MOTT MACDONALD

Predict, prepare and protect

Smart, sustainable solutions to manage rivers, mitigate flood risk and increase climate resilience

Understanding the challenges you face

Flood events and climate shocks are increasing in frequency and severity as global temperatures continue to rise.

Cost-effective, practical solutions

The consequences of extreme weather can be devastating and reported losses are rising. Businesses, governments and organisations worldwide are suffering long-term harm to assets, productivity, service provision and reputation.

Compounding climate change are increasing pressures from population growth, ageing infrastructure and financial constraints. Service providers and asset owners are expected to do more with less, providing greater flood protection to more people, but with proportionally less investment.

Not all floods can be prevented and you can't just keep building higher walls. Clients need solutions that are cost-effective, practical, environmentally sensitive and sustainable, combining soft and hard engineering and addressing the social dimensions of flood risk.

Our expertise and experience in whole catchment management, nature-based solutions, adaptive planning and infrastructure resilience can help you tackle these challenges.

Addressing cascade failure

Disruption in one sector can have diverse, far-reaching consequences if a failure cascades through others. More frequent, intense and enduring extreme weather events, such as flooding, will increase the risk and the level of such failures.

We will map the water system and how it interacts with other systems to identify weak points and, if they cannot be eliminated, develop a contingency plan and build redundancy into the system. This will limit the extent of cascade failure and emergency response to maintain continuity of services even during worst-case climate events.

New ideas and technologies

As an employee-owned company, we have the freedom and independence of mind to seek out new, innovative ways of solving complex problems.

We'll show you how building information modelling (BIM) cuts waste and carbon, and makes it possible to integrate design and construction teams, realising significant savings in time and programme costs.

And we can help you make the most of smart technologies to extend the working life of existing assets by making systems adaptable and more responsive to weather warnings, and achieve better utilisation of space and storage capacity outside flood events.

Making a difference to communities

The primary purpose of infrastructure is to serve society and improve people's lives. We never lose this focus. In all our projects, we look upon infrastructure as a way of realising social benefits and meeting community needs around accessibility, inclusion, empowerment, resilience and wellbeing.

We care about making our projects the best they can be. And we believe that business needs can be met without compromising the natural environment and, very often, while enhancing it.

By looking for opportunities early in project development, it's possible to go beyond core objectives and deliver wider benefits at little or no additional cost. This is how our social and environmental specialists think and operate, and they work closely with our engineers to make sure we not only anticipate and avoid negative impacts, but identify ways in which we can maximise positive outcomes for communities.

It involves taking a 'people perspective' and putting community considerations front and centre, rather than treating them as ancillary to design and development processes. For us, this is business as usual.

We cover all aspects of flood risk management. Our specialist teams will help you to:

- Predict and prepare for flood events
- Protect critical infrastructure from extreme weather
- Manage flood risks better and more cost-effectively
- Develop strategies to adapt to climate change
- Improve emergency planning
- Recover more quickly from climate shocks
- Prolong the effective life of assets
- Achieve greater returns on investment
- Enhance the landscape and preserve natural habitats
- Deliver beneficial social outcomes in line with the UN's Sustainable Development Goals

Delivering landmark projects to meet complex challenges

As one of the world's leading consultancies in flood risk management, we can call upon a vast array of specialisms and capabilities.

We deliver world-class engineering solutions by:

- Putting safety, wellbeing, equality and diversity principles first

- Creating sustainable solutions that provide social, economic and environmental benefits

- Promoting innovations, driving down cost and shortening programmes

- Challenging the need for new infrastructure and repurposing existing assets

- Ensuring stakeholder engagement throughout

- Providing whole-life asset and carbon management facilitated by BIM

- Packaging projects together to create economies of scale
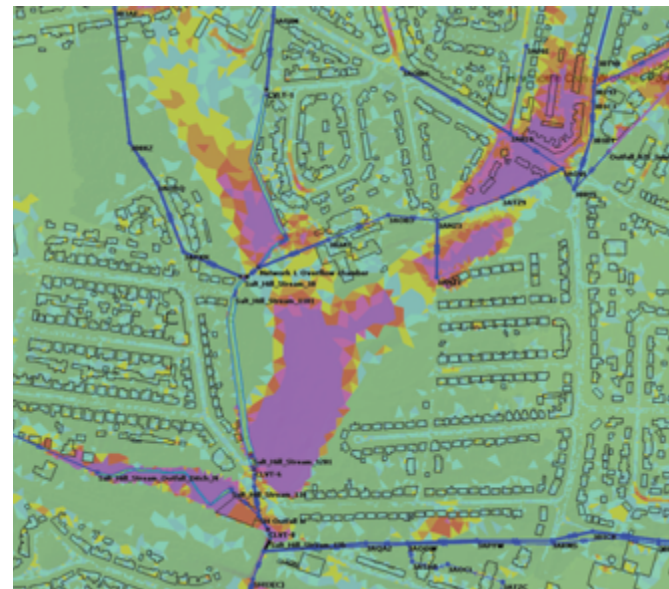
Carbon management of flood defences

Our teams have a solid track record of designing projects that mitigate increased flood risks posed by climate change while aligning with sustainability goals. We can help you combine low-carbon flood defence types with nature-based solutions that enhance ecosystems and deliver co-benefits to communities.

We are working with the Edinburgh Climate Change Institute to demonstrate how flood defence schemes, by protecting a city from flooding, can save more carbon than it takes to build them. This research will aid carbon reduction in the industry, helping to meet national and international net-zero targets.

Innovative flood modelling

We are a leading developer of improved modelling and mapping techniques that better inform our clients of the risks they face from different flooding scenarios. We address fluvial, tidal, pluvial and water quality analysis through traditional hydrodynamic and AI techniques.

An understanding of the real impact of flooding can be achieved by integrating flooding information with data on land use, population demographics and economic activity. Such analysis enables authorities to make quick decisions during a flood response, and supports a consistent risk-based approach to developing flood resilience.

River engineering skills

Across the globe, in rural and urban areas, and in all kinds of terrain, our multidisciplinary teams have designed and delivered a wide variety of river engineering projects: diversions, river training works, scour protection at bridges, river amenity improvements, river flow gauging stations, flow control structures, flood storage reservoirs and tidal barrages.

We combine engineering skills with expertise in BIM, hydrology, hydraulic modelling and natural flood management (including environmental assessment and landscaping) to provide clients with a fully integrated flood risk management service.

Coastal protection expertise

Engineering a successful coastal project to protect infrastructure and communities requires an impressive battery of analytical, design and technical skills, covering everything from coastal processes and geomorphology to hydraulics and logistics. We can provide them all.

Our knowledge of shoreline protection includes beach and dune nourishment, evaluation of sea level rise and storm impacts, living shoreline solutions, ecosystem enhancement and marsh creation, and the optimisation of waterways and harbours.

Working with nature to reduce flooding and improve communities

By harnessing natural processes, we can mitigate flood risk sustainably and deliver wider social benefits.

Nature-based solutions

In the face of climate change and biodiversity decline, there is increasing demand for harnessing natural processes and restoring and adapting landscapes to reduce flood risk and improve the functions of catchments, floodplains, rivers and coasts.

By replicating and working with natural processes, we develop nature-based solutions to improve and restore the natural hydrology, geomorphology and ecology within the land and riverscape.

These approaches can be applied by themselves or in unison with more traditional engineering methods as part of a holistic approach to water resources management.

Natural flood management

Natural flood management (NFM) focuses on altering, restoring or using natural landscape features and functions to reduce flood risk. This solution is most effective when a catchment-scale, systems-thinking approach is taken, but can also be applied to resolve local issues.

We are contributing to and leading ambitious, pioneering projects designed to maximise the effectiveness of NFM and unlock its multiple benefits, including habitat diversification and creation, water quality improvement, and better social and environmental outcomes for local communities.

Our expertise encompasses river restoration, catchment screening and opportunity mapping, hydrological and hydraulic modelling for NFM measures, and economic viability assessments.

Catchment management

We focus on solutions to manage river catchments intelligently and sustainably by applying a multisectoral and systems approach to understanding the sources of water quality issues, surface water and groundwater pathways, and human and environmental receptors.

Our specialists provide guidance in conceptualising and modelling diffuse and point sources of pollution, and appraise catchment, societal and engineered mitigation measures. By looking beyond the direct effects of water quality and water resource demands, our solutions focus on sustainability and are helping clients to challenge the norm of using grey solutions by default.

We evaluate the multiple influences of mitigation measures by integrating our holistic understanding with policy, stakeholder engagement, and assessment of ecosystem services, natural capital and social outcomes.

River restoration

An integrated, holistic approach, from feasibility study to construction, is also the hallmark of projects where we work with and restore natural processes to improve the reliance of river environments and enhance their biodiversity.

We design and implement schemes collaboratively, engaging with a broad range of clients and stakeholders, including water companies, government agencies and regulators, local authorities, and landowners and communities. We identify and deliver opportunities for habitat enhancement that meet our clients' goals and regulatory requirements as well as deliver benefits to society and the environment.

Ground-breaking digital solutions

Digital technology has a key part to play in building resilience and we have been pioneering the development of new software tools to mitigate flood risk.

Fast and accurate forecasting

It is not possible to eliminate the risk from storms, floods and tidal surges, but it is possible to predict and prepare for extreme weather events. We have developed a suite of bespoke digital tools that raise the bar in flood forecasting and warning in terms of accuracy, speed and detail.

Our models convert weather forecasts into meaningful visual information that illustrates the potential consequences of flooding and storm surges, making it easier to understand where the impacts would be the most destructive.

By identifying areas at high risk of flooding, and giving time to take necessary preventive measures, our tools offer huge value in flood forecasting, flood warning, flood risk assessments and flood defence development schemes.

Get smart with infrastructure

Feeds from sensors, social data, weather data and much more can be combined with an accurate digital representation of systems and their components in their geospatial context to generate insights. This is how Moata, our digital twin platform, enables you to make better decisions, pinpoint failures before they occur, increase resilience and improve environmental performance.

Moata is open, secure, scaleable and adaptable, delivering predictive power through advanced analytics and machine learning.

Our Moata solutions include:
- Moata Geospatial – enables rapid access and collaboration around geospatial data
- Moata Carbon Portal – allows detailed embodied carbon accounting and planning at all stage of projects

- Moata Criticality Live – helps understand performance risks for critical assets using intelligent analytics
- Moata Rain Wise – provides state-of-the-art geotemporal rainfall prediction across an entire catchment area in real time
- Moata Sewer Sure – focused on maintaining flows and preventing flooding in sewer systems

Visit **www.mottmac.com/digital** for more information.

Neural networks, arguably the most important subset of artificial intelligence today, is another area of our expertise. They enable you to capture non-linear trends in data without the need to make complicated, higher-order calculations, making them extremely fast and efficient. Neural networks have been successfully deployed in the field of hydrology for a wide range of applications including forecasting flood risk and multiple scenario analysis flood modelling.

Our digital product portfolio includes:

Real Time Flood Forecasting Tools

These tools rapidly translate offshore or rainfall radar forecast data into information that can show when and where flooding will occur and the potential flood depth and hazard level. By combining innovative radar technologies with AI, we have been able to provide usable lead times for intense urban flood warnings.

Water and Wave Overtopping Tool

Combines data on the type and condition of coastal defences with weather information, such as wind speed and direction, to calculate water and wave overtopping rates for dunes, sea walls, rock revetments and earth embankments for a range of tide and storm surge scenarios over any length of coastline.

Appraisal Tool

This can assess all residential and non-residential flood damages and is fully compliant with the Multi-Coloured Handbook, the UK reference document for assessing flood risk and its impacts. When compared against commercial flood damage tools, it has proved to offer wider coverage of flood damage types and greater accuracy with capping in more complex scenarios.

3D Flood Visualisation Tool

Generates 3D flood visualisations and animations to communicate flood risk information in a format that can be easily understood by the general public. Combined with BIM models of defences, town flythroughs help communities appreciate flooding vulnerabilities and the solutions.

10 ways our expertise can help you:

1.

Have confidence that the flood risk is understood

Our industry-leading expertise and robust governance maximise the confidence we have in our models and our understanding of the flood mechanism.

2.

Predict how risk may change in future

With continuous improvement to the understanding of future climate predictions, we pride ourselves at leading how this understanding should be applied. We develop adaptive pathways and identify the thresholds which trigger a change in strategy, reducing the need for rebuilds for decades to come.

3.

Improve sustainability

We can help you manage whole river catchments intelligently, developing sophisticated modelling to work out what can be done in each part of the catchment to minimise flooding. Natural flood management has relatively low operating costs compared with more traditional hard engineering schemes that add pressure on future maintenance budgets.

4.

Plan investment wisely

Our models can help you plan infrastructure, ensuring new assets are built in safe locations, are able to withstand the effects of projected flooding events and do not exacerbate the effects of flooding on adjacent assets.

5.

Build efficiently

We are experienced in delivering large infrastructure projects through BIM, which brings major efficiencies to the design process. You and your contractors will benefit from the reduced risk of redesign during construction.

6.

Increase resilience

Owners and operators can identify the vulnerability of their existing infrastructure to flooding, and then strengthen their assets to maintain continuity of services even during worst-case flood events.

7.

Recover quickly

A city that survives climate shocks and achieves continuity of, or quickly restores, essential services will be more competitive and attract greater investment than rival cities. We have experience of building resilient new cities as well as improving the resilience of existing communities.

8.

Communicate effectively

Our modelling and 3D visualisation tools can be used to communicate the effect that flooding could have on a community, making a complex issue accessible to all. You can clearly show the impact your proposals will have both during and following construction, and enable stakeholders to be part of the integrated team.

9.

Work with one supplier

Many river and flood projects require a range of specialists but you may not want to procure numerous contracts to achieve your goals. We can provide a one-stop shop that will deliver your vision from one point of contact.

10.

Lead the industry

Our experts are regularly called upon to shape government regulations and write industry guidance, on topics ranging from bridge scouring and resilient design to flood self-certification systems and NFM. By tapping into our knowledge, you will be able to design and deliver better projects and stay at the forefront of the industry.

Tidal barrier delivers wider benefits to the local community

Project
Boston Barrier

Location
Boston, Lincolnshire, UK

Client
Environment Agency

Expertise
Project management, outline and detailed design, environmental impact assessment, hydraulic modelling, stakeholder management

Opportunity
When 700 homes were flooded in Boston, it highlighted the town's need for better protection against tidal surges. Building a tidal barrier was identified as the best way to reduce the risk of flooding to more than 14,000 properties and increase the town's resilience to climate change.

Solution
We engineered the design of the 25m sector gate and the control building and operating machinery. Our hydraulic modelling, including computational fluid dynamics, identified significant cost savings, while our innovative solutions for revising the piling system and using low-carbon concrete reduced the project's carbon footprint.

Findings from our environmental impact assessment influenced the barrier's design to ensure there were no significant adverse impacts, including to the Wash, the largest estuarine system in the UK and a site of special scientific interest. The United Nations Sustainable Development Goals (SDGs) provided a framework for monitoring and evaluating the scheme's wider societal benefits, and was the first major Environment Agency project to use this approach.

Outcome
The barrier, which can be raised in just 20 minutes, protects Boston from a 1 in 300-year flood event, even accounting for sea level rise and the likely increased frequency of tidal surges as a result of climate change. It will contribute to economic regeneration in the region by aiding the future development of inland waterways, boosting tourism and improving connectivity between cities in the east of England. The barrier has delivered benefits against all 17 SDGs and is an example of how sustainability and social outcomes can be embedded into all aspects of a civil engineering project.

RICS Social Impact Awards 2020, East Midlands
Winner: Infrastructure category

ICE Awards 2020
Edmund Hambly Medal for substantial contribution to sustainable development

ICE East Midlands Merit Awards 2020
Team Achievement Award

ICE East Midlands Merit Awards 2021
Large Project of the Year Sustainability Award

Sustainable flood defences will safeguard lives and livelihoods in Bangladesh

Project
Flood and Riverbank Erosion Management Investment Programme

Location
Bangladesh

Client
Bangladesh Water Development Board

Expertise
Flood risk management, riverbank protection

18km
of riverbank protected

23km
of flood protection embankment

Opportunity
About a fifth of Bangladesh is flooded annually, while extreme floods can inundate up to two thirds of the country. Faced with chronic riverbank erosion, rapid population growth and the increasing impact of climate change, a new approach was needed to floodplain management. The Flood and Riverbank Erosion Management Investment Programme (FRERMIP) aims to improve the livelihoods of people by reducing flood and riverbank erosion risks through integrated and sustainable interventions.

Solution
Flood defence embankments were constructed using sand, one of Bangladesh's most abundant resources, instead of clay or a clay core. In a world first, we piloted a more sustainable form of wave protection: erosion protection 'mattresses' made from jute, a locally sourced biodegradable material, and filled with grout to protect above-water slopes. Geotextile bags filled with sand were dropped from barges to carpet the underwater slopes of rivers.

Outcome
Using sand to construct embankments reduced the extraction of fertile clay soils, cut costs and halved the construction time to one season. Besides supporting local industry, the choice of jute rather than geotextile for the grout-filled mattresses is more of a permanent solution for above-water slopes because of the increased exposure to wave action and ultraviolet light. Opting for underwater geotextile bags instead of concrete blocks has considerably reduced the programme's carbon footprint. In total, FRERMIP has provided infrastructure to protect 18km of primary riverbank and 23km of flood protection embankment.

Project
Leeds Flood Alleviation Scheme

Location
Leeds, West Yorkshire, UK

Client
Leeds City Council

Expertise
Civil and structural engineering,
BIM, hydraulics, environmental
and management services

Project
Leeds Natural Flood Management

Location
River Aire catchment,
West Yorkshire, UK

Client
Environment Agency (on
behalf of Leeds City Council)

Expertise
Natural flood management

Working with nature to reduce flood risk

Flood defence scheme wins over residents

Opportunity
Leeds is sited in a catchment where river levels can rise rapidly in response to rainfall and the growing risk of fluvial flooding prompted the construction of extensive defences along a 4.3km stretch of the River Aire. Careful planning was needed to ensure residents were not inconvenienced and properties fronting the water, including many thriving businesses, were not needlessly demolished to make way for the new defences.

Solution
Strong engagement with the community, including open days where specially produced videos were shown, helped to convince residents of the necessity of the scheme. We assessed the capability of waterfront buildings to act as part of the defences themselves by establishing whether they could withstand flooding and offer protection to the streets, homes and businesses behind them. The owners of these properties were only too happy to see them saved, and this innovative use of existing assets has cut costs. Besides linear defences, the scheme includes the installation of moveable weirs that can be lowered in flood conditions to reduce river levels, the first of their kind to be used for flood defence in the UK.

Outcome
The scheme has reduced the flood risk to 3000 homes, 500 businesses and 120ha of development land in central Leeds, giving confidence to future investors in the city and opening up key regeneration opportunities. The defences proved their effectiveness in 2020 when they were able to withstand rising river levels during Storms Ciara and Dennis.

Opportunity
We are supporting the delivery of an ambitious six-year natural flood management (NFM) programme across the 700km^2 River Aire catchment. This involves working with partners and landowners to implement a range of interventions that will slow the flow of rainwater into the Aire, helping to reduce the risk of flooding and mitigate the impacts of climate change.

Solution
We have developed a web-based platform which gives users access to a suite of innovative digital GIS tools that enable them to adopt a consistent approach for the identification and development of NFM sites throughout the catchment. These tools feature environmental and hydrological screening maps to visualise proposals and identify the risks around utilities and other hazards on sites, allowing concept designs to be created collaboratively with landowners. Interactive dashboards display key project indicators relating to site identification, concept design, site visits and derived benefits such as carbon sequestration.

Outcome
The project will reduce flood risk to the city of Leeds by implementing a range of measures that work with natural processes across the Aire catchment. Our tools are not just delivering and managing the NFM programme, they are defining project terminology and standards to develop a systematic, repeatable and auditable process for managing the delivery of similar programmes at catchment scale. In addition, we are contributing to the wider understanding of NFM through the development of a range of pilot sites that demonstrate how these methods can be designed and delivered in collaboration with landowners and stakeholders.

**Constructing
Excellence Yorkshire
and Humber Awards**
Project of the Year (Civils)

NEC Awards
Large Project of the Year

700km^2
river catchment

Project
Mantoloking Sea Wall

Location
Mantoloking, New Jersey, USA

Client
New Jersey Department of Environmental Protection

Expertise
Detailed engineering design, project management

ENR New York Best Projects Awards
Water/Environment
Best Project

Sea wall will protect hundreds of homes and businesses

Opportunity
Out of adversity comes opportunity. In October 2012, a storm surge from Hurricane Sandy cut through the narrow section of New Jersey's Barnegat Peninsula and flooded the streets of Mantoloking. All of the Borough's 521 homes experienced varying degrees of damage, and scores of them were destroyed. Bulldozers were used to create and maintain artificial sand dunes as a temporary measure but residents would remain vulnerable until permanent flood defence infrastructure could be put in place, giving their homes long-term protection.

Solution
We provided assistance with the design, financing and construction of a 5.6km sea wall built from steel sheet piles, the largest of its kind in New Jersey. The project involved in-depth analysis of soil conditions, environmental impacts, anticipated wave conditions and materials to determine the optimum design. We worked closely with stakeholders to meet environmental constraints, provide the cost-benefit analysis needed to acquire funding, and ensure alignment with a long-planned beach replenishment project.

Outcome
What was a particularly vulnerable section of the New Jersey shoreline has greater resilience against future severe weather events. The new sea wall is designed to withstand another storm of the magnitude of Sandy, offering protection to Route 35 and safeguarding hundreds of homes and businesses. The marine-grade steel used in the wall has a minimum lifespan of 75 years. If it stays buried in the sand, it should last for anything between 100 and 150 years.

5.6km
length of sea wall

75
years minimum lifespan

A smarter way to manage flood risks

Project
Stormwater Management
and Road Tunnel (SMART)

Location
Kuala Lumpur, Malaysia

Client
MMC Engineering
Group-Gamuda JV

Expertise
Feasibility study, detailed design,
engineering support, construction
supervision, specialist tunnel
and hydraulic design services

Opportunity
Innovative ideas to unlock new sources of funding
are urgently needed to address chronic global
underinvestment in flood resilience. In order to
generate a return on a major capital investment and
attract investors, the central section of the dual-
purpose SMART stormwater tunnel in Kuala Lumpur
doubles up as a toll motorway, thus providing flood
protection and alleviating traffic congestion.

Solution
The 9.5km tunnel diverts floodwaters away from the
confluence of the two major rivers running through
the city centre while its central 3km section serves as
a two-deck motorway to relieve traffic congestion at
the main southern gateway into the city. Water can flow
under the lower road deck without disrupting traffic
flow in most flood conditions. Decks are sealed from
the rest of the tunnel by sets of guillotine-style gates.
But in the most extreme floods the road decks are
shut to traffic and the cut-off gates opened, increasing
the tunnel's storage and conveyance capacity.

Outcome
SMART was the first tunnel of its kind in the world and
has saved central Kuala Lumpur from several potentially
disastrous flash floods, preventing widespread business
and domestic disruption. The landmark project
has received international acclaim and numerous
accolades for its innovation and ingenious design,
including the UN-Habitat Scroll of Honour Award.

**UN-Habitat Scroll of
Honour Award**
For improving the
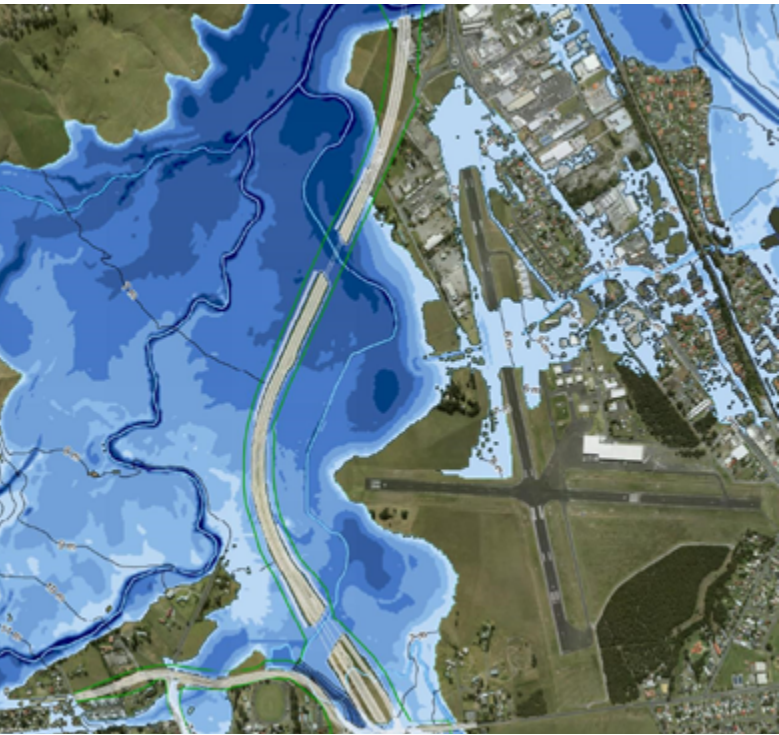management of stormwater
and peak-hour traffic

Keeping Australia on track to grow its economy

Project
Infrastructure Investment
Programme

Location
Australia, nationwide

Client
Multiple

Expertise
Civil and structural engineering
design, hydrology and hydraulics
assessment, environmental
and management services,
project management

Opportunity
The Australian Government is investing US$110bn over
10 years from 2021-22 through its rolling land transport
infrastructure plan to increase national resilience,
enhance the rail freight network, and make passenger
journeys safer and quicker. We are supporting some of
the largest projects in the country such as Melbourne
Airport Rail, Geelong Fast Rail, Inland Rail and Sydney
Metro – Australia's biggest public transport project.

Solution
We are building or upgrading hydrological and
hydraulic models to assess the complex nature of
flood risk, whether the source is intense, short-
duration storms, large fluvial floods or tidally influenced
combinations. Our modellers work closely with
design teams and local stakeholders to undertake
rapid multicriteria assessments to optimise design
solutions in a timely and cost-efficient manner. The
models we produce allow us to assess pre- and post-
design scenarios to identify where flood risk to third
parties may be increased and develop innovative
solutions to prevent any negative impacts.

Outcome
Our work means that existing and future flood risks
are considered during the full lifecycle of these major
rail projects, with a dual focus on optimising designs
which meet the flood immunity criteria while managing
the flood risk to third parties. This approach to design
includes providing new and existing assets with
resilience to the changing climate and the associated
changes to floodplain behaviour as a result of more
extreme weather conditions. With every new model we
develop, we greatly increase understanding of local
flood risk, contributing to the design of flood-resilient
infrastructure that boosts local, regional, and national
economies without detriment to local communities.

Modelling solutions to keep the trains running

Opportunity

Since 2000 the railway line that connects the south-west of England to the rest of the UK has been closed for lengthy periods due to severe flooding, causing widespread travel disruption and costing the regional economy millions of pounds a day. We are delivering a programme of works to improve the line's resilience in its five most vulnerable locations between Exeter and Newton Abbot in Devon.

Solution

Our multidisciplinary team is developing practical solutions to a diverse array of flooding issues: fast-flowing river flooding, standing water and wave action, rainfall run-off, groundwater flooding combined with overland flow, and overflowing aqueducts. To improve forecasting and warning thresholds, we are evaluating flood prediction systems that maximise the use of Environment Agency river gauges, Met Office rainfall radar and existing lineside cameras. We are also looking for opportunities to improve flood conveyance not just within Network Rail land but across the wider hydrological catchment, co-ordinating with other flood management schemes, for example, to remove weirs and improve culverts.

Outcome

We are developing cost-effective, sustainable flood resilience solutions despite challenges posed by the historic location of the railway line on the floodplain and predicted increases in rainfall and river flow with climate change. One of the region's most important transport links – essential to connecting communities and economic growth – will be more robust in the face of extreme weather of increasing severity and frequency.

Project
Western Route Geo-Environmental Resilience Study

Location
Devon, UK

Client
Network Rail

Expertise
Hydrological and hydraulic modelling

One of the region's most important transport links will be more robust in the face of extreme weather of increasing severity and frequency.

Optimised design cuts costs and carbon

Project
Rhiwbina Flood Defence Scheme

Location
Cardiff, UK

Client
Cardiff City Council

Expertise
Civil engineering, flood modelling, geotechnical engineering, landscape architecture, ecological services, arboricultural surveys, archaeological assessment

Opportunity
The brook that runs through the residential suburb of Rhiwbina in Cardiff is prone to flash flooding during heavy rainfall. A spate of flood events triggered investment in new defence measures and we were engaged to design and supervise construction of a robust, sustainable solution which took into account the sensitive nature of the local conservation area as well as environmental and ecological issues associated with the watercourse.

Solution
The scheme consists of a range of hard and soft engineering defences along the upstream section of the brook and we have steered the project from the feasibility stage to construction. We used our expertise in hydraulic flood modelling and BIM to optimise the positioning of flood defences, which concentrated works on seven distinct areas, minimising disruption to residents, and leading to an environmentally-conscious design that was aesthetically acceptable to property owners and the local community. There was extensive community engagement throughout the project.

Outcome
The scheme will contain fluvial flooding up to a 1 in 100 year event (plus allowance for climate change) and increase capacity and flow within the brook. Gravity-fed systems, removing the need for pumps, and construction of earth embankments instead of retaining walls, reduced costs and lowered the scheme's carbon footprint.

ICE Wales Cymru Awards
Roy Edwards Award
for outstanding design
and construction

Data platform hastens Cumbria's storm recovery

Opportunity
Storm Desmond, a 1 in 200-year flood event, brought massive disruption to Cumbria, leaving 800 bridges and 300km of highway damaged or destroyed. The Infrastructure Recovery Programme (IRP) was launched to restore vital road links, reconnect cut-off communities and get the county moving again.

This involved more than 1200 individual works, ranging from patch repairs to full reconstruction of roads, slopes, retaining walls, culverts and bridges. Cumbria County Council needed a digital solution capable of quickly collating, assessing and managing huge quantities of data from surveys and inspections, and on land ownership, river levels and traffic regulation, to support the IRP's effective delivery.

Solution
Our cutting-edge Moata Geospatial platform presented clear and accurate information through live map views of all roads, bridges and associated infrastructure owned and operated by the council. By making this data accessible to everyone involved in an interactive way, teams could access and manage progress on the IRP in real time. Collaborative decisions were able to be referenced and audited to ensure truly co-ordinated activity.

Outcome
Moata Geospatial drove collaborative working across a diverse range of stakeholders, enabling the council to plan and prioritise works packages more efficiently. Co-ordinated decision-making combined with clear communications led to large reductions in the economic and social impacts of the programme, and contributed to the IRP taking a year less to complete than planned.

Project
Infrastructure Recovery Programme

Location
Cumbria, UK

Client
Cumbria County Council

Expertise
Smart infrastructure, common data environment, data visualisation

1200
**individual works
co-ordinated in real time**

Greening the streets of Philadelphia

Opportunity
Like many older US cities, more than half of Philadelphia is served by combined sewers that carry both sewage and stormwater. Heavy rain or snow can cause combined sewer overflows to discharge into local rivers through the city's 164 outfalls. A sustainable stormwater management plan was launched that would not only improve the city's ailing infrastructure but also support regeneration through green improvements to the urban environment and social fabric.

Solution
The Philadelphia Water Department decided to invest in green infrastructure to collect and treat stormwater run-off at source as part of an ambitious programme to reduce the amount of stormwater entering the combined sewer system.

We prepared final design plans and specifications for several projects including stormwater curb extensions, infiltration trenches that water trees with stored stormwater, and planters that collect drainage from the street. We modelled these and other stormwater devices, resolved constructability issues where new measures were to be built near existing structures, and optimised the designs to improve durability and maintenance.

Outcome
The programme is reducing the number and volume of combined sewer overflows in the average rainfall year and the amount of polluted run-off reaching sewers. In neighbourhoods, air quality is improved and streetscapes are more attractive, improving the quality of life for residents. Making Philadelphia a greener city is also attracting clean tech companies, creating jobs and improving economic prosperity.

The programme is reducing the number and volume of combined sewer overflows in the average rainfall year and the amount of polluted run-off reaching sewers.

Credit: Philadelphia Water Department

Credit: Philadelphia Water Department

Smarter ways to manage water resources

Smarter ways to store water

Opening opportunities with connected thinking.

Talk to us:

Fiona Barbour
Global practice leader for
water resources and flooding
fiona.barbour@mottmac.com

Search **Mott MacDonald water resources and flooding**