The present work applies the shoreline model from part 1 to a real environment. In part 1, a numerical shoreline model which could handle the development of arbitrarily shaped shorelines was applied to consider the development of shoreline undulations on an unstable shoreline exposed to incoming waves with a directional spreading. In this paper, these findings are extended to firstly include the effect of a varying wave climate on the shoreline morphology and secondly, to tune the model to two naturally occurring shorelines. It is found that the effect of a variable wave climate is to slow down the development of the morphology and in some cases to inhibit the formation of shore-parallel spits at the crest of the undulations. On one of the natural shorelines, the west coast of Namibia, the shore is exposed to very obliquely waves from one main direction. Here, the shoreline model is able to describe the observed shoreline features qualitatively and quantitatively. The model slightly over-predicts the scale of the feature and, associated with this, slightly under-predicts the migration speeds of the features. On the second shoreline, the west coast of Denmark, the shore is exposed to waves with an angle close to the critical around 45°, and here the existence of undulations is discussed in detail. © 2012 Published by Elsevier B.V.