

RPS APASA

Science. Services. Solutions.



Overview

RPS APASA is a leading provider of high-quality environmental modelling services to support offshore and coastal industries in Australia, South-East Asia and the South-Pacific region.

RPS APASA operates from East and West Coast offices in Australia and services a large client base in over 25 countries.

For more than a decade, RPS APASA has been at the forefront of development and application of computer modelling and analysis tools for the assessment of impacts in marine and freshwater environments. Our work has been recognised at the prestigious Queensland Premier's Export Awards, winning the Environmental Solutions Award (2013), the Small Business Award (2012) and the Dermot McManus Award for Outstanding Achievement in Export Innovation (2011).

We are highly experienced with supporting environmental impact assessment and engineering development projects, working independently or as part of multi-disciplinary teams. Our blend of expertise in oceanography, environmental engineering, marine ecology and hydrodynamic modelling ensures that we provide scientifically robust and cutting edge solutions.

We provide specialised environmental modelling and analysis to support the following sectors:

Oil & Gas

- Quantitative oil spill risk assessments
- 24/7 emergency response modelling services for oil, gas and chemical spills
- Guidance for search and rescue or recovery of lost materials
- Discharge fate assessments for produced water, hydrotest dewatering, thermal and other wastewater discharges
- Fate assessment for drill cuttings and drilling fluids
- Servicing of metocean forecast data for situation awareness and input to analysis
- Supply and training for oil and chemical spill modelling software

Industry & Resource Development

- Dredging fate assessments
- Hydrodynamic and wave climate change
- Industrial outfall assessment, including fates of thermal, brine and wastewater discharges
- Waterway flushing and water quality studies
- Metocean data delivery for situation awareness during construction and operations
- Remote sensing analysis for impact assessment and monitoring.



Spill Modelling and Risk Assessment Studies

RPS APASA has been the leading provider of oil spill trajectory modelling to the oil and gas and shipping industries throughout the Asia-Pacific region for over 15 years.

We provide rigorous and informative assessment of exposure risk to meet industry requirements, helping our clients prepare contingencies for accidental spill events. We offer reliable and cost-effective risk assessment, served by our specialised knowledge of oil behaviour gained through extensive support during responses to real spill events and many hundreds of individual risk assessments for a wide range of spill scenarios.

We offer the most sophisticated and capable hydrodynamic and spill behaviour models and data sources to assess risks and responses to any type of accidental spill. Our peer-reviewed and validated software and procedures exceed ASTM International Standard F2067-13 "Standard Practice for Development and Use of Oil Spill Models" and are continuously developed and extended with advances in spill modelling technology and experience with real incidents. This modelling technology is well supported by our skills in hydrodynamic modelling and metocean data analysis.

We have solutions for:

- 2-dimensional (surface) and 3-dimensional (depth layered) spill trajectory and fates modelling
- Spills of any scenario, at any depth, ranging from instantaneous or slow leaks at the water surface to long-term blowouts in very deep water
- Spills of any type of hydrocarbon ranging from highly volatile gas/ condensate mixtures to highly viscous crudes and heavy fuel oils
- Customisation for the physical and chemical properties of specific oil types to consider all processes controlling weathering, dispersal and transport
- Desktop analysis of weathering behaviour and eco-toxicological rating of specific oil types
- Stochastic modelling to quantify fields of potential effect and risks of exposure to surrounding receptors, based on trends and variations in local metocean conditions
- Reverse stochastic modelling to identify source locations posing highest risk of exposure to key receptors
- Defining exposure risk for oil that is floating, physically entrained or dissolved
- Defining zones of explosion and exposure risk for releases of gas and volatile organic compounds
- Simulating the effect of response measures, including booming and application of chemical dispersants at surface or depth (net benefit analysis, NEBA)
- Quantitative data for environmental risk assessment, contingency response and financial assurance.



Gas and Vapour Plume Modelling

RPS APASA is a leading provider of gas and vapour plume modelling services.

RPS APASA is a leading provider of gas and vapour plume modelling services. Our work allows our clients to understand and manage health and safety risks posed by accidental releases of volatile organic compounds (VOC) on the water surface, subsea or directly into the atmosphere.

RPS APASA can provide guidance on a wide range of scenarios involving hydrocarbons and other volatile or reactive chemicals. For gas releases in deep-water, we are able to assess the fate of gases through the water column to understand the magnitude, rate and eventual area of release to the atmosphere. Our systems allow us to study the unique flow characteristics for each operation, so that OH&S and Zones Of Concern (ZOC) can be tailored for each operation.

RPS APASA uses the proprietary software CHEMMAP, OILMAP, AIRMAP and OILMAP-DEEP to represent specifics of release situations. These technologies allow the quantification of the temporally and spatially varying concentrations

generated by any chemical or hydrocarbon mixture. Explosion risks and other concentrations of concern related to OH&S thresholds can also be identified and used to guide Emergency Response Plans for a facility or operation. Our team of experts has responded to numerous incidents including the Montara gas plume, where we reported the distributions of vapour clouds assisting the responders and field teams to operate safely.

To support planning and permitting, RPS APASA can undertake modelling and analysis for credible release scenarios as input to OSCP and other planning and reporting requirements. We can also support training for specific response readiness, including training and testing of plans.

RPS APASA can provide risk assessment and contingency planning and offers key advice during response incidents to subscribers of our 24/7 modelling response service:

- Identification of nearby platforms/facilities that may be in the envelope of a hazardous gas/vapour cloud
- Most appropriate response strategy based on oil/condensate type and modelled/expected behaviour in the marine environment
- Methods for vapour monitoring to assure safety of vessel/rig/response personnel
- Determination of restriction and exclusion zones
- Identification of safe zones for remedial drilling or spill response
- Calculation of the area of effect for gas and VOC plumes throughout the incident, supported by analysis for environmental significance
- Independent assessment for claims of contamination or impact by regulators or third parties.



24/7 Response Modelling

RPS APASA offers a 24 hours a day, 7 days a week subscription-based modelling service to support response to marine oil and chemical spills.

This service provides critical situation awareness related to the future movement and direction of spills, where and when impact to shoreline is likely to occur and what response strategy would be optimal.

To support this service, RPS APASA applies cutting edge technology, combining modelling software that has been proven over years of practical application to real emergency events, including OILMAP (for oil spills), CHEMMAP (chemical spills) and SARMAP (search and rescue or recovery), with the COASTMAP Environmental Data Server system that ensures that multiple reliable metocean forecasts are always available for trajectory prediction.

This service covers a wide range of emergency scenarios from spills of oil or chemicals onto the water surface through to complex subsea blowouts in deep water. All fate assessments consider the weathering and transformation based on the specific physical and chemical properties of the pollutant of concern, with our response supported by our database of oil and chemical data properties. Outcomes are modelled using multiple sources of the best available

metocean forecast data sets, with the degree of consensus providing important guidance on the safety factors that should be applied.

Critical to any response, our service is available around the clock and we provide rapid turn-around on forecasts and advice.

Our team of experts have responded to numerous incidents including:

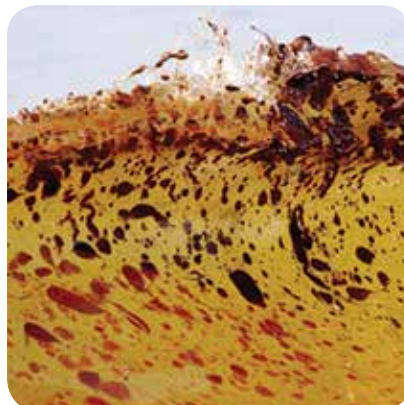
- Montara oil spill in the Timor Sea
- BP Deep Horizon oil spill in the Gulf of Mexico
- Pacific Adventurer oil and chemical spill in Queensland
- Shen Neng oil spill and grounding in the Great Barrier Reef Marine Park
- Apollo S vessel collision off Port Lincoln
- MV Island Trader fuel spill at Lord Howe Island
- Vega Fynen spill in PNG
- MV Rena spill of oil and noxious chemicals in New Zealand.

Case Study Montara Well Blowout

In August 2009, the Montara wellhead platform in the Timor Sea suffered a blowout. Oil leaked continuously at the seabed for the next three months with approximately 300 to 400 barrels of oil released each day. Australia's national oil spill response plan was activated immediately, triggering the mobilisation of the Australian Maritime Safety Authority (AMSA).

RPS APASA supported AMSA's response by providing metocean data analysis, integration of remotely-sensed oil observations and oil spill trajectory forecasts on a daily basis. Together, the AMSA and RPS APASA team was able to apply new techniques and technologies to assist in effectively managing the spill response.

(Information provided courtesy of AMSA)



Operational Discharges

RPS APASA provides operational discharge modelling services supporting a wide range of industries with development of their Environment Plans and Environmental Impact Assessments.

RPS APASA assists a diverse range of clients throughout the Australia and Asia Pacific region, being highly experienced in supporting the environmental impact assessment processes in many countries. A diverse set of skills of our team, together with the experience gained over many years, helps us provide the best available advice for the specific operation being assessed.

RPS APASA use state of the art stochastic (or probabilistic) models to determine mixing zones based on initial contaminant concentrations in the discharge. In the case of drill cutting and fluid discharges, the settlement zones of sediments and other solids can be predicted. We apply near-field models to simulate the initial mixing caused on discharge, providing advice on the optimal design of diffusers or any pre-treatment. Stochastic dispersion modelling is then applied, sampling from many years of metocean data, to define the wider mixing zones and areas of effect. This process allows RPS APASA to predict with a great degree of certainty the mixing zones associated with any operational

discharge, including the potential for overlap.

RPS APASA can advise on any type of discharge to the marine environment including:

- Cooling water
- Produced formation water
- Drill cuttings and fluids
- Hydrotect water
- Reverse osmosis reject streams
- Hypersaline discharges
- Wastewater
- Sewerage treatment plant discharges.

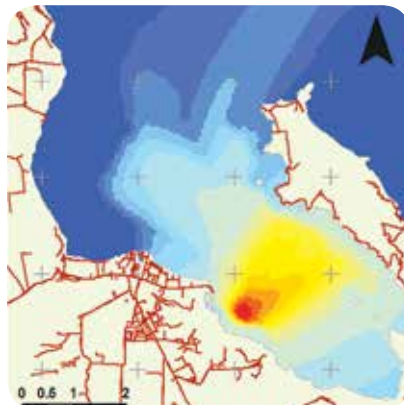
RPS APASA Technology

RPS APASA combines leading fate and dispersion models, data analysis and GIS systems to assess the dynamic behaviour of the discharge as it evolves in time and space.

These models include industry recognised models such as MUDMAP, CHEMMAP, OOC, Visual Plumes and Delft3D to resolve both near and far-field mixing zones.

The metocean conditions required to drive these models can be drawn from measurements, global databases or customised modelling applications undertaken by RPS APASA.

The application of advanced post-processing techniques allows assessment against complex environmental criteria in a spatial context.



Dredging and Sediment Capability

RPS APASA excels in the modelling and assessment of dredging and other operations involving sediment discharge and disturbance in open sea, coastal, estuarine and inland waterway settings.

We service a large range of sectors, including offshore oil and gas, energy, mining, shipping, ports and harbours, and coastal and waterway development industries. RPS APASA has undertaken fate and impact prediction to guide some of the largest dredging and development projects in the world. These studies have included assessment of potential effects resulting from the removal and disposal of more than 50 million cubic metres over periods of 6 years or more. We provide guidance to minimise negative environmental and logistical outcomes. Our success in helping clients achieve State and Federal Environmental Approvals demonstrates our strong track record of technical excellence.

Our work commonly extends to interrogation of the high resolution spatial and temporal output to derive a variety of zones where degraded water quality or light conditions may put pressure on local habitats. Where environments are very sensitive to changing outcomes, our models and analysis systems can be deployed operationally to provide ongoing guidance.

We offer comprehensive and flexible services, including:

- Advanced, three-dimensional modelling of circulation and wave climates as input to discharge studies
- Cutting edge modelling software and data interrogation techniques for fates and effects of sediment disturbed or discharged by dredging, reclamation and offshore disposal operations, trenching, subsea mining, cuttings discharge, jetting and wash-affected systems
- Efficient simulation of full dredging programs that may span multiple years and involve multiple sources of sediment input
- Assessments to resolve optimal diffuser designs for operational discharges of sediments and other solids
- Forecast modelling coupled to state of the art geospatial visualisation and light transmission analysis
- Operational modelling to guide and monitor the progress of dredging operations with our unique Environmental Data Server™ (EDS) technology providing operational forecasting for wind, wave and current conditions
- Information Systems to feed back to dredging and environmental managers using web-based and GIS compatible displays
- Integrated vessel traffic sediment disturbance model, calculating propeller-wash effects
- Advanced and customised threshold analysis for environmental effect
- Comprehensive analysis and documentation for environmental impact assessment
- Reliable field measurement capabilities, including the deployment and assessment of LISST, ADCP, turbidity and light transmission instruments
- Monitoring and data analysis for establishing baseline conditions and environmental compliance
- Stakeholder engagement and regulator liaison.



Data Delivery and Situation Awareness

RPS APASA provides a variety of delivery solutions for spatial metocean data, critical for situation awareness and to enhance operational planning and avoid costly down-time.

Through the world leading Environmental Data Server™ (EDS) technology, subscribers have seamless access to a wide variety of global, local and point-based data sets including wind, water level, current and wave data. This is the same data that drives our world leading OILMAP, CHEMMAP and SARMAP emergency response modelling systems. This technology can serve any time-varying data sources that can be linked to web-services, including measured data (tide gauges, wave and current meters, temperature or salinity measurements, satellite information etc) feed from position tracking systems and outputs of forecasting models.

For localised applications, RPS APASA prepare high resolution hydrodynamic and wave models that are run operationally, feeding into the EDS one or more times each day and forecasting up to one week ahead. For dredging or discharge projects, forecasts of suspended sediment, water temperature or pollutant concentration can also be integrated and rendered by the system.

The data sets can be presented and accessed in a number of forms:

- Displayed and interrogated through a web browser via our Coastmap and Environmental Common Operational Picture (ECOP) portals
- Built into custom web-based applications for specific needs
- Access via WMS services for integration into other GIS frameworks or web solutions
- Integration with ESRI products including ArcGIS Online.

The use of web-based technology extends to mobile applications, with our aim to put consistent data into the hands of as many authorised end users as possible. This allows common access across multiple locations and throughout different groups who may be involved in the same operation. An important feature of the data available in the EDS is that it is primarily forecast based, and therefore a great tool for operational planning.

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