

CROSSING CHANGING CATCHMENTS – THE RELATIONSHIP BETWEEN SALINITY AND ROAD INFRASTRUCTURE

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Abstract

The successful management of road infrastructure over the next 10-50 years in Southern Queensland will be dependent on the development of a clear understanding of the processes of salinity as they relate to road infrastructure, and the fostering of partnerships between government, industry and the community. The Departments of Main Roads and Natural Resources, Mines and Energy have committed to developing this understanding of salinity as it relates to road infrastructure, through the development of a formalised partnership – achieved via a Salinity Memorandum of Understanding (MOU). The agreement focuses on four main areas of activity: 1) Data collection and information exchange; 2) Research and development; 3) Awareness and education; and 4) Standards and technical guidelines. Achievements to date include commencement of data exchange, a series of training workshops, and provision of expert advice on standards and technical guidelines. A number of case studies are currently under investigation, and development of a risk analysis framework for road/salinity interactions has commenced.

Additional Keywords : salinity, road, Queensland, construction

Introduction

Salinity is an emerging issue in Queensland and one that road authorities have the opportunity to manage - in most cases, proactively rather than reactively. In the Australian context this is unique, as most road authorities have been forced to react to a rapidly changing landscape that is directly impacting on the road asset. Consequently, numerous organisations and individuals have been progressively working towards the development and testing of various salinity risk assessment models, the potential cost to road infrastructure and solutions to ensure the protection of the road asset. However, few have quantified how:

- salinity processes affect road infrastructure
- road infrastructure affects salinity processes
- extent of the impact of salinity on road infrastructure over time, and cost that will be incurred by the asset manager.

We believe the only way these issues can be quantified is through the collaboration of a range of disciplines and organisations. These disciplines include soil science, hydrology, civil engineering, risk management, agronomy, hydrogeology and others. This acceptance was the genesis of the Memorandum of Agreement for Salinity between the Department of Main Roads and Department of Natural Resources, Mines and Energy.

Memorandum of Understanding (Salinity)

In December 2002, following a meeting between both departments to discuss how they could assist each other in improving the understanding of salinity and its relationship to road infrastructure, it was decided that to ensure long term cooperation that extended past individual officers commitment and interest, a MoU would be a reasonable course of action.

The MoU is limited to the priority catchments under the National Action Plan for Salinity and Water Quality, and the area within and immediately adjacent to the state controlled road network throughout Queensland. It focuses on four main areas – data collection and information exchange; research and development; awareness and education, standard and technical guidelines.

Data collection and information exchange

- a. On an annual basis providing biophysical (soil, geological and groundwater) data that is collected or products that are produced. This requires the establishment of standard data recording and exchange formats;
- b. Providing information and research about the impact that salinity and water quality have on road infrastructure and adjacent landscapes;
- c. Installing suitable infrastructure in existing and future bore holes on an ongoing basis, to allow ground water monitoring to occur, if required;
- d. Providing locations of salinity expressions identified within, and adjacent to, the state controlled roads in an agreed format, on an annual basis;
- e. Develop a salinity risk assessment model for transport infrastructure that considers environmental, economic and engineering constraints.

Research and development

- a. Commence research to develop and document practices to prevent and/or minimise the impact of salinity and water quality on transport infrastructure and the landscape.
- b. Investigate and quantify impacts of roads regarding vertical and lateral movement of groundwater.
- c. Assist with catchment based solutions for salinity and water quality in collaboration with catchment management and natural resource groups.
- d. Providing technical and field support for any research that furthers the objectives and knowledge of both departments about salinity and water quality issues on an ongoing basis, within resource and financial constraints.

Awareness and education

- a. Implement an ongoing awareness and education program to increase the understanding among transport infrastructure providers of the causes, extent and available management practices for salinity and water quality issues.
- b. Distribute information that can be used by catchment management associations about the economic impacts of salinity for transport infrastructure and in particular the impact that catchment decisions can have on salinity and road infrastructure
- c. Develop self-paced salinity education toolkits for designers and engineers.

Standards and technical guidelines

- a. Updating and amending existing soil and geotechnical testing procedures for road infrastructure to comply with Department of Natural Resources, Mines and Energy and other organisations standards.
- b. Producing 'Engineering Technical Notes' that address planning, design, construction and maintenance of roads in areas affected by salinity.
- c. Amending existing engineering standard drawings and specifications to address best practice for salinity.

Outcomes

The MoU is only nine months into a five year program. One of the most significant outcomes has been the recognition of the complexity of the issue, and the potential for the agreement to involve other organisations and road authorities. At present, negotiations are occurring between these parties, achieving one of the long term goals of the agreement – a partnership between government, industry and the community in managing the issue of salinity and transport infrastructure. We anticipate that this will result in greater synergies and cooperation between all parties and a better on-ground outcome.

Major achievements to date include:

- a. A preliminary risk assessment model has been developed. It has identified that approximately 720 km of road network is at risk from salinity. At this stage field assessment of the areas is still underway to validate the extent and cost of the impact now, and in the future. Due to a lack of data at present, it is uncertain as to how much of the network will be at risk in the future. We expect this information to be available in early 2005. In addition to this, special attention is being directed to the impact of salinity on structures. So far 14 structures have been inspected with three confirmed as possessing accelerated structure degradation with salinity suggested as the primary cause. There are several hundred structures in southern Queensland with a similar potential to be impacted and these will be assessed over the next 12 months.

- b. A case study has commenced to determine the cost of salinity on existing road infrastructure. The study area includes road pavements and structures. Preliminary results indicate that the increased costs to maintain the road asset are not equivalent to costs stated in other publications.
- c. A case study has commenced to examine the cost of designing a new road that accounts for salinity problems. It appears that there is an increased cost for pavement/embankments but no significant increase in cost for structures.
- d. Joint field inspections of known salinity expressions have been undertaken by technical officers of both departments to improve the knowledge and technical skill of both Departments officers. This has revealed some knowledge and technical process gaps that are being addressed.
- e. Data exchange between both departments has commenced, with information provided assisting in the development of project specific salinity assessments and develop of landscape models for salinity and the salinity risk assessment model for road infrastructure.
- f. A methodology for the research program has been developed but implementation will not commence until the 2004/2005 financial year. The main focus in the initial stages of the research will be to investigate and quantify impacts of roads regarding vertical and lateral movement of groundwater.
- g. Technical standards for the assessment of salinity at the project level have been developed. These have been applied on two projects with decisions being made to change structure and embankment design.
- h. Awareness and training sessions on salinity processes and implications for infrastructure have been conducted for all road planners, designers and engineers. These involved a field visit and were jointly presented by both signatories to the MoU.

Conclusion

Salinity is known to have significant impacts on the environment, agricultural productivity and civil infrastructure. Increased awareness and research into salinity in Queensland has resulted in co-operation between two agencies to determine the relevance and nature of salinity interactions in the road environment. It is acknowledged that transport infrastructure can potentially contribute to localised salinity and is vulnerable to the consequences of increasing salinity in the landscape. One of the key objectives of the National Action Plan for Salinity and Water Quality is to minimise, if not prevent the adverse impacts of salinity on natural resources and infrastructure. As such the co-operation encouraged by this MOU and the outcomes to date firmly contribute to these national agreements, strategies and policies. The development of the MoU is seen as only the beginning to a more effective, long-term relationship between natural resource, construction and other organisations involved in dealing with the development and impacts of salinity in Queensland.