

About WREMA

WREMA was formed in 2014 to provide consulting services in the fields of water resources and environmental management. Our services in road, rail and pipeline linear infrastructure include:

- Estimation of design flows
- Flood risk assessment
- 1D and 2D Hydraulic modelling
- Design of bridge waterways
- Design of culverts
- Design of water quality treatment train
- Design of energy dissipators
- Design of scour protection works
- Environmental impact assessment
- Bridge hydraulics analysis

Projects Undertaken by our Staff

The following is a selection of projects undertaken by our staff prior to the formation of WREMA:



Central Queensland Integrated Rail Project, EIS and Prefeasibility Study, Queensland – Aurizon.

Water Resources and flood assessment of over 500 waterway crossings of railway line from Diamond Creek to Abbott Point in Central Queensland. The project included the delivery of the overall hydrological & hydraulic and drainage studies for the project. Flood risk assessment and management was undertaken as part of this study. Tasks included data collection and analysis, hydrological modelling using XP-RAFTS model, hydraulic modelling using HEC-RAS and 2d hydrodynamic model TUFLOW, bridge scour analysis,

channel protection works, flood impact assessment and mitigation options. A comprehensive surface water assessment report has been prepared as part of the Environmental impact Studies for the project.

Goonyella to Abbott Point Railway Project, Northern Missing Link Railway Design and Construction- CoalConnect Alliance.

Design of the drainage system for a 60km of coal haulage railway including comprehensive hydrological and hydraulic modelling. Cross drainage design and flood impact assessment of major drainage system of the proposed Greenfield and Brownfield railway corridor including stormwater management for the proposed project construction camps. Tasks included data collection and analysis, hydrological and hydraulic modelling using XP-RAFTS, HEC-RAS and Mike FLODD models, bridge scour analysis, channel erosion protection design, culver sizing and design, bridge hydraulic analysis and reporting.



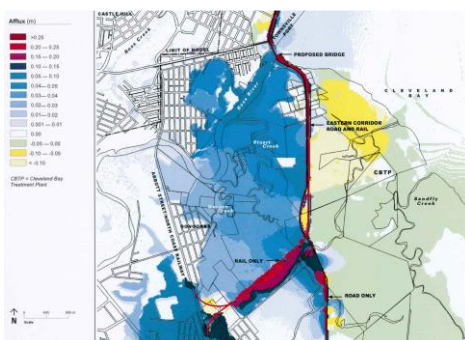
channel erosion protection design, culver sizing and design, bridge hydraulic analysis and reporting.

Trans Australian Rail Flood Risk Assessment - Australian Rail Track Corporation (ARTC).

Flood risk assessment of about 1,800 km of existing railway line from Port Augusta (SA) to Kalgoorlie (WA) was undertaken to assess the existing waterway crossing infrastructure flood immunity. Main tasks included data collection and analysis, hydrological and hydraulic modelling using XP-RRAFTS, HEC-RAS and Mike FLODD models, bridge hydraulics analysis, culver re-sizing to provide ARTC updated flood immunity standards and reporting.



Townsville Port Access Hydraulic Modelling

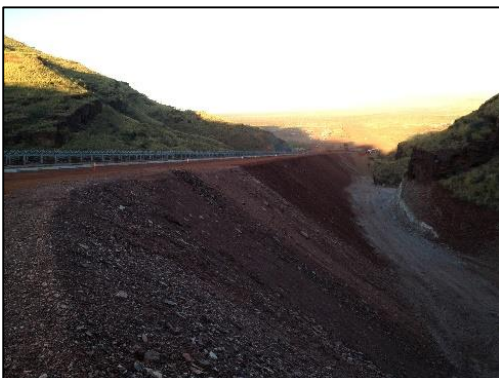


A hydraulic assessment of the Townsville Port Access Project was undertaken to determine the impacts from proposed construction of a new transport corridor (road and rail) to the Port of Townsville from the southern side of the city. The corridor is located to the south of Ross River and crosses approximately 5km of floodplain and tidal flats. This region is subject to flooding from Ross River and local catchments, as well as inundation from high tides and storm surge. The study objective was to provide an assessment of the impacts that the proposed corridor would have on tidal and flood flows and to determine the optimum arrangement of drainage structures under the embankment. Hydraulic modelling was undertaken using the DELFT-FLS package.

APLNG export pipeline and gas collection header EPC Project, Queensland - MCJV / Origin Energy. A comprehensive hydrological assessment for a 750 km high pressure gas pipeline in Central Queensland. The study utilised regional assessment techniques to determine the potential for river channel erosion, scour, buoyancy and waterway morphological change.

Bruce Highway Planning Study from Caboolture River to Caloundra Exit, Queensland – Department of Transport and Main Roads. Hydrological, hydraulic and drainage studies were undertaken for the section of the Bruce Highway from Caboolture River to Caloundra Exit. Tasks included high level cross-drainage assessment using existing flood models developed by Moreton Bay Regional Council.

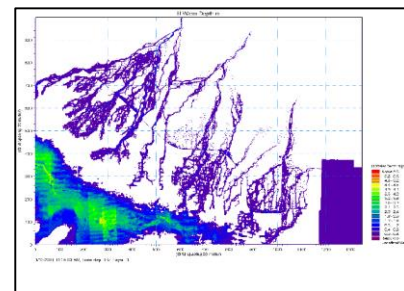
Bruce Highway Link Study from Pine River to Caloundra Exit, Queensland. Hydrological, hydraulic and drainage studies was undertaken for the section of the Bruce Highway from Pine River to Caloundra Exit. Tasks included a flood immunity assessment of the existing highway and the proposed highway extension.



Western Turner Syncline Mulga Hydrology Study - Rio Tinto.

Undertook a 2D hydraulic modelling study to investigate the impact of a proposed 12 km conveyor on distributed channel flows in an area with extensive mulga communities. Development of design flows utilising regional methods and a rainfall-runoff model. A 2D hydraulic model was developed and used to optimise the number and placement of environmental culverts to minimise impact on the mulga communities.

Haul Road P2P5 - Fortescue Metals Group. Assessment of catchment flows and design of waterway crossings for a 20+ km haul road associated with Christmas Creek mine. Development of a two dimensional hydrodynamic model to represent surface flows under natural and developed conditions to assess the impact of the road on sheet flow dependent Mulga. Design of waterway crossings to ensure minimal impact.



Nyidinghu Sheet Flow Assessment – FMG Developed a two dimension hydrodynamic model to assess sheet flow conditions and assess the impact of a proposed mine development on sheet flow dependent Mulga located adjacent to and downstream of the site.



Nabucco Gas Pipeline (Turkey to Austria) - Fichtner Consortium Reviewed the hydrologic investigations for the 730 km section from Silopi-Ouakoy to Sivas-Ulas (Turkey). The review included flood studies and scour assessments.

Hume Highway Southern Alliance: 32 km freeway north of Albury. Supervised hydrologic investigations for transverse drainage including hydrologic modelling, hydraulic modelling, scour calculations and design of scour protection works.

National Road Rehabilitation Project (Malawi): Employed by the World Bank to determine the cause of 50 bridge failures (on national highways), which had been washed away during the wet season in recent years. An improved understanding of river geomorphology and new scour protection approaches were required.

Brisbane Gateway Motorway Upgrade: Drainage design manager of winning tender for \$2.5 billion project.

Orissa State Roads Project (India): Managed team responsible for estimating design discharges, flood levels, potential scour and waterway requirements for 130 bridge sites associated with the design of 400 km of State Highway.

Tugun Motorway Alliance: Technical reviews and design advice for drainage component of Pacific Motorway upgrade on the Gold Coast.

Wollongong Northern Distributor Extension: Supervised drainage design for 10 km extension to the Wollongong Northern Distributor.

Sydney Westlink M7: Design reviewer for flooding and drainage aspects.



Darra to Springfield Transport Corridor Project – Horizon Alliance – Brisbane. The Darra to Springfield transport corridor is a major infrastructure project commenced by Queensland government to the booming south east Queensland community. The Alliance was formed in March 2007 to carry out design and construction of the much anticipated Darra to Springfield Transport Corridor. Design of these major transport facilities included bridge crossings for four major creeks (Opossum, Mountain, Sandy and Bullockhead Creeks) and the development of a stormwater

drainage system to minimise flooding impacts along the proposed project corridor.

Cobram-Barooga Bridge over Murray River, Victoria. Hydrological and river hydraulic modelling was undertaken to assess the existing bridge abutment and pier scour and river bank erosion including the design of the bridge abutment protection using riprap. Extensive flood modelling of sections of the Murray River floodplain was developed using a combination of a 2-D model (DELFT-FLS) and a 1 D model (HEC-RAS) for bridge design and scour analysis.

Alice Springs to Darwin Railway Design and Construction Project, Australia. Client: ADRAIL. The Alice Springs to Darwin railway was a major infrastructure project in the Northern Territory. An important part of the project involved the design of bridges and culverts, with over 100 bridges and over 1,000 major culvert groups proposed for the project. The line traverses some of the most remote regions of inland Australia. The hydrology and hydraulic design for this railway was undertaken with the available data, which is particularly limited. There was specific concern for the design of the line to achieve the best possible reliability while minimising the cost of the waterway structures, estimated to have a total value of over \$100 million. The hydrology designs utilised all available streamflow data for the Northern Territory and this information was been analysed to prepare a regional flood frequency procedure for the whole region. This information was then used to prepare design floods for all watercourses. The design floods were then used to size culverts or bridges for each of the sites.

Shah Deniz 2 British Petroleum Oil & Gas Terminal Expansion Project – Oil & Gas Terminal and Access Road Flooding and Drainage Design, London & Baku Azerbaijan. Cross drainage design and flood impact assessment of the proposed access roads, camp facilities and the oil and gas terminal infrastructure was undertaken. Tasks included data collection and analysis, hydrological and hydraulic modelling using a rainfall-runoff model (RAFTS), flood hydraulic modelling (ISIS and HEC-RAS), bridge scour analysis, channel erosion protection design, culver sizing and design, bridge hydraulic analysis, flood mitigation works and the design of the stormwater cross-drainage and longitudinal drainage system.

Gold Coast Rapid Transit Tender Design -Flooding and Drainage Design, Brisbane. Hydrological and hydraulic design inputs for the tender documents. Flood risk assessment and management was one of the tasks of the study together with the design of the drainage system for the proposed infrastructure.

Mains & Kessel's Road Intersection Detailed Engineering Design, Queensland. Peer review for the flood and drainage studies was undertake as client's detailed engineering designer.

QCLNG export pipeline and gas collection header EPC Project, Queensland - Queensland Gas Company. Technical adviser and peer reviewer of the hydrological assessment of over 460 waterway crossings of a high pressure gas pipeline in Central Queensland was undertaken. This included regional assessment techniques to determine the potential for erosion, scour, buoyancy and morphological change of waterway crossings.

Contact WREMA

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