DHI CASE STORY

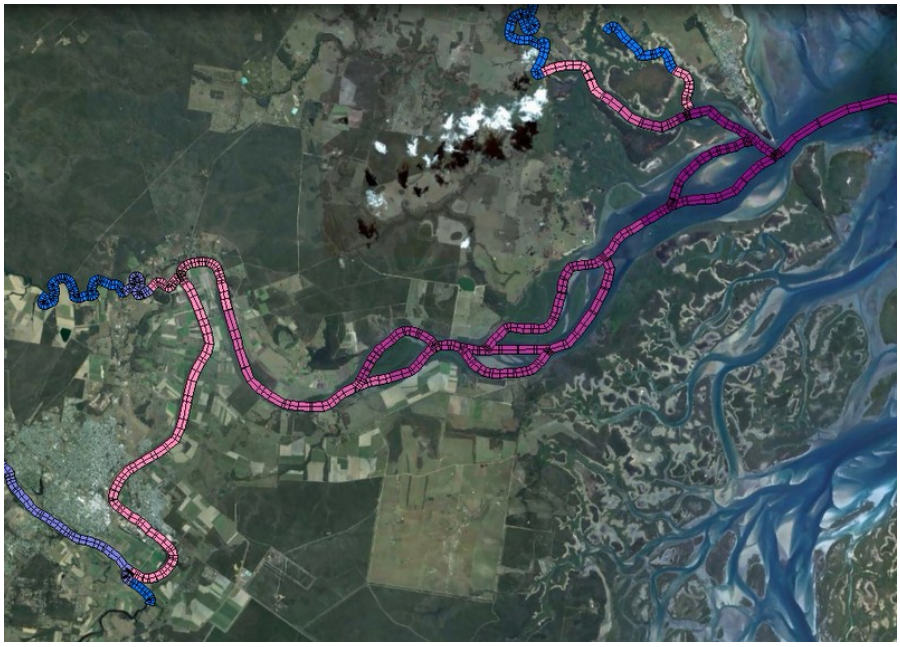
MINE WATER RELEASE IN AN AREA OF HIGH ENVIRONMENTAL VALUE

Developing operational rules to ensure environmental compliance

An open-cut coal mine is an enormous intrusion into the environment – and a very striking one. However, with the proper technology at hand, mining companies can take care that the environmental impacts are kept to a minimum and all activities comply with the legislative requirements. For this Coal Mine project in north-eastern Australia, DHI developed rules to optimize mine water release, ensuring compliance with water quality standards and assisting in the project approval process.

THE DISPERSION OF MINE DISCHARGE IN THE RIVER

Maryborough is one of the oldest provincial cities in Queensland, with Mary River as its lifeblood. It is situated right next to a major coal mining area, the Burrum Coal Measures. A company with coking and thermal coal projects, intended to develop a Coal Mine in the Burrum Coal Measures, to the north-west of the Mary River estuary. The mine is expected to deliver 0.5 million tonnes per annum of coking coal from an estimated five million tonne reserve.



The Mary River water quality model showing water quality variations

SUMMARY

CLIENT

Coal Mining Company

CHALLENGE

Develop operational rules for mine water discharge to protect an area of high environmental value

SOLUTION

Modeling the fate of mine water discharged into receiving waters allows optimizing its release and minimizes its environmental impact

VALUE

- Compliance with water quality standards
- Better protection of the local environment
- Professional decision support for controlled mine water release
- An environmental management plan complying with legislative criteria

LOCATION / COUNTRY

Maryborough, Australia

The company proposed to release excess mine water from the proposed Mine site into the Mary River. The area is regarded as one with high environmental value (HEVZ) and the World Heritage Listed Fraser Island is situated just west of the Mary River. Therefore, attention needs to be given to the impact of the mining activities on aquatic ecosystems.

ON THE RIGHT TRACK TO ENVIRONMENTAL COMPLIANCE

Our client submitted an environmental management plan (EMP) to the Department of Environment and Resource Management (DERM). DERM requested more detailed studies on a number of aspects, including water management plans.

Our client commissioned a team including DHI to assess the potential of releasing mine water into the Mary River, based on field monitoring as well as modelling studies. Information was required regarding both the quality as well as the potential effects of the released water in order to be able to obtain a mining permit.

Installation of a water sampler in the Mary River during a field trip.

MODELLING THE DISPERSION OF MINE DISCHARGE IN THE RIVER – AND HOW TO OPTIMISE IT

DHI took a closer look at the mixing dynamics in the river to assess the far-field mixing effects. A coupled hydrodynamic (HD) and advection-dispersion (AD) model was developed using our one-dimensional modelling software MIKE 11. Concentrations of various elements found in the mine water release were compared with simulated concentrations at the upstream end of the HEVZ and the reduction in concentrations was calculated. Owing to the length of the simulation period, covering 110 years of historical data and the approximately 8 km distance between the discharge point and the HEVZ, one-dimensional modelling was sufficient to provide a good estimate of the concentration of various elements in the area of interest.

Modeled reach of the Mary River, the mine discharge point and the location of the upstream end of the High Environmental Value Zone.

OPERATIONAL RULES FORM THE BASE OF PROFESSIONAL DECISIONS

The modeling results revealed that the major reduction in tracer concentration occurs at the discharge location. Based on these findings, an operational rule was developed to ensure that water quality was maintained within acceptable threshold values. Mine discharge can now be optimized to fulfill the legislative requirements and minimize impacts on the environment. Our client was also able to submit a revised environmental management plan for the proposed Mine.

PRESERVING MARYBOROUGH'S HERITAGE FOR THE YEARS TO COME

Tourism – particularly activities on the Mary River – plays a significant role in the economy of Maryborough. So will the Coal Mine project. There were concerns about the development of the Coal Mine damaging the recreational value of the river. Thanks to DHI's assessment, our client is now able to develop the necessary operational rules to continue with its mining activities while at the same time protecting the Mary River's natural heritage for future generations.

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