 2.

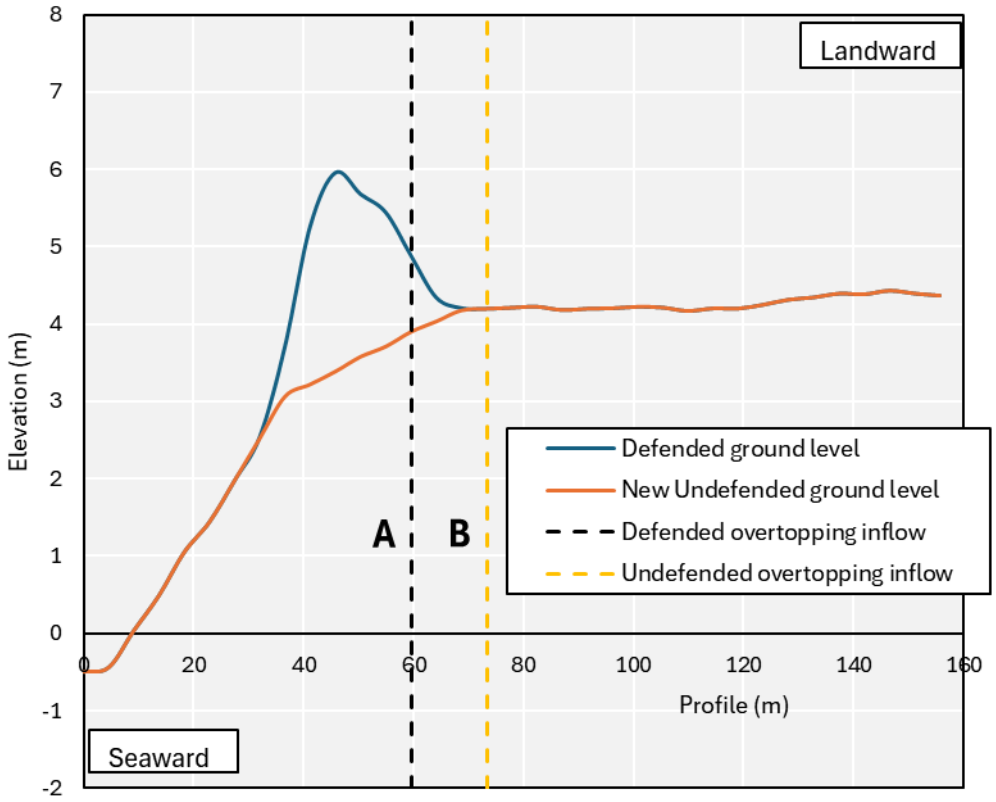

Figure 2: Example of the wave overtopping inflow line placement.

The wave overtopping, previously placed at location A on the slope of the beach so all inflows were flowing back down the beach and into the sea. The new wave overtopping inflow was moved further landwards to location B.

Moving the overtopping inflow to flat land (location B) allows the water to flow either inland or back to sea based on the lowest surrounding ground levels.

The modelled flood extents are generally now more extensive in the updated undefended model setup compared to the previous undefended results. This is expected due to the improved placement of the wave overtopping inflows in the undefended model setup. There are still some locations where higher ground prevents the wave overtopping inflows from spreading inland and instead the water ponds on the beach or flows back to sea. An example of the current existing undefended extents compared to the new undefended flood outlines for East Wittering, for the 0.5% AEP present day and with climate change to 2121 using the Environment Agency guidance for sea-level rise from the UKCP18 95% uplifts, are shown in Figure 3. The 0.5% AEP is used to define Flood Zone 3a which is classed as the area at high risk of coastal flooding.

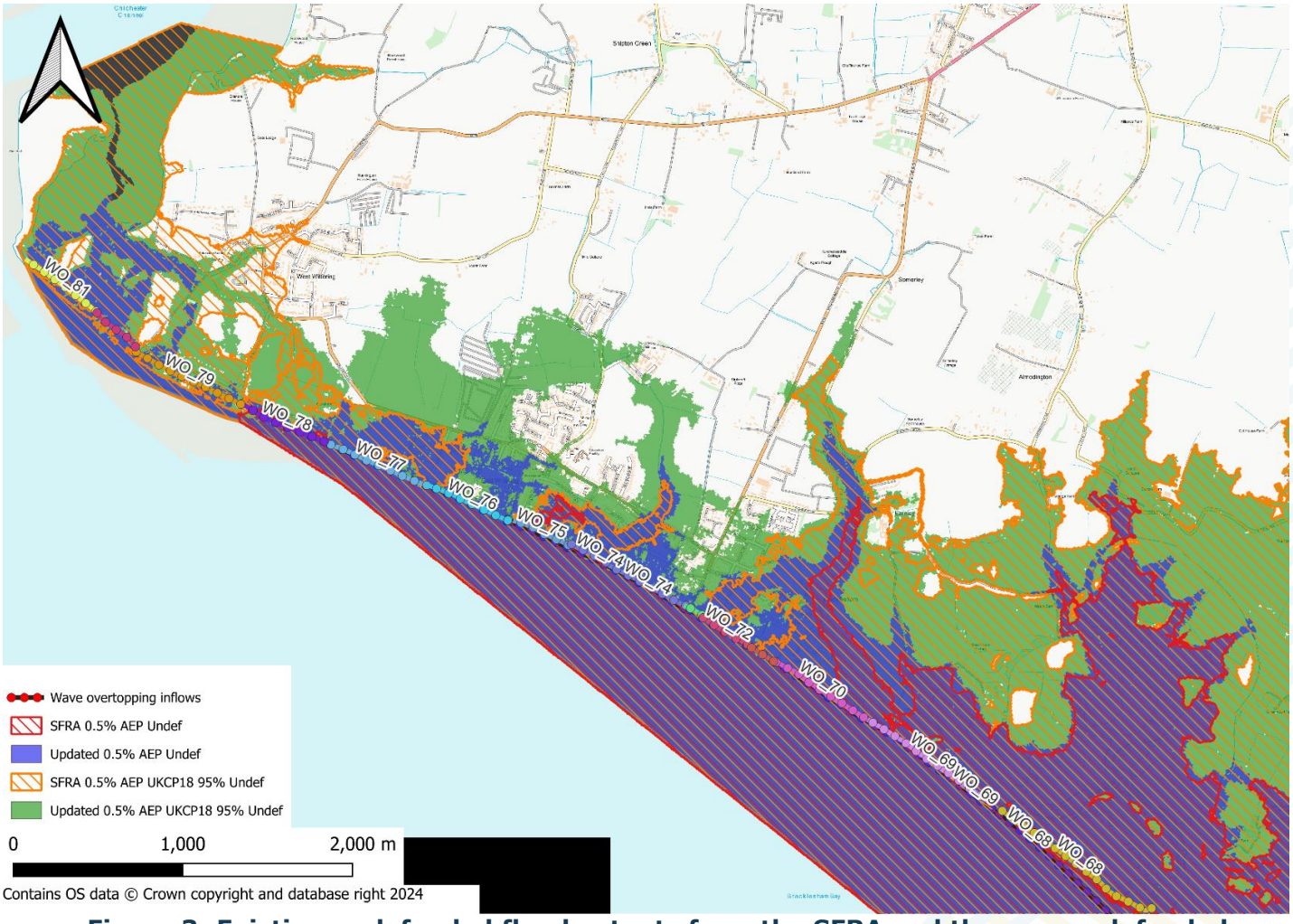

Figure 3: Existing undefended flood extents from the SFRA and the new undefended flood 0.5% extent for present day and with 100-years of climate change in East Wittering

At Selsey the updated results cause more extensive flooding from the wave overtopping inflows, as shown in Figure 4.

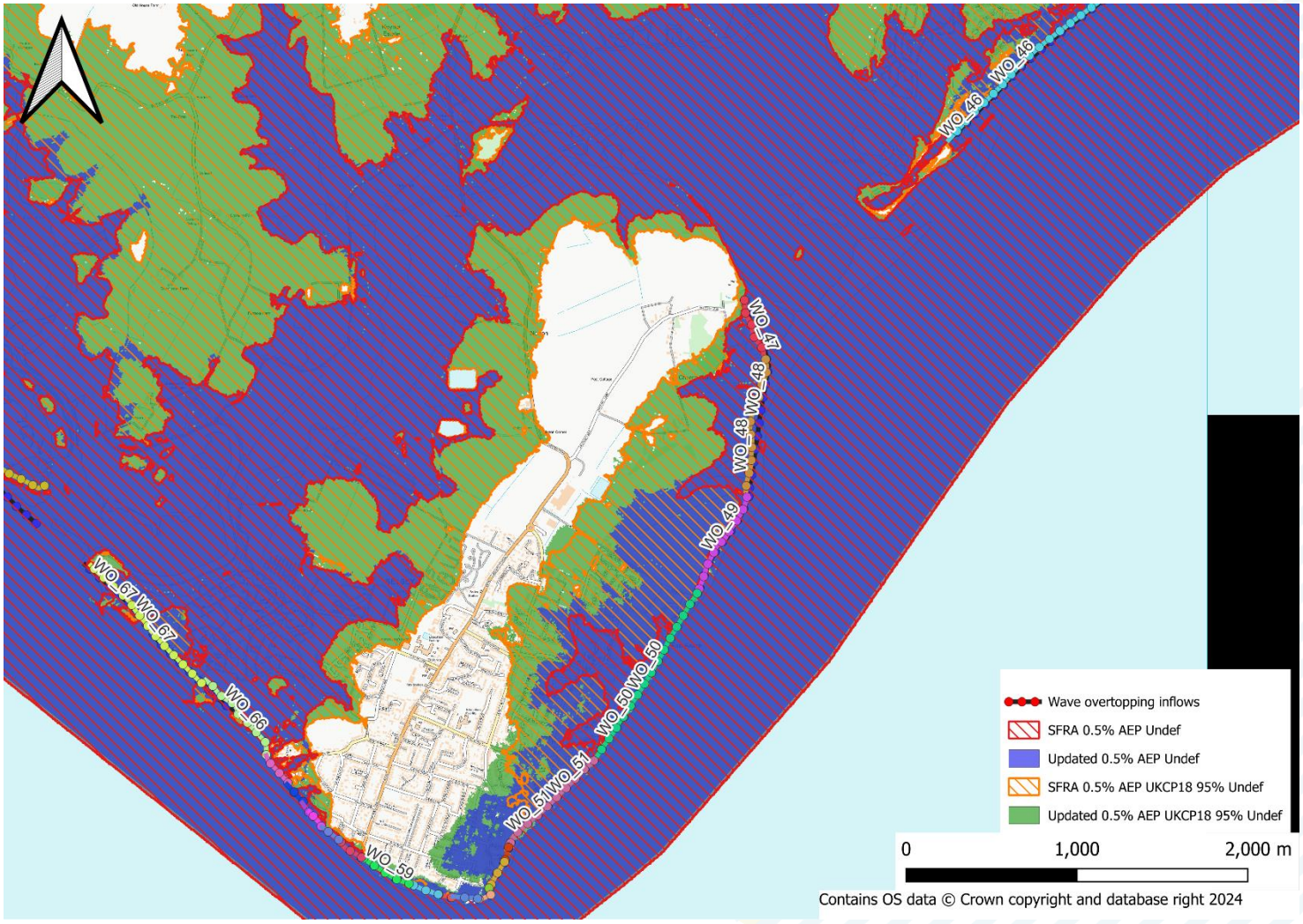

Figure 4: Existing undefended flood extents from the SFRA and the new undefended flood 0.5% extent for present day and with 100-years of climate change in Selsey

For the rest of the SFRA area covered by the AtoEH model, the results are very similar for the inland flooding away from the coast, compared to the original outputs from the SFRA, as shown in Figure 5.

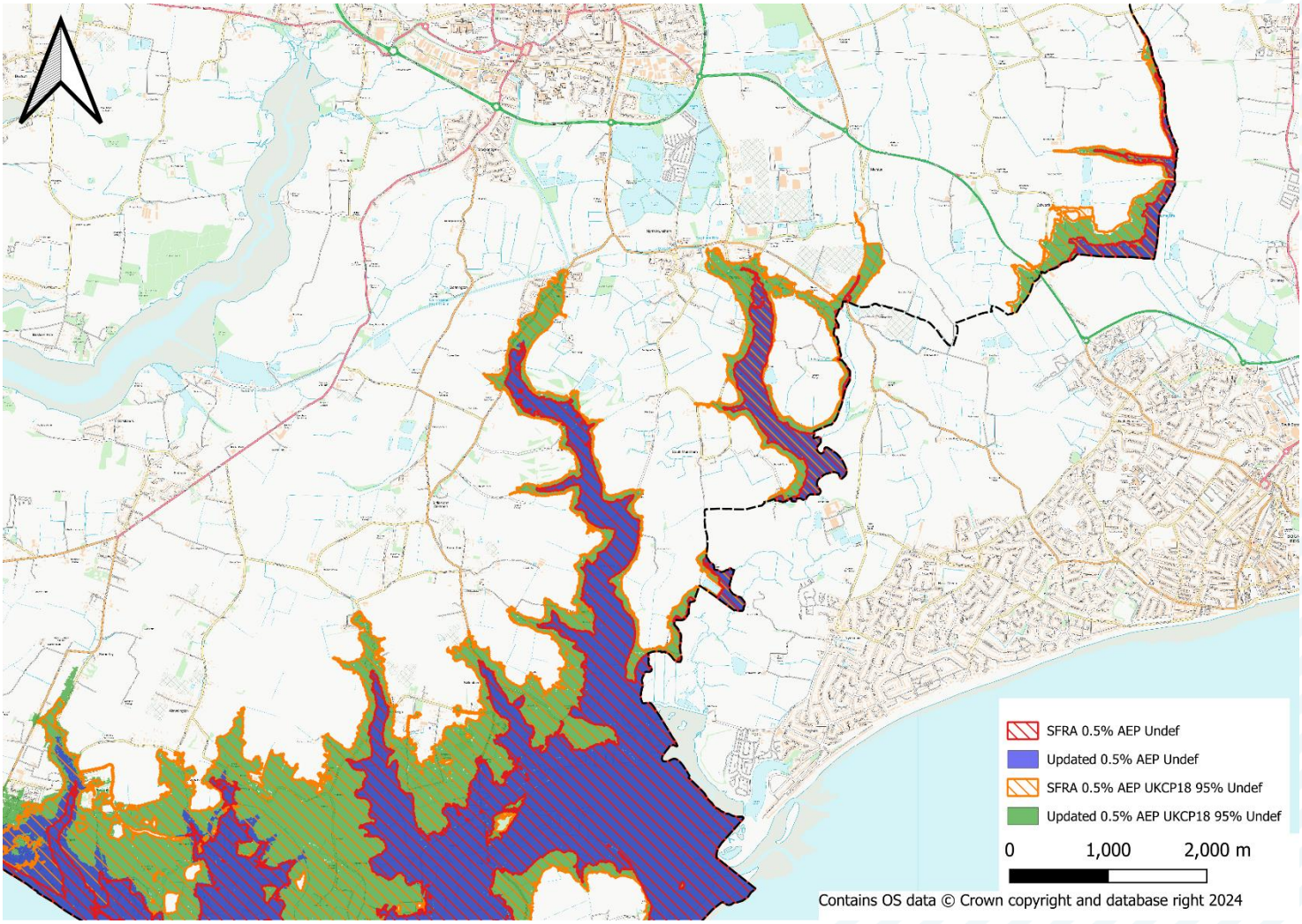

Figure 5: Existing undefended flood extents from the SFRA and the new undefended flood 0.5% extent for present day and with 100-years of climate change for the SFRA area to the north of Bognor Regis

The pattern of increased flooding in the updated outputs is the same for the other modelled scenarios, an example is shown for East Wittering for the 0.1% AEP present day and with climate change in Figure 6. The 0.1% AEP extent is used to define Flood Zone 2 which is the area at medium risk of flooding. It is also used in the application of the sequential test to identify areas at medium risk of flooding now and in the future.

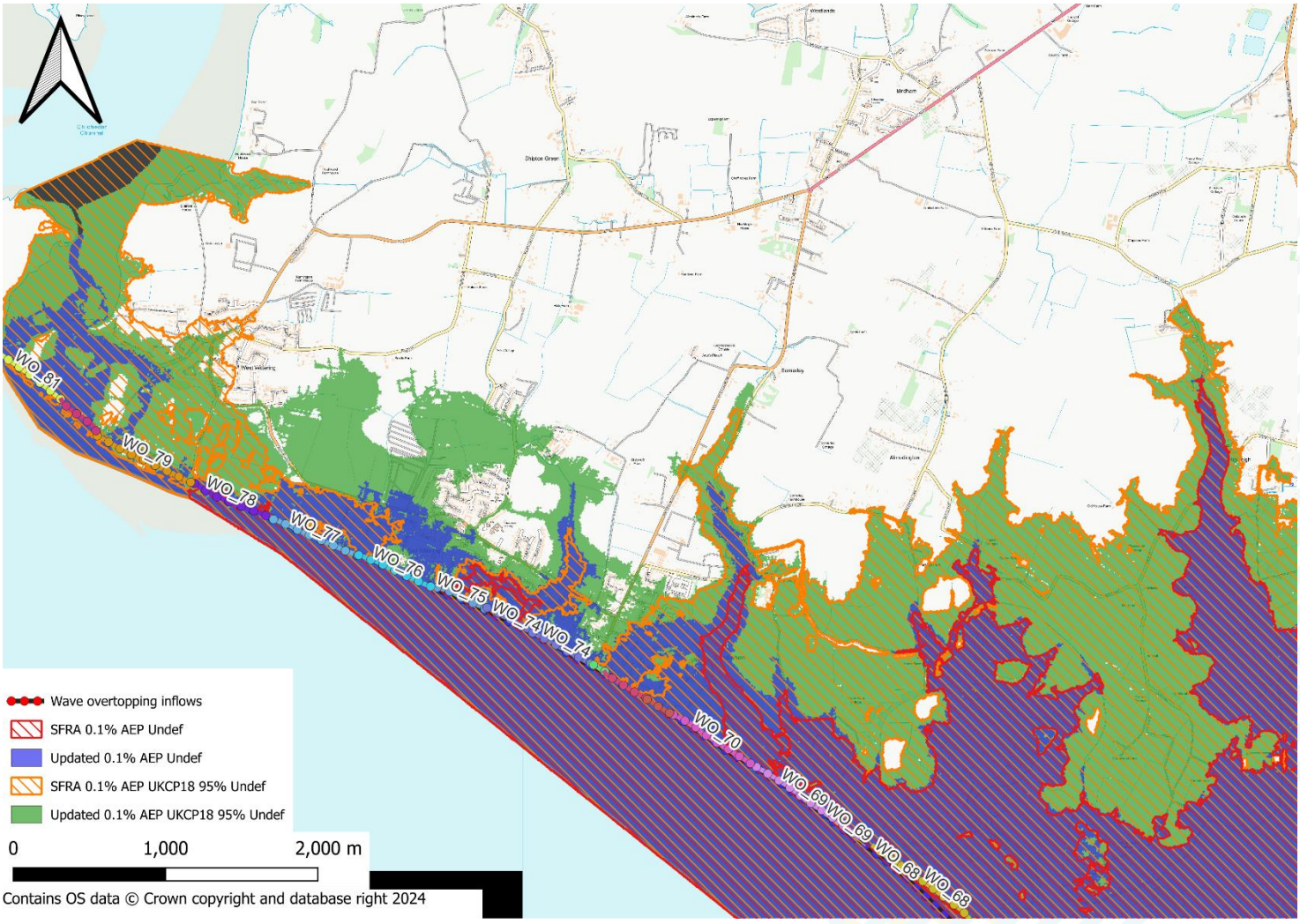

Figure 6: Existing undefended flood extents from the SFRA and the new undefended flood 0.1% extent for present day and with 100-years of climate change for East Wittering

At Selsey there is increased flooding in the updated 0.1% AEP outputs, particularly for the present-day events, but very little change in the climate change flood extents, as shown in Figure 7.

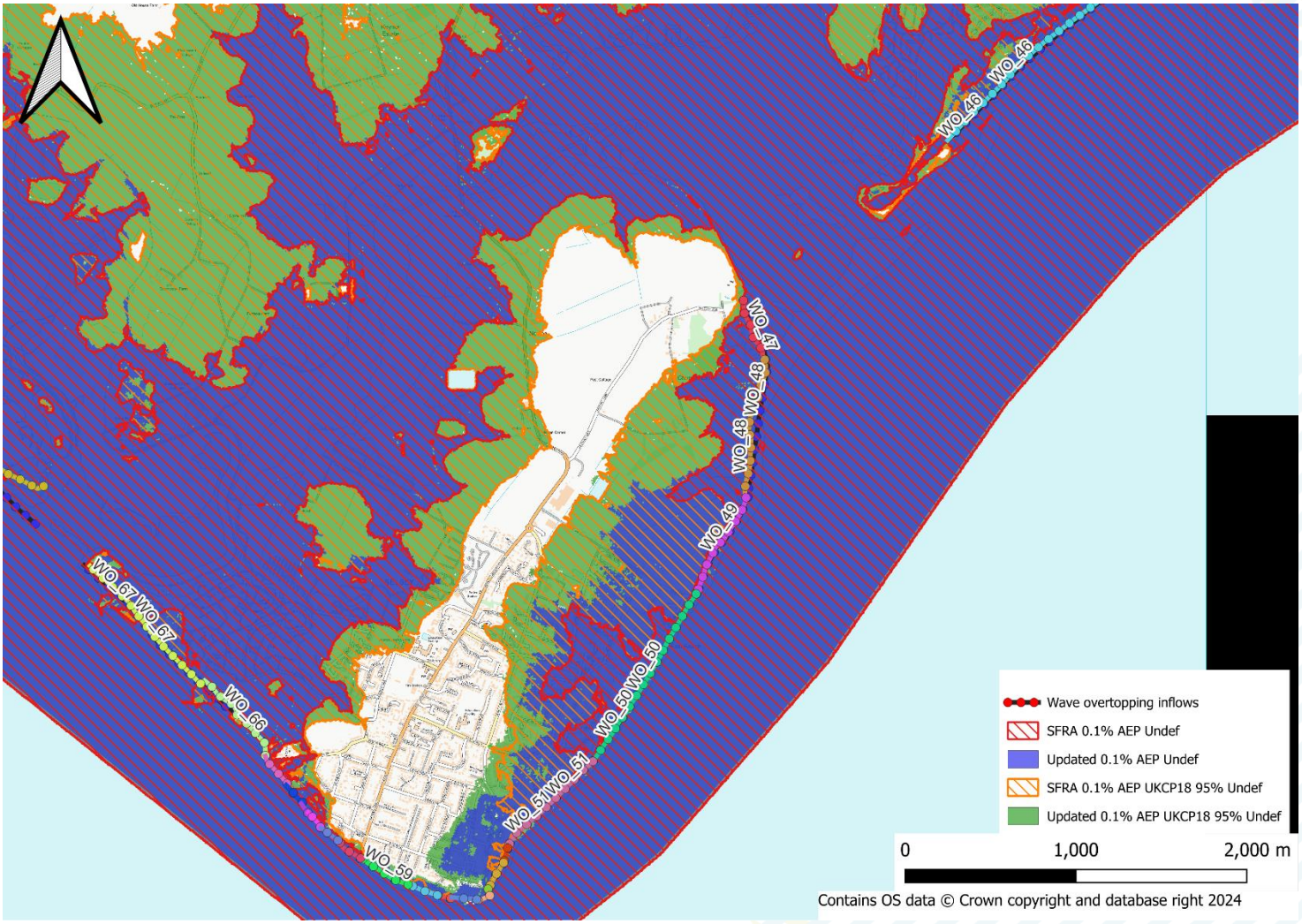

Figure 7: Existing undefended flood extents from the SFRA and the new undefended flood 0.1% extent for present day and with 100-years of climate change in Selsey

For the remainder of the SFRA area to the north of Bognor Regis covered by the AtoEH model, there is little difference between the original and updated outputs for the 0.1% AEP events, as shown in Figure 8.

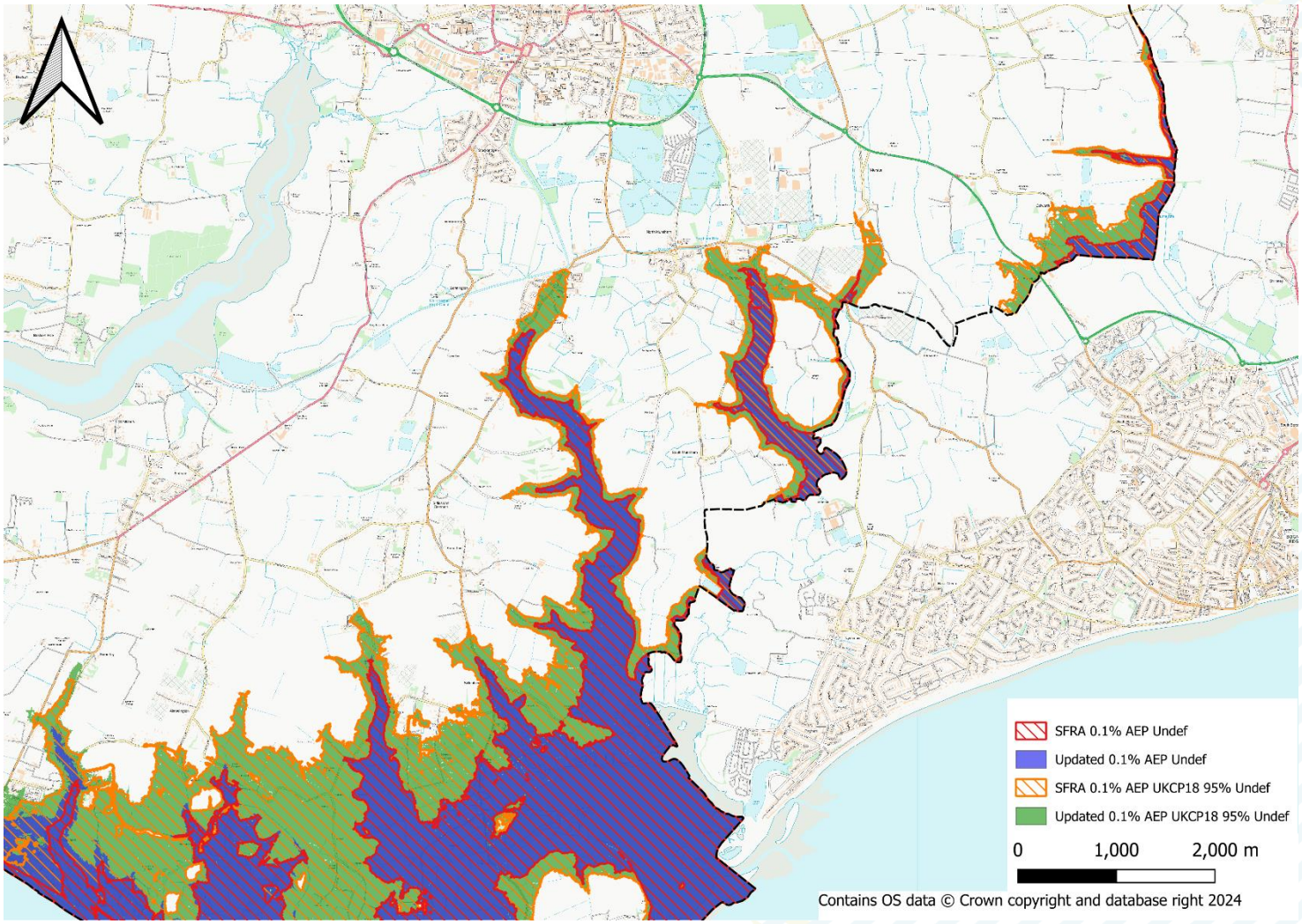

Figure 8: Existing undefended flood extents from the SFRA and the new undefended flood 0.1% extent for present day and with 100-years of climate change for the SFRA area to the north of Bognor Regis