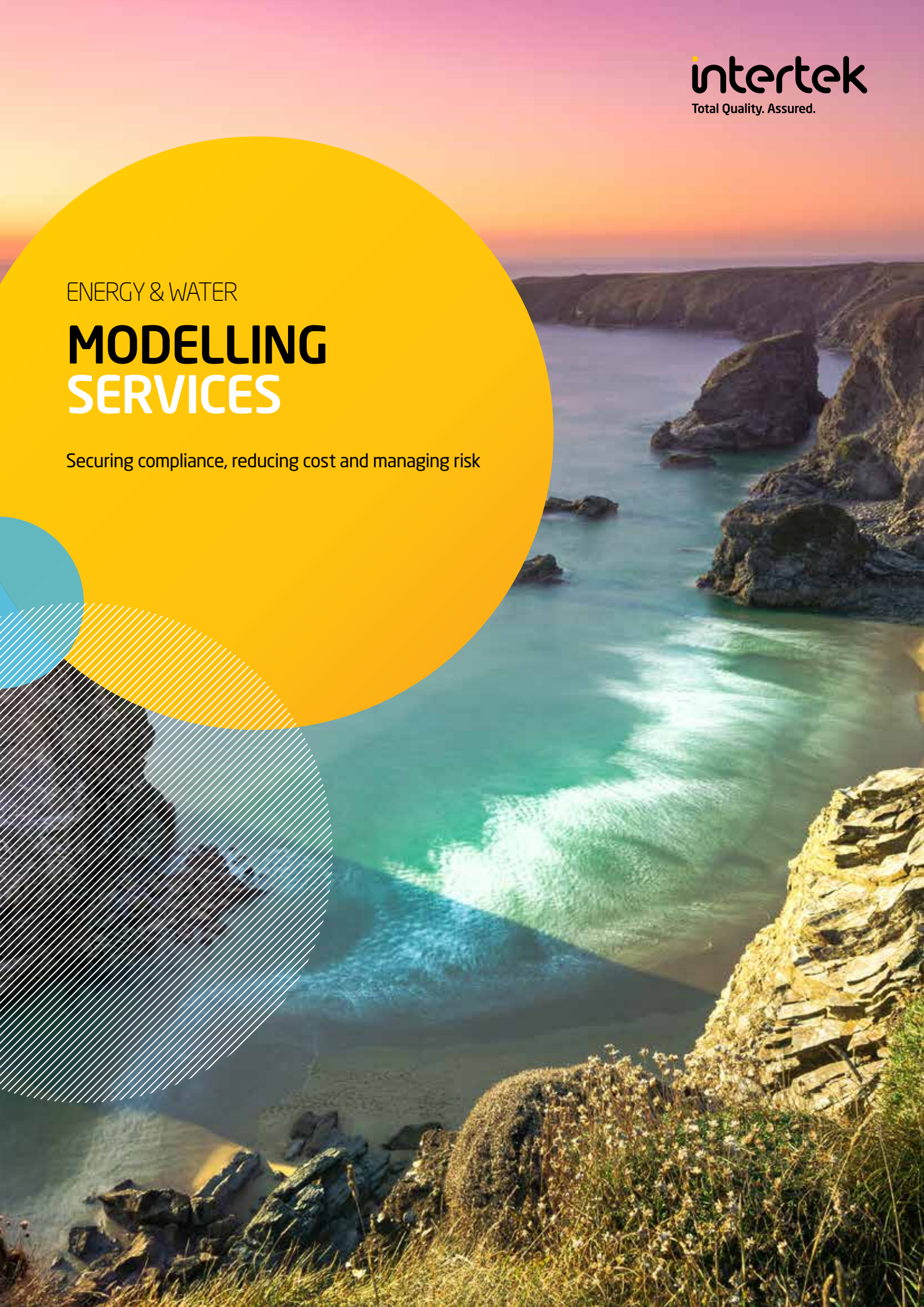


ENERGY & WATER

# MODELLING SERVICES

Securing compliance, reducing cost and managing risk





# Securing compliance, reducing cost and managing risk

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The earth's water environments including rivers, lakes, reservoirs, estuaries, coasts and oceans are complicated, dynamic systems. Given their ecological, economic and social value, understanding the dynamic processes in operation is vital to the sustainable use of these natural resources. Anthropogenic activities can significantly impact the water environment and being able to quantify impacts is essential. This is becoming increasingly important with the onset of global climate change, the ambitious net zero targets being set by many countries, including the United Kingdom, and the ever-increasing competition for space between new and existing sea users, e.g. offshore renewable energy development driven by sustainability and 'coastal creep' associated with the growing blue economy.

Climates and weather patterns are changing, causing rising sea levels and more frequent severe weather events. Significant interventions are required on a global scale to reduce greenhouse gas emissions and protect our vulnerable coastline. The UK has approximately 31,000 km of coastline supporting significant population centres, coastal infrastructure, and important natural habitats all of which are extremely susceptible to the consequences of climate change and other anthropogenic activity associated with growing demands for space and resources. **Intertek, through the use of numerical modelling, is able to understand, predict and quantify these impacts, supporting and advising our clients throughout the project lifecycle from feasibility to design, permitting, construction, operation and decommissioning.**



## We help you optimise asset performance from feasibility to decommissioning.

### Our Experience & Expertise

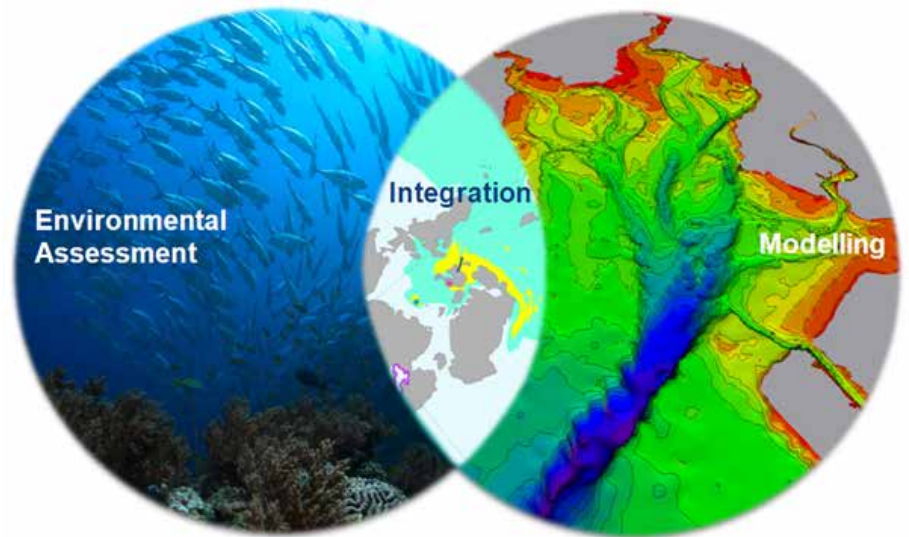
Intertek's Energy & Water team has over 35 years' experience delivering sustainable solutions to our clients, using our technical knowledge and experience of the water environment, supported by our advanced numerical models to understand, quantify and visualise complex water environments. Intertek's expertise delivers Total Quality Assurance (TQA), helping our clients secure Regulator approval, reduce risks, and minimise capital and operational expenditures.

### Key Specialists

Our dedicated modelling team is one of the largest in the UK. It is led by a team of senior professionals each with at least 25 years' experience, supplemented by a team of extremely competent modellers and data analysts who between them have a breadth and depth of knowledge in marine science, hydrodynamics, waves, sediment dynamics, and water quality modelling, as well as expertise in coding, data processing and visualisation for a variety of different applications.

Many staff possess PhD qualifications and / or have achieved chartered status in marine-related fields.

As such, our team possess innovative technical capabilities, industry best practise and project management acumen to exceed clients' project requirements and deliver to the highest industry standards.



### Numerical Modelling Services

Our diverse modelling services support all stages of a project's lifecycle – from initial planning, surveys and testing through to design, environmental assessment and consenting, to installation, maintenance, monitoring and final decommissioning. Intertek's modelling capabilities cover a broad range of sectors and services.

### Marine Development

As well as numerical modelling, we offer a variety of services to aid marine developments through site characterisation, site investigation and surveys, cable routing and protection, and environmental assessment and consenting / permitting.

#### Modelling / Metocean

- Tides and Waves (including resource assessment)
- Coastal processes
- Metocean assessment
- Engineering design basis
- Operability analysis
- Sediments / morphology
- Overtopping
- Oil spill modelling
- Underwater noise
- Water quality studies
- Ballast water assessment
- Bathing / Shellfish Waters
- River catchments, lakes and reservoirs
- Thermal and saline discharges
- Minewater discharges
- Industrial discharges

#### Site Investigation & Seabed Surveys

- Geophysics, Geotechnics
- Sedimentology / scour
- Survey design & specification
- Survey management & quality assurance
- Survey tender & procurement
- Evaluation & support
- Survey consent / licences
- Weather window assessment
- Client field representation
- Engineering design basis
- GIS-based data management

#### Marine Environment

- Feasibility / site selection
- Consents & Permitting
- Environmental Impact Assessment (EIA)
- Strategic Environment Assessment (SEA)
- Stakeholder consultation

#### Other Marine Services

- Total Sustainability Assurance
- Testing Services
- Site Inspection

### Hydrodynamic Models

We have built and applied hundreds of hydrodynamic models around the world at a variety of scales and complexities, from coastal waters to estuaries, ports and harbours to lochs, lakes and rivers.

We use all of the industry-standard software packages and have developed bespoke tools. The software we possess helps us quantify and predict processes, such as sediment transport, wave overtopping, scour and water quality (physical and chemical).

Our hydrodynamic models also support the assessment of extreme conditions (e.g. metocean) and climate change.

Our modelling specialists are able to tailor specific modelling products for our clients, with our scientists specialising in a range of coding languages.

### Geographic Information Systems (GIS)

Our dedicated Geographic Information Systems (GIS) and data management team provides visual data services for a variety of projects to help understand the issues by identifying relationships, patterns and trends.

This is supported by a proven track record of web-based and standalone GIS systems to support decision-making and asset management.

## Model Animations

Click on each link below to view an animation of our modelling.

- ▶ [Interactive map of modelling experience<sup>1</sup>](#)
- ▶ [North Sea Tides<sup>2</sup>](#)
- ▶ [Sediment plume modelling in Dublin Bay<sup>3</sup>](#)
- ▶ [Swansea Bay Tidal Lagoon dispersion modelling<sup>4</sup>](#)

Or scan the QR code to view on your mobile.



1



2



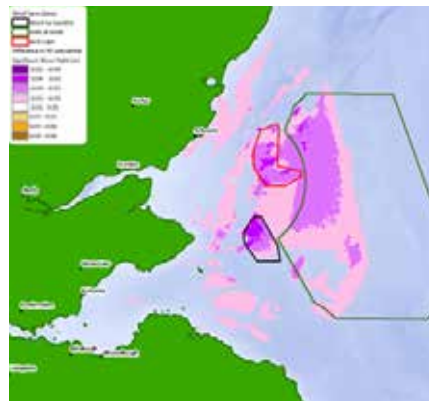
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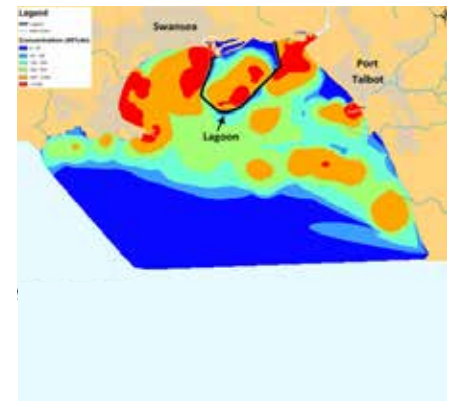
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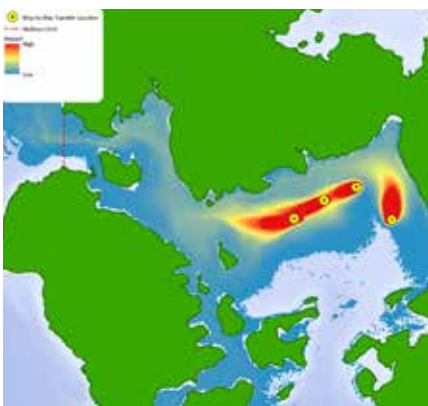
Dredge sediment plume modelling



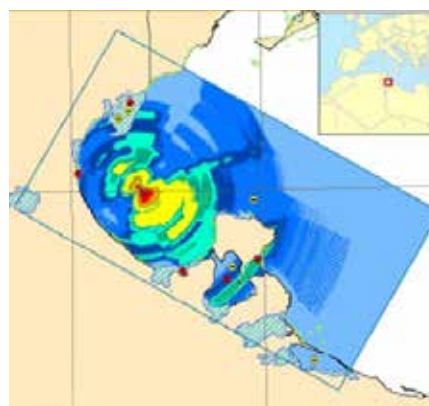
Wave height modelling cumulative effects



Tidal Lagoon dispersion modelling



Ballast water dispersion assessment



Oil spill modelling



Our UK modelling experience

### Offshore Wind & Marine Renewables Dublin Array Offshore Wind Farm Physical Processes Assessment – RWE

The Dublin Array Offshore Wind Farm site is located on the Kish and Bray banks, approximately 10 km off the east coast of Ireland.

The area surrounding the site is highly designated, which necessitated a detailed Environmental Impact Assessment (EIA).

To support the EIA, we built and calibrated hydrodynamic and spectral wave models to characterise the hydrodynamics, wave climate and sediment regime in the project area.

The performance of the models was assessed against industry metrics, Offshore Wind Farm modelling guidance and with Intertek's extensive industry experience.

This allowed the baseline environmental conditions to be determined, against which the effects of the development on the physical environment could be assessed and quantified.

Intertek's assessment provides the developers and other stakeholders with regional and site-specific characterisation of physical processes, comprising the metocean and sedimentological environments.

### Swansea Bay Tidal Lagoon, Water Quality Impacts Investigation – Tidal Lagoon Power

Technical services and expert consultancy services to support the Development Consent Order (DCO) for the proposed Swansea Tidal Lagoon in Wales – the first of its kind in Europe. Intertek undertook hydrodynamic and water quality modelling to predict the environmental impacts of the lagoon construction, operation and decommissioning.

With a large number of effluent discharges to Swansea Bay a particular concern was the impact of the lagoon operation on local river water quality, and local recreational (bathing) waters. Given Swansea's industrial past the impacts of dredging during construction and the release of sediment contaminants was also a key consideration.

We worked closely with the client, regulators and stakeholders and provided expert witnesses at DCO (Development Consent Order) hearings and technical inputs to a WFD (Water Framework Directive) Section 4.7 derogation, the first in the UK.

We also provided Tidal Lagoon Power with expert services for feasibility assessments and initial strategic planning for three further proposed lagoons.

### Inch Cape and Nearth na Gaoithe Offshore Wind Farm Physical Processes and Metocean Assessment – Repsol and Mainstream Renewable Power

Metocean and coastal processes assessment for two offshore wind farms in Scottish Territorial Waters (STW), in support of an EIA.

We delivered a calibrated and validated coastal hydrodynamic (HD) and spectral wave (SW) model of the area, and a coastal processes assessment.

This provided the developers and other stakeholders with regional and site-specific characterisation of the metocean and physical geo-marine environment.

Against these baseline environmental conditions, the potential impacts of each individual offshore wind farm development, and in-combination and cumulative effects of all developments, could then be assessed.

The projects were given consent by Scottish Government following review of the Environmental Statements.



## Our ports and harbour services support ballast water management, environmental assessment, port design & management and marine ecology.

### Ports & Harbours

#### Harbour Expansion Project — Client Confidential

Modelling (current, wave, sediment transport and water quality) and consultancy services to assess the potential environmental impacts of the harbour expansion to support an EIA in the following areas:

- Changes to physical coastal processes, specifically tides and waves
- Changes to sediment transport patterns and impacts from dredging operations
- Water quality impacts in terms of both the Water Framework Directive and the revised Bathing Water Directive
- Flood risk
- Climate change

The impacts were assessed using a combination of existing data and detailed coastal modelling to compare baseline and post-construction environmental performance.

The study concluded that effects of the proposed harbour extension would remain localised to the harbour area, and would be insignificant to the wider area.

#### Scapa Flow Ballast Water Management Policy, UK — Orkney Islands Council (OIC)

We undertook Strategic Environmental Impact Assessments (SEAs), Appropriate Assessments (AAs) and marine modelling to investigate OIC's proposed Ballast Water Management (BWM) Policy for discharging exchanged ballast water within Scapa Flow, Scotland.

The work supported implementation of a revised BWM policy in Scapa Flow, which would enable ships to discharge ballast water within Scapa Flow.

The SEA and AAs we carried out to support the Revised Policy with our modelling assessment an integral part of both.

We provided continuous expert advice and technical inputs, consultation with statutory consultees Scottish Natural Heritage (SNH) and the Scottish Environment Protection Agency (SEPA), as well as with stakeholders including RSPB, Marine Scotland, Orkney Fisheries Association and the general public.

The work addressed the new International Maritime Organisation BWM convention.

We also prepared and managed the consultation process, which included workshops, information packs and posters; public drop-in sessions; providing council briefings and presenting at their seminars; and assisting OIC with reporting.

The Ballast Water Management Plan (BWMP) has since been approved by the Council.

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**Our solutions are used by many blue chip companies and our client testimonials reflect our creativity, quality and reliability.**

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Our experts provide a wide range of water services that ensure the preservation and quality of one of our most precious resources.

### Industrial Discharges

#### Hamma Desalination Plant discharge modelling, Algeria — Hamma Water Desalination Company

The Hamma Desalination Plant in Algiers was at the time the largest proposed desalination works in Africa.

Intertek delivered the full Environmental Impact Assessment, to World Bank guidelines, to allow consenting and financing of the project.

The work involved the assessment of the impact of the hypersaline discharge from the Reverse Osmosis plant, to ensure no detrimental impact to the surrounding area.

This was delivered through numerical modelling of the discharge, and also included a risk assessment to ensure optimal positioning of intake and discharge points, to ensure no re-circulation of the hypersaline discharge back through the plant.

#### Oil Spill Modelling, Eastern Mediterranean Sea — Client Confidential

This project included the development of a high-resolution hydrodynamic database of the area of interest.

This area is dominated by residual currents, but the influence of tidal flows is also significant in the Gulf.

Therefore, both seasonal residual and daily tidal current data were obtained from various sources, including FOAM data, from which the hydrodynamic model was configured and calibrated, using Intertek's sophisticated modelling software and process.

An oil spill model was used to predict the behaviour of various potential accidental spills that may occur in the area.

The spill model allows the oil to be characterised based on key parameters, such as density, viscosity, water content, and hydrocarbon fractions.

The model was used to simulate a number of different scenarios under a variety of environmental conditions in order to determine 'stochastic' probabilities of surface oiling and beaching.

The results were then used in the preparation of the client's oil spill contingency plan.

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**Our experts provide data and models that aid environmental assessments that help identify and prioritise potential spill scenarios for specific locations ensuring that you are compliant with regulatory requirements.**

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