



# Hydrology, Hydrodynamics and Flood Risk Assessment

Earth Systems provides state of the art eco-hydrology and flood prediction for resource industries including modelling, risk assessment, design, monitoring, analysis, and treatment for mining, hydropower, municipal, and development sectors.

Our staff are experienced in hydrological, hydraulic, and 3D hydrodynamics modelling. Design capability includes sedimentation basins, rip-rap armour protection, landform design and coastal engineering. Asset protection, flood risk assessment, dam break analysis and Extreme Event Modelling are key focus and research areas.

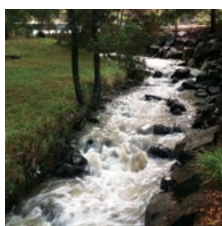
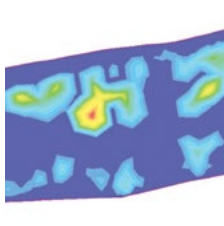
## SERVICES PROVIDED

- Climate change analysis and SLR assessment
- Extreme value storm event prediction
- Hydrologic assessment
- Rainfall runoff modelling
- Catchment and drainage network design
- Natural stream design
- Hydrodynamic water quality modelling 1D-3D
- Reservoir/dam/lake limnological analysis
- Stream flow gauging, flow hydrograph development
- Flow event analysis, return interval determination
- Flood modelling and hydraulic design for asset protection
- Dam break analysis
- Rip-rap and armouring design
- Coastal engineering
- Final closure mine pit lake modelling and design
- Water quality sampling and reporting, physical and chemical
- Biological water quality assessment (marine systems)
- Stream/River health assessment (AUSRIVAS)
- Aquatic habitat assessment and modelling
- Nutrient cycling and algal growth risk assessment
- Ecotoxicity assessment
- Mixing zone and outfall design, multiple lines of evidence and compliance monitoring
- Training of staff for stream flow gauging, water management

## PROJECT EXPERIENCE

- Mako Gold Project EIS –Catchment Hydrology Assessment, runoff and Flood Modelling, river and tributary backflow.
- Fekola Gold Project EIS, Catchment Hydrology Assessment, runoff

- and Flood Modelling for mine and village asset protection.
- Project Technical Reviewer –Blairgowrie Yacht Squadron Safe Boat Harbour Reconfiguration Project –MIKE21 hydrodynamic model of tidal current circulation, current and proposed wave screen construction impacts on boat safety, local current circulation patterns, pollutant dispersion and mooring protection.
- Lead modeller –Hydrodynamic mixing zone modelling for Lar-rakeyah Outfall, Darwin. David coordinated the development and outputs of a hydrodynamic far field mixing zone model RMA11 for a primary treated outfall operating in the pristine Darwin harbour.
- Project Manager –Meville Bay Alcan Gove Mixing Zone Modelling –development of a MIKE21 hydrodynamic mixing zone model incorporating components of the Melville Bay Marine Health Monitoring Program database. The final predicted mixing zone was included in the environmental licence requirements for the \$3 bill Alcan Gove Refinery seawater outfall.
- Team Member –Derwent Estuary Program Hydrodynamic Model Development –David worked in a multidisciplinary team to deliver a ecosystem biogeochemical conceptual model for the Derwent Estuary.
- Lead Modeller –Blackmans Bay SPS overflow: David used a steady state near shore mixing zone model developed by CSIRO to evaluate the dilution and recreational water quality effects of a major sewage spill into the Derwent River.
- Lead Modeller –Lake Alexander and Fanny Bay Stormwater and Drainage System Recreational Water Quality Investigation 2D lake dispersion and first order die-off model for microbial pathogens. The hydrodynamic water quality model identified seasonal and tidal stressor periods that were high risk for recreational water users. A stressor targeted monitoring program with signage was developed for Darwin City Council.
- Lead Modeller – Salmon Creek Mixing Zone Model: 3D hydrodynamic and near field model to examine the zone of initial dilution from a groundwater dewatering discharge into a tropical marine estuary near Port Hedland. Results included 3D visualisations of the extent of the mixing zone for a variety of tidal scenarios.



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