Environment Agency
NEC4 Professional Services Contract (PSC)
Modelling Technical scope

Project / contract Information

Project name	National Flood Risk Assessment (NaFRA) Update – Interim NaFRA
Project SOP reference	[redacted]
Contract reference	31885
Version number	10
Environment Agency Area	National
Area lead	[redacted]
Modelling technical lead	[redacted]
Contact for additional information	[redacted]

This Scope should be read in conjunction with Operational Instruction 379_05 "Computational modelling to assess flood and coastal risk" current at the Contract Date. In the event of conflict, this Scope shall prevail. The *service* is compliant with the Minimum Technical Requirements set out in the Operation Instruction 379_05 and NEC4 Minimum Technical Requirements for Modelling_V2.1.

1. Project Overview

a) Although NaFRA covers the whole of England, updates typically focus on smaller, local areas as and when new information becomes available from either local modelling projects or local flood risk schemes. This information must remain relevant to the public and continue to support core business decisions and activities such as prioritising investment and supporting the maintenance programme.

It can be updated in two ways – either by manual change, or by running the Modelling and Decision Support Framework (MDSF2). This project focuses on updates that are dependent on running MDSF2.

The Environment Agency no longer has a support contract in place for MDSF2 and is unable to rerun MDSF2 in-house.

2. Project Specification

This project looks to rerun MDSF2 in 3 locations around England and put in place a mechanism where an MDSF2 rerun can be completed externally as required. For each location, at a minimum, the *Consultant* shall:

a) Review data provided by the *Client* and produce a summary document of the findings. The review should focus on:
   - Spatial completeness and coverage of datasets provided by the *Client* and if any other datasets are required
   - Any discrepancies between similar datasets (for example, the Continuous Defence Line and the AIMS Asset Elements) and how they will be managed during the project
   - the likely impacts of these findings on the MDSF2 modelled outputs

b) Build, run and quality assure the MDSF2 model to produce draft NaFRA outputs

c) Provide a mechanism for a *Client* led review of the modelled outputs. The *Client* review will focus on if the MDSF2 modelling has been correctly applied and any input data that might need changing, for example crest level or ground level.

   The *Consultant* shall allow the *Client* 20 business days for all *Client* led reviews. Dependant on the findings of the *Client* led review, prior to the final MDSF2 v1.9 deliverables, it may be necessary to rerun MDSF2.

d) Provide the following final MDSF2 v1.9 deliverables to allow NaFRA to be updated by the *Client*.
   - National Spatial Grid (NSG)
   - Coastal Event Tracking Dataset (CETD)
   - Continuous Defence Line (CDL)
   - Asset Management Scenarios
     - **CAMC – Condition Grade 5:** All assets are set to Condition Grade 5
     - **CAMC – Target Condition:** All assets are set to their Target Condition
     - **CAMC – No Defences:** All raised assets are removed from the modelling by altering the fragility curves to ensure all defences are always in the failed system-state
     - **SAMPS – Reduced Conveyance:** Fluvial loading conditions are adjusted to reflect the removal of conveyance management

   For each deliverable, an agreed format will be provided by the *Client*.

The study area comprises 3 locations across England:

Brunton Park, North East

Overview - In October 2016, work was completed on a flood reduction scheme in Brunton Park on the River Ouseburn to reduce the risk of flooding to more than 100 properties. Work included installing 380 metres of new river channel to divert the Ouseburn, creating a new storage basin and constructing 650 metres of flood defences (walls and earth embankment).
Driver - An MDSF2 rerun is required to ensure that the new river channel is correctly reflected and associated changes in flood risk are included in NaFRA
Modelled reach length - 2km
Area of Model Domain – 0.5km^2

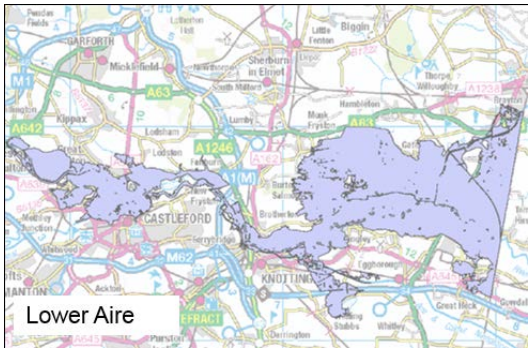
East Kent Coast, Kent and South London

Overview - In recent years a new £30 million capital scheme was completed at Sandwich followed by updated coastal flood risk modelling of the wider East Kent coast. There is significant local interest in our national flood map products from the public as a result
Driver - An MDSF2 rerun is required given the scale and complexity of the update. Whilst the update is driven by a need to better reflect new coastal flood risk modelling data, there is a need to ensure that the MDSF2 modelled outputs reflect the interaction of coastal, tidal and fluvial flooding in this location.
Modelled reach length - 55km of coastline (plus approximately 180km of river within the tidal/coastal floodplain)
Area of Model Domain - 208km^2

Lower Aire, Yorkshire
Overview – The Lower Aire catchment contains the main River Aire, often enclosed within man-made embankments. The floodplains have typically been converted from natural floodplain to managed washlands. These managed washlands are designed to store water effectively during flood events. Storm Dennis in 2020 saw the washlands being filled to capacity, with significant flooding occurring.

Driver - An MDSF2 rerun is required to improve our confidence in NaFRA given the nature of the catchment and political challenges we have faced. The Lower Aire flood modelling study was completed in 2017, and due to the complexity of the catchment it is not possible to complete a manual change to Nafra in this area.
Modelled reach length - 71km
Area of Model Domain - 68km^2

Map of Study Area



[redacted] 29/03/2018

1: Hydraulic Model Review

1.1 This is not required for the MDSF2 runs however, the *Consultant* shall assess the supplied local model data to determine its compatibility for use in MDSF2.

2: Hydrological Model & Tidal / Coastal Boundary Review

This section is not relevant to the study.

3: Local Flood History

This section is not relevant to this study

4: Site Visit and Topographic Survey

4.1 No site visits or additional topographic survey are required for the MDSF2 re-runs. Local knowledge will be provided by the *Client* during draft output review.

5: Hydrological Assessment & Hydrometric Review

5.1 This is not required for the MDSF2 runs however, the *Consultant* shall assess the supplied local model data to determine its compatibility for use in MDSF2.

6: Tidal / Coastal Boundary Analysis

6.1 This is not required for the MDSF2 runs however, the *Consultant* shall assess the supplied local model data to determine its compatibility for use in MDSF2.

[redacted] 29/03/2018

7: Fluvial – New Hydraulic Model Build

7.1 A new MDSF2 model is required.

8: Fluvial – Update Existing Hydraulic Model(s)

This section is not relevant to this study.

9: Model Proving, Calibration and Verification & Sensitivity

9.1 The *Consultant* shall complete model proving through the inspection of MDSF2 model outputs. Particular attention will be paid to model input datasets and validation layers during the modelling process in order to identify and resolve input data anomalies. Draft outputs will also be scrutinised and issues addressed before providing the draft outputs to the *Client* for review.

10: Design Simulations & Results

10.1 The *Consultant* shall produce standard MDSF2 design simulations to allow the *Client* to update NaFRA.

11: Flood Warning Improvements

This section is not relevant to this study.

12: Blank Section

This section is not relevant to this study.

13: Flood Forecasting – Inception Stage

This section is not relevant to this study.

14: Flood Forecasting – Model Development and Calibration

This section is not relevant to this study

15: Coastal – New Hydraulic Model

A new MDSF2 model required.

16: Coastal – Hydraulic Model Review

16.1 This is not required for the MDSF2 runs however, the *Consultant* shall assess the supplied local model data to determine its compatibility for use in MDSF2.

17: Coastal – Update Existing Hydraulic Model(s)

This section is not relevant to this study

18: Broadscale Modelling

This section is not relevant to this study

19: Options Appraisal

This section is not relevant to this study

20: Surface Water – Hydraulic Model Review

This section is not relevant to this study

21: Surface Water – Update Existing Hydraulic Model(s)

This section is not relevant to this study

22: Surface Water – New Hydraulic Model Build

This section is not relevant to this study

Available Data – Treat as Site Information

All datasets supplied for the project must be returned to the *Client* upon project completion. Datasets returned should adopt the appropriate security marking, be password protected/encrypted in accordance with the latest government guidelines. Data that will be made available to the *Consultant* include:

Please list any relevant existing model reports / technical notes etc
MDSF2 model domain Description - ArcGIS shapefile derived from Flood Zone 2, showing the extent of each MDSF2 rerun Date – extracted 03/02/2021 Available – at tender stage
MDSF2 expected DRN Description – Taken, and slightly modified from the 'SoN RiverSegments_UsedForSoN' layer within the National Fluvial Levels Database (NFLDv9) to indicate the extent of the Detailed River Network to be embedded in the new MDSF2 models. Date – extracted 03/02/2021 Available – at tender stage
Continuous Defence Line (CDL) Description - ArcGIS geodatabase clipped to the MDSF2 model domain, containing the Continuous Defence Line from AIMS:Inventory. It is populated in the AIMS system and contains spatial and attribute data for flood defences. Nb: Due to limitations in AIMS:Inventory, it was necessary to extract the CDL for the East Kent Coast model domain in 3 sections and many assets are duplicated as a result; The Brunton Park CDL was extracted from AIMS:Inventory but spatially modified in ArcGIS to reflect the location of the updated defence line. Date - extracted from AIMS on 26/01/2021 (Brunton Park) and 03/02/2021 (all other locations) Available – at tender stage. It may be re-provided at contract award if significant improvements to crest levels or asset type are made.
East Kent Coast – MDSF2 data for tasks 1 and 2 Description - Some work was completed EKC by HRW to complete tasks 1 and 2. Checks will be required for any changes to asset data. Date - June 2019

Available – at tender stage

Digital Terrain Model (DTM)

Description – The *Consultant* is asked to access the most recent LiDAR dataset in 1-2m resolution from the defra digital services platform and produce a single DTM for each MDSF2 model domain
Date - extracted at contract award, LiDAR flown at various dates beforehand
Available – at contract award

Surfzone Bathymetry

Description - Composite bathymetry dataset produced for State of the Nation project covering the whole of the coast of England

Date - 2018
Available – at contract award

Agricultural Land Classification

Description - Data - National shapefile for England containing agricultural classifications

Date - 2015 (date uploaded to EA network)

Available – at contract award

Soils

Description - National shapefile for England containing soil types and hydraulic properties

Date - 2017 (date uploaded to EA network)

Available – at contract award

Detailed River Network (DRN) – as per 'DRN_With_FilterResults_for_Review' from input final geodatabase as delivered by the CDL project

Description - The thinned, national geodatabase containing river networks for England that was produced by the CDL project to inform the State of the Nation update to NaFRA. It will need to be used in conjunction with the MDSF2 expected DRN layer.

Nb: The Detailed River Network v3 (DRNv3) is also available on request. The document 'Task1_DRN_workaround.docx' outlines a change required to attribute field type in DRNv3 before running in MDSF2. However, it is hoped that this work around will not be required by using version of the DRN which has been provided.

Date - 2016

Available – at contract award

National Fluvial Loads Database v9

Description - National geodatabase for England containing in channel water levels for 40 return periods. Last updated during the State of the Nation project.

Date - 2017
Available – at contract award

National Coastal Loads Database v4

Description - National geodatabase for England containing information including, overtopping volume and still water level tables for 40 return periods; and joint probability regions.

Date – 2016

Available – at contract award

Local Detailed Models – Fluvial

Description - In channel water levels. The local model data supplied to inform the MDSF2 run will need to be assessed for its compatibility for use in MDSF2.

Date - Various

Available – at contract award

Local Detailed Models - Coastal

Description - Tidal estuary water levels and overtopping volumes and rates. The local model data supplied to inform the MDSF2 run will need to be assessed for its compatibility for use in MDSF.

Date – Various

Available – at contract award

CEH (Centre for Ecology & Hydrology) Catchment data

Description - Two National for England containing Flow and Catchment descriptor and Cumulative Catchment Area providing catchment data

Date - will be extracted at contract award

Available – at contract award

AIMS Asset Elements

Description - National data held in AIMS containing additional defence asset information such as element type.

Date - will be extracted at contract award

Available – at contract award

National Receptors Database (NRD)

Description - National shapefile containing risk receptor information. Based on the NRD 2014, with modifications to 3226 NRD property records to incorporate learning from the State of the Nation project

Date - 2017

Available – at contract award

Flood Map Data

Description - multiple shapefiles including the Flood Zone 3, Extreme Flood Event Outline, Areas Benefitting from Defences, Flood Storage Areas and Historic Flood Event Outline, clipped to the MDSF2 model domain. Date - will be extracted at contract award

Available – at contract award

Lakes

Description - National shapefile for England of lakes and flood storage areas. Clipped to MDSF2 model domain.

Date - extracted at contract award

Available – at contract award

Risk of Flooding from Rivers and Sea (RoFRS)

Description – If required at any stage for information purposes, the *Consultant* is invited to access the latest national spatial grid of NaFRA results from the defra digital services platform where it is published as RoFRS.

Date - extracted at contract award

Available – at contract award

State of the Nation Modelled Input Geodatabases (PD007)

Description – Input data geodatabases used to run the last national update to NaFRA in England by the State of the Nation project.

Date – 2018 (the geodatabases themselves. However, the individual datasets within them were extracted or created over several years prior to this)

Available – for information on request.

Nb: the *Consultant* is reminded that these MDSF2 reruns are driven by the availability of significant data changes since the State of the Nation project.

MDSF2 v1.9 Software

Description – The MDSF2 software, user manual and associated Environment Agency operation instructions.

Date – 2018

Available – at contract award

Existing Model Summary – Fluvial Hydraulic

Model Name	Date	Length of modelled watercourse (km)	Hydraulic model type	Other Type	Description	Information only or to be updated
Brunton Park Scheme Model	2019	4	Flood Modeller Pro		Model has in channel water levels and flows	Info only
Lower Aire Study	2017	66	Estry – Tuflow		Model has in channel	Info only

[redacted] 29/03/2018

					water levels and flows	
Gorrell Stream	2017	1	Infoworks ICM		Model has in channel water levels and flows	Info only
Oyster Coast Brooks	2013	2	ISIS - Tuflow		Model has in channel water levels and flows which have been incorporated into NFLDv9	Info only
Plenty Brook	2013	4	1D-2D Estry-Tuflow		Model has in channel water levels and flows	Info only
Lower Stour fluvial	2010	36	1D-2D Estry-Tuflow		Model has in channel water levels and flows which have been incorporated into NFLDv9	Info only
Little Stour	2012	9	Uncalibrated FEH		Model has in channel water levels and flows which have been incorporated into NFLDv9	Info only
Flood zone improvements (Sarre Penn)	2011	9	Uncalibrated FEH		Model has in channel water levels and flows which have been incorporated into NFLDv9	Info only

Existing Model Summary – Coastal Hydraulic

Model Name	Date	Length of modelled watercourse (km)	Hydraulic model type	Other Type	Description	Information only or to be updated
East Kent Coast – Domain 1	2018	55	Flood Modeller Pro – Estry - Tuflow		Model has in channel water levels and flows	Info only

3. The *services* specifically excludes the following

a) Any manual changes that need to be made to the modelled outputs will be made by the *Client,* in *Client* hosted systems after the final deliverables listed in section 2d) have been received.

b) The National Fluvial Loads Dataset (NFLD) is not required.