TECHNICAL NOTE

Project Name	Kemnay Flood Study		
Project No.	4021839		
Document Title	Hydrology Review Note		
Issue Date	21/03/25		
Issue Status	FINAL		
Prepared	**Checked**	**Reviewed**	**Approved**
AG	*JK*	*HB*	*HB*

1. Introduction

RSK / Binnies were commissioned by Aberdeenshire Council to carry out a flood study in Kemnay. This technical note forms part of the initial work to gather data and review the available hydrology in line with current SEPA guidance and industry best practise. The purpose of this document is to summarise the findings from the review of the hydrology previously developed for the models in this area.

At Kemnay, an existing model of the sewer network was available and was held by Scottish Water.

2. Existing Scottish Water Model

Scottish Water provided their sewer network model covering Kemnay in Infoworks ICM v.2025 format. This existing model contained both the winter and summer FEH13 storm events for a range of durations between 30 minutes and 1 day. The 1 in 1, 2, 5, 10, 20, 30 and 50-year return period events for this range of storm durations were provided with the model. The 1 in 100, 200 and 1000-year events were not included in the model, but will be required as part of the Kemnay Flood Study.

2.1 Hydrology Schematisation

Hydrological (rainfall) inputs have been applied entirely to defined subcatchments. No direct rainfall exists in the model (either entirely, or outside subcatchments) and therefore overland flow is only generated at arbitrarily selected manhole locations which is not the optimum representation when looking at overland flows. Furthermore, larger subcatchment sizes may produce inaccurate results as this approach does not account for key overland flow routes, such as roads. Thus, an improved method for accounting for surface water flow that either enters the network or flows overland through direct rainfall should be considered.

No hydrological inputs to fluvial watercourses were supplied with the model other than two level files that are included in the model database representing constant watercourse water levels.

2.2 Data Provenance

Rainfall generation was based on FEH13 catchment data, which captures the hydrological characteristics of the area. Design rainfall profiles based on the FEH13 dataset were generated in ICM 9, utilising ReFH2 software version 2.2.6029. An antecedent depth of 10mm was applied uniformly to all events to account for pre-existing ground wetness. To reflect seasonal variations, summer events

included an evaporation rate of 3mm/day and an antecedent precipitation index (API) of 0.16mm, while winter events used a reduced evaporation rate of 1mm/day and a higher API of 0.83mm.

2.3 Climate Change Allowances

Kemnay falls within SEPA's North-East Scotland river basin region, and the uplift on peak rainfall intensity to the year 2080 is +37% as advised by the most recent climate change allowances. Climate change allowances are included within the provided model; however, an error seems to have occurred, as the rainfall profiles in the climate change uplift folder are identical to the present-day synthetic rainfall profiles, meaning no actual allowance has been applied. The uplift on peak river flows to the year 2100 is +34%. Note that uplifts for watercourses with catchment areas smaller than 30km^2 utilise the +37% uplift figure on peak rainfall intensity.

3. Summary of Outcomes

The following are required updates to make the hydrology suitable for use in the Kemnay Flood Study:

- The 1 in 100, 200 and 1000-year return period events will be added to the model.
- FEH22 rainfall will be used for all return period events.
- Most recent climate change allowances will be applied to the FEH22 rainfall generated.
- The critical storm duration requires to be defined.
- No fluvial hydrology on the River Don was available from any existing model at Kemnay, and this should be included as part of the Kemnay Flood Study.

The following are suggested updates, which may enhance the model outputs in the Kemnay Flood Study:

- Removal of storm subcatchments and application of direct rainfall onto the model mesh.
- Consider the inclusion of ground infiltration in the ICM model.