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Geomorphological appraisal of the River Nar Site of Special Scientific Interest

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Introduction

The River Nar was notified as a Site of Special Scientific Interest for its chalk river to fenland river transitions, but like many river systems in lowland England, has been heavily modified.

The upper river supports chalk river habitats and flows through a predominantly semi-natural floodplain. However, interventions include canalisation of the headwaters, construction of ornamental lakes, over-deepening and over-widening, and the presence of a series of weirs and mills. In recent decades, elevated levels of silt ingress have resulted from the intensive arable farming in the wider catchment.

In contrast, the lower river occupies an entirely artificial channel, having been diverted from its original course. It flows through a landscape dominated by intensive agriculture and is characterised by high flood-banks, low river gradients, and a lack of connectivity with its floodplain. As a high level carrier, there are significant issues in relation to the balance between flood-risk management, and impacts of this management on the special interest.

Upstream of its outfall, the Nar flows through King's Lynn and an industrial hinterland which is currently under redevelopment by the Nar Ouse Regeneration Area (NORA) Project. In addition, there are also proposals to develop a marina on the outfall of the river and to reopen navigation upstream to the Flood Diversion Channel.

What was done

A geomorphological appraisal was jointly funded by English Nature, the Environment Agency, King's Lynn Consortium of Internal Drainage Boards, and the Borough Council of King's Lynn & West Norfolk (the latter on behalf of EEDA and English Partnerships). The objectives of this appraisal were to provide a holistic overview of the river, to identify appropriate solutions to environmental issues, and to consider impacts and mitigation in relation to the NORA project and proposed navigation. The appraisal involved a detailed fluvial audit to establish the physical nature of the river channel, and geodynamics assessments to understand how the river functions within this channel. The report also details a new methodology designed to integrate scientific evaluation of natural geomorphological conditions with data on channel modifications. This multi-criteria analysis is used to extract a set of indices of geomorphic function and morphological condition relative to natural conditions. To assist decision making in relation to the NORA Project and the proposal to re-

open navigation, the report also provides an assessment of the proposed landscaping, and the potential for compensatory enhancement work between King's Lynn and Narborough.

Results and conclusions

A reach classification is presented with comparisons against geomorphological reference conditions. This information is used to derive a set of suggested management approaches to move each reach back towards a more favourable geomorphological condition. Reach-by-reach information is summarised in the report and accompanying maps, and Geographical Information System (GIS) database. Key conclusions are:

- The geomorphology and gravel bed substrate on the upper river are a relic of past geomorphological processes.
- Once gravel beds have been removed, there is an insufficient supply of gravel to replenish these through natural processes.
- Fine sediment is mostly derived from catchment sources, with a limited contribution from bank erosion. The sand load is mobile throughout the river under flood conditions.
- The road and ditch network should be viewed as an extension to the naturally low density drainage network and managed to reduce sediment ingress.
- The perched nature of the channel on the lower river precludes embankment set back except in the reach upstream of Marham flume.
- The transition from the upper to the lower river should be regarded as a valuable ecological gradient.

English Nature's viewpoint

The Geomorphological Assessment of the River Nar Site of Special Scientific Interest is a useful baseline and gives us new insights into the form and function of the river. It gives us a valuable new tool in order to develop a strategic approach to river restoration on the upper river, but also to evaluate proposals on the lower river with regard to flood risk management and proposed developments associated with the regeneration of King's Lynn.

Selected references

SEAR, D.A., NEWSON, M.D. & THORNE, C.R. 2004. *Guidebook of applied fluvial geomorphology*. Defra/Environment Agency Flood and Coastal Defence R&D Programme. R&D Technical Report FK1914.

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