Lower Murray Reclaimed Irrigation Area technical reports

Issued July 2014

EPA 1034/14: This information sheet summarises the work carried out by the EPA and other government agencies to manage acidic drain water entering the River Murray. A set of technical reports was produced to document the project.

Introduction

The Lower Murray Reclaimed Irrigation Area (LMRIA) has experienced problems with acidic drainage water. The appearance of unusual orange colouration and precipitates in many drains came to attention of the EPA in February 2011 (Figure 1). The acid drainage water has occurred as a result of the rewetting of acid sulfate soils which dried and oxidised during the 2007–10 drought in the Murray–Darling Basin.

The Environment Protection Authority (EPA) is working closely with other government agencies and local landowners in the region to manage and assess the issue. A series of technical reports have now been completed and are available on the EPA website[1].

Figure 1 An acidic drain showing orange-brown discolouration due to iron precipitates

How did the problem arise?

Acid sulfate soils (ASS) are naturally occurring soils which form in waterlogged coastal and inland areas, in the presence of iron, sulfate and organic material. Acid sulfate soils are harmless when covered with water, but if exposed to air, through excavation or drainage, they react with oxygen to form sulfuric acid in the soil matrix reducing the pH of soil and groundwater to low values (<4). pH is a commonly used indicator of acidity and alkalinity where a pH of 7 is neutral, lower levels (pH 1–6) are acidic and higher values (pH 8–14) are alkaline. Metals are also released during the acidification that

[1] <www.epa.sa.gov.au/environmental_info/water_quality/acid_sulfate_soils_ass/lower_river_murray_reclaimed_irrigation_area_lmria>

can be toxic to plants (including pastures), livestock and native animals, contaminate water supplies and corrode concrete and steel.

The very low inflows from the Murray–Darling Basin from 2007–09 caused the water levels in the Lower Murray River (below Lock 1) to fall from a normal pool level of +0.75 m AHD to a low of –1.05 m AHD. The low river levels and lack of irrigation during the drought led to a drop in the shallow water table of 1.5–3 m from pre-drought levels. The heavy clay soils not only salinised, dried and cracked, but also exposed and aerated large areas of acid sulfate soils under some irrigation areas. This produced large quantities of sulfuric acid in the soil.

When the water levels recovered in late 2010, and the irrigation of the LMRIA recommenced, the stored acidity mixed with a rising water table to create acidic groundwater which is eventually flushed into the drainage channels. This drainage water is then discharged to the River Murray, a practice which is necessary to maintain agricultural activities in this area. The acidic (low pH) drainage water entering the River Murray poses a risk to the water quality, ecosystem habitat and environmental values. Screening by the EPA in late February 2011 highlighted the presence of acid water in 14 salt drains across 13 of the 27 LMRIA irrigation areas (Figure 2).

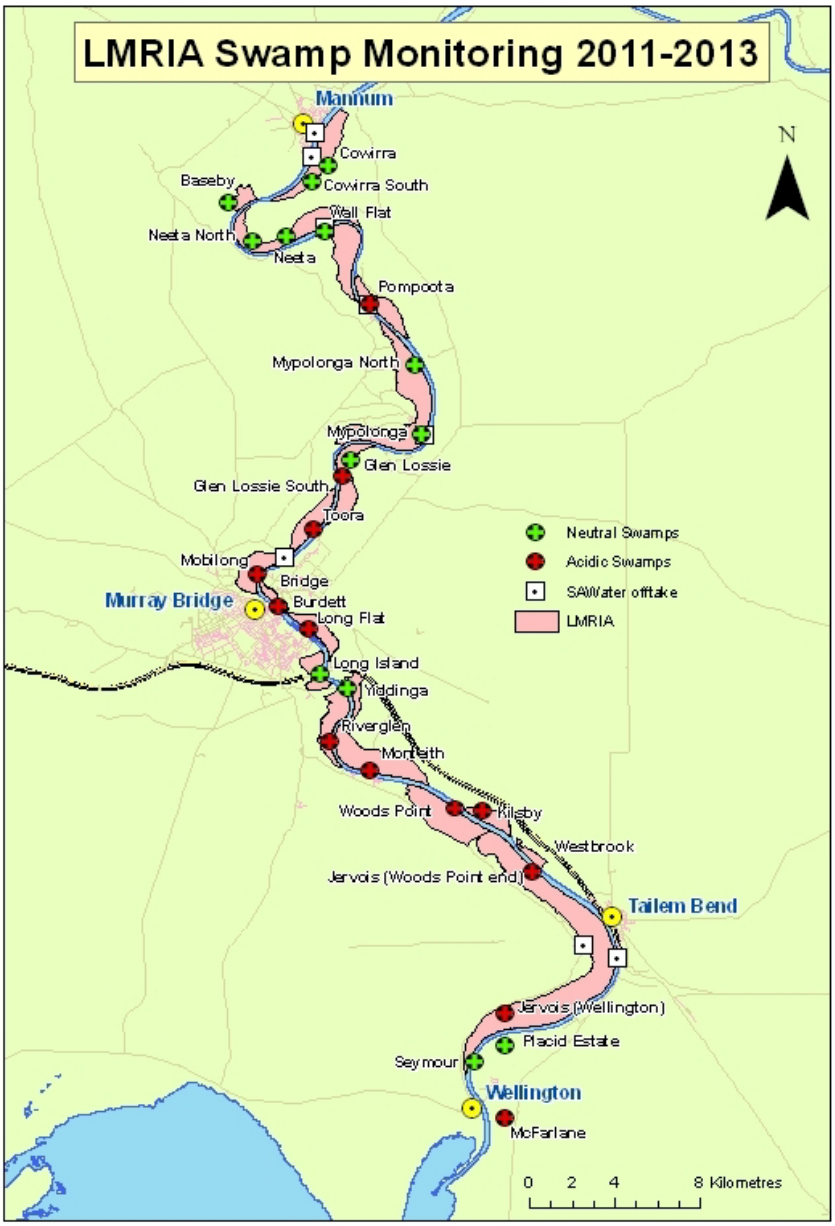

Figure 2 Location of irrigation areas in the LMRIA region, including the 14 acidic irrigation areas

Results from technical studies

The EPA has undertaken extensive technical studies to determine the risk of environmental and ecosystem impacts whilst also considering how best to manage the acid sulfate soil issue. Each of the studies, including brief detail is listed below

1 Monitoring and evaluation

The EPA has been regularly monitoring the salt drains, groundwater and the River Murray since February 2011 (Figure 3). Scientific assessment and analysis of the water quality has been summarised into two reports .. The acid drainage issue is still persisting in the region and monitoring and assessment is continuing.

Figure 3 EPA Officers testing the quality of shallow groundwater

2 Remediation and management options (on-site)

A range of potential management/treatment options were trialled, including controlled flood irrigation to flush acidity from the soil profile, surface limestone application followed by irrigation, lime dosing of drain water prior to discharge to the river, subsurface injection of a hydrated lime and limestone slurry via a mole plough (Figure 4). The depth of the acidity (<1 m below ground) and scale of the issue make it a difficult and expensive problem to manage.

Figure 4 Subsurface lime injection trial being undertaken at the Mobilong irrigation area

3 Modelling

The impacts of the salt drain discharge water on the River Murray was modelled using a three-dimensional water quality model. As predicted by the model, no significant risks are currently observed to water supplies or recreational users of

the river. Complex soil analysis of the soil processes was also undertaken using a one-dimensional biogeochemical model framework. The results are being used to better prepare for future droughts.

4 Ecosystem assessment

Two studies were conducted by CSIRO[2] to assess the potential impacts of drainage waters on aquatic ecosystems. Metal removal is rapid following dilution and neutralisation with river water No acute impacts on ecosystems are predicted, as also confirmed by field observation. Further research and field assessment is ongoing to assess the potential for longer-term chronic impacts.

Future management

The EPA, in conjunction with the South Australian Murray–Darling Basin Natural Management Board, has updated the LMRIA management initiate guidelines for on-farm management of drought and acid sulfate soil issues. The EPA has been proactive to encourage policy change to ensure that there is no re-occurrence of the acid sulfate soil issue in the future by initiating and recommending water management strategies at local and basin scale.

Further information

Legislation

Online legislation is freely available. Copies of legislation are available for purchase from:

Service SA Government Legislation Outlet
Adelaide Service SA Centre
108 North Terrace
Adelaide SA 5000

Telephone: 13 23 24
Facsimile: (08) 8204 1909
Website: <shop.service.sa.gov.au>
Email: <ServiceSAcustomerservice@sa.gov.au>

General information

Environment Protection Authority
GPO Box 2607
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Telephone: (08) 8204 2004
Facsimile: (08) 8124 4670
Freecall: 1800 623 445 (country)
Website: <www.epa.sa.gov.au>
Email: <epainfo@epa.sa.gov.au>

[2] Ecotoxicological assessment of acid drainage plumes from the LMRIA being discharged to the Lower Murray River, www.epa.sa.gov.au/xstd_files/Water/csiro_acid_ecotoxicity.pdf

Behaviour and potential impacts of acid drainage plumes being discharged to the Lower Murray, www.epa.sa.gov.au/xstd_files/Water/csiro_acid_behaviour.pdf