

# River Engineering and Restoration

Arup has extensive experience in the feasibility, design, construction and management of river engineering and river restoration schemes



## Introduction

Rivers are natural, dynamic systems. However, in the past, some attempts to control waters through drainage and hard engineering have resulted in visual and environmental degradation, negative impact on flora and other wildlife and the loss of many river and wetland habitats.

In the context of flood risk management, successful river engineering involves the balance between achieving/maintaining a natural environment while providing adequate flood control.

Arup solutions embrace the following principles:

- Reducing flood risk
- Improving water quality
- Facilitating recreation and amenity
- Fisheries protection
- Strategic creation / enhancement of critical Biodiversity Action Plan (BAP) habitats
- Recovery of threatened riverine and wetland species
- Protection and improvement of the ecological and physical status of European water bodies in line with the EC Water Framework Directive (WFD)

Arup expertise addresses these issues by:

- Employing an understanding of the relationship between fluvial geomorphology (the study of the physical form of rivers and their catchments) and ecology to determine where key morphological features are missing and/or under-utilised
- Identifying potential opportunities to enhance and restore physical habitat features and the recommendation of beneficial management practice changes
- Providing detailed knowledge of physical river structure and function
- Applying wider, catchment-based approaches to water management involving an understanding of geomorphology, sediment dynamics, land management and river channel evolution
- Using a holistic approach key for the delivery of sustainable solutions
- Wetland and habitat creation including integration of engineering and fluvial geomorphology to provide sustainable, soft engineered solutions

Working with natural forces to shape our rivers, while achieving sustainable and cost-effective solutions, Arup has extensive experience in the feasibility, assessment, design, construction and management of river engineering and river restoration schemes including:

- Flood alleviation schemes
- Management of river flows
- Installation of fish passes at weirs and other structures
- Rehabilitation of rivers
- Maintenance and improvement of bank side defences
- Gauging stations
- Remedial work to and reconstruction of river walls.

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## Our comprehensive river engineering service encompasses:

- Feasibility studies including evaluation of existing physical, engineering, statutory and environmental constraints and opportunities
- Environmental studies
- Investigation of water quality issues
- Hydraulic and hydrological modelling of major and minor river systems
- Structural assessment of existing structures
- Cost benefit analysis
- Geotechnical engineering
- Engineering design and construction of existing and new river walls.
- River restoration design
- Landscape design
- Sediment studies
- Scour and erosion studies
- Habitat enhancement
- Historical assessments of channel change
- Geomorphological field surveys
- Strategic catchments management plans
- Low flow studies
- Integrated GIS
- Locks and Lock Gates
- Canal engineering
- Boating facilities

## Ravensbourne, Queensmead

Arup was commissioned by the UK Environment Agency to undertake a pre-feasibility study to identify channel improvement and restoration measures on a section of the Ravensbourne River, South London. The objectives of these channel improvements are to reduce flood risk, while improving habitat diversity and general environmental aesthetics. This work forms part of a wider River Corridor Improvement Plan (RCIP) which is being prepared for a reach of the Ravensbourne. A potential focus of this project is the creation of a linear riverside park. This could bring together and connect both existing and new green spaces and incorporate a restored river channel and continuous footpath and cycle network. In addition, it would also provide multi-purpose flood alleviation, recreation, ecological and educational benefits.



## Tregaron Flood Alleviation Scheme

A preliminary geomorphological assessment of the potential impact of a proposed flood alleviation scheme identified significant issues relating to scour and sediment movement. A number of innovative solutions were developed to protect the bed from scour and enhance the ecological value of the river channel. These solutions included a series of sunken check weirs with soft 'green' edges to cover the sheet piling and provide a riparian buffer for the river. Notches placed in the check weirs will encourage a meandering low flow channel to develop; improving the habitat for fish and other ecology.



## River Wylde Wiltshire

Restoration work has been being undertaken on the River Wylde, (a chalk stream designated as a SSSI and SAC) to reduce the impact of low flow because of abstraction for public water supply. Arup recently undertook a geomorphological survey of a number of restoration sites which have been implemented since 2001, and compared the results with a similar benchmark survey from 2001. Analysis of the data sets using GIS allowed assessment of the success of the restoration measures and their ability to improve the geomorphological diversity of the river.