

THE MINE LAND POST

AUTUMN 2021

The Mine Land Rehabilitation Authority works with community, industry and government to oversee the rehabilitation planning of declared mine land and ensure transition to safe, stable and sustainable post-mining land uses in Victoria.



From the Executive Chair

Welcome to the Autumn edition of the Mine Land Post. On 22 March it was World Water day. A day that raises awareness of the importance of water and the global water crisis that is developing as the world's population grows, water demands build, water is polluted and the climate is changing. These make the world's fresh water sources more vulnerable, volatile or scarcer. The recent flooding on Australia's east coast after one of the worst droughts on record provides a vivid example of the dynamics of our climate and the difficulties of managing water to meet our needs. The occurrence of this day has prompted the MLRA to reflect on the wider implications of water management alongside the local considerations of water for the Gippsland region and for the rehabilitation of the Latrobe Valley Brown Coal mines.

The predictions for the region's surface water resources are that these will diminish over time as the water requirements for agriculture, drinking and industrial uses are likely to grow. At the same time, there may be savings in water consumption as the thermal power industry in the Valley ceases to operate. We heard in March that Energy Australia will be ending its power production at Yallourn in 2028, four years before its previously scheduled closure date. This means the Yallourn mine that supplied the brown coal to the Station will also close and its rehabilitation will be earlier as a result. While this reduces the water used in the region, the desire to use the released water to meet the requirements for rehabilitation is also strong. The Latrobe Valley mine operators have concluded water-based rehabilitation represents the best option

for delivering landforms that are safe, sustainable, useful and attractive.

Using water for mine rehabilitation under conditions of limited supplies, growing demand and greater variability is an increasingly important matter and considerable effort is being made to understand the implications of adding this future use to the water management strategy for the region. Four of the six actions under the Latrobe Valley Regional Rehabilitation Strategy are concerned with water. We are looking forward to learning more about these when the results of the studies are reported in June.

Given this background, this newsletter brings together a range of short articles that explores one aspect of water for pit lakes, namely water quality. The usefulness of a pit lake is largely governed by the quality of the water and globally the history of pit lakes in mine rehabilitation ranges from excellent water quality to very poor. Understanding why different outcomes occur and what this means for the Latrobe Valley, should pit lakes be created, is helpful in formulating an opinion on the possible value of water-based rehabilitation. I hope you enjoy reading these articles and the Board and Staff of the MLRA look forward to hearing any comments that you may have. Please feel free to contact us if you want any further information or clarification of the content of this Post.

Yours,

Rae Mackay
Board Chair

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**MINE LAND
REHABILITATION
AUTHORITY**

Meet the MLRA's new CEO



David Salmon joined the MLRA in January 2021 as our new CEO.

I joined the MLRA as CEO in January 2021. My role is to ensure the MLRA is visible, respected, and a trusted source of information providing unbiased, impartial advice to all parties and that it promotes effective and consistent rehabilitation of coal mine land in accordance to the Latrobe Valley Regional Rehabilitation Strategy and the Declared Mines Regulations.

I am working closely with the Department of Jobs Precincts and Regions regarding operational matters and getting involved with relevant government departments regarding technical matters. I am also speaking to stakeholders such as the Latrobe City Council, LVRRS Advisory Committee, and have commenced communication with the Minister's advisors, as well as visiting all three Latrobe Valley sites.

Assessment of MLRA staffing needs has led to a staff recruitment drive to ensure the MLRA maintains visibility, enhances our community and stakeholder interactions with various educational programs, and increases the depth of our technical expertise.

The MLRA commenced on 30 June 2020, with the establishment of the MLRA Board and transfer of staff from the Latrobe Valley Mine Rehabilitation Commissioner's office to the MLRA.

We need to ensure the scientific, economic, and social rigour of all plans, investigative studies and collected data to meet the long-term rehabilitation goals of safe, stable, and sustainable landforms; with the aim to reduce residual risk. This is essential for the MLRA, as it may well become the custodian of future relinquished declared mine sites.

This is an exciting and challenging time to start with a new organisation that has the purpose of benefitting post-mining rehabilitation and relinquishment outcomes, and minimising risk to the Victorian community and Government in the long term.

Yours,

David Salmon
CEO MLRA

Meet our Team

Now that the COVID19 restrictions have eased, the MLRA team are available to meet face to face to discuss the long-term rehabilitation plans for the Latrobe Valley's brown coal mines. If you and your group are interested in meeting with us, please feel free to contact us via email at contactus@mineland.vic.gov.au or call us on 1800 571 966.



Water a finite resource

World Water Day, held on 22 March, is a UN initiative highlighting the importance and increasing scarcity of freshwater worldwide. This year's theme is water and sanitation for all by 2030.

Surface water is the world's principal freshwater supply, but groundwater, currently the primary freshwater source for approximately two billion people, is growing in importance as surface supplies become less reliable and predictable due to climate change. Both surface and groundwater resources are under stress due to growth in demand. These effects may alter the spatial and temporal distribution of freshwater availability globally and decrease availability for some ⁽¹⁾.

The Latrobe Valley is not immune to the changes that are being felt globally. We have finite surface water resources and these are likely to reduce in the future due to climate change. The millennium drought reduced water availability by twenty-five percent since 2000 and climate change modelling suggests that this reduction may continue.

Population growth and rising demand for water for agriculture and industry are also occurring across the region. Alongside this, we have a heavily pumped groundwater resource for mine stability. These are some of the reasons why there is so much concern about the use of water for mine rehabilitation.

However, if we can rehabilitate the mines with water, to help stabilise the mine voids, the water bodies created may provide a means of flood management as well as providing a drought reserve. Given this background, it is clear that the planning for mine rehabilitation has to be closely connected with the planning for water for the Latrobe Valley. The economic, social and environmental trade-offs between using water for mine rehabilitation and other uses will be subject to intense scrutiny and analysis in the coming years as decisions are made about the long-term management of water in the region.

(1) Richey et al., 2015, Quantifying renewable groundwater stress with GRACE, Water Resources Research.



Moondarra Reservoir courtesy Gippsland Water.

A local perspective on water quality issues

Water quality is a defining characteristic of a pit lake; affecting its potential future use opportunities and can also impact on the regional environment. The Latrobe Valley's brown coal doesn't contain many reactive compounds that will impact upon water quality, which means that pit lake water quality is principally driven by the quality of the water used to fill the pit. Therefore, a good quality water source could permit multiple potential future uses, such as recreational (e.g. fishing, swimming, water skiing) or commercial (e.g. aquaculture). The fill water quality will also influence the lake's ability to develop and maintain an aquatic ecosystem and riparian zone, including the species that can be stocked in the lake as well as the species the lake attracts, such as water birds. (Read our article on the Yallourn North Extension Lake System for a local study on pit lake ecosystems).

Use and ecological condition of the pit are not the only considerations; the interaction and mixing of water from the pit lake with the surrounding environment, such as with aquifers, also needs to be studied. The pit lake may be a groundwater sink (i.e. receive groundwater) or source (i.e. feed water into aquifers) or both depending on the season. It may also vary between aquifers. If the lake is a groundwater source, the quality of the lake's water should not negatively impact that aquifer. If a good quality freshwater source is available, the Latrobe Valley's brown coal mines could become usable pit lakes without impacting the surrounding environment.

Not all pit lakes are bad

Pit lakes form because the resource has been mined below the surrounding groundwater table creating a hydraulic gradient towards the pit void. There is a view the pit lakes in mining pit voids are an environmental devil incarnate.

Old defunct, orphaned and abandoned open pit and open cast mine sites, locally and world-wide, have the potential to be sources of pollution and environmental harm, commonly due to poorly rehabilitated and managed mine landforms that may not be stable, safe nor sustainable.

However, not all pit lakes contain poor quality water or are a blot on the landscape. Pit lakes have the potential for multiple uses. The utility of pit lake water is defined by the quality and quantity of water it contains and these characteristics are controlled by the commodity mined (e.g. coal, gold, base metals, quarried materials like sand and road stone), the geology, the mining method and final void geometry, rock material geochemistry, hydrology and hydrogeology.

What is most notable, is that each mine site, even those mined for the same commodity, have specific characters influencing potential pit lake water use. Materials mined in the Latrobe Valley have few reactive geochemical properties to cause hydro-chemical pollution of the pit lake.

These materials do not have geochemical properties that can cause the issues of acid and metalliferous mine drainage seen in some Australian bituminous coal mines and hard rock mines. A distinction needs to be drawn between hard coal or bituminous coal mines and brown “soft” coal or lignite mines and potential uses of pit lake water. The nature of the deposit and the mining methods employed differ considerably. Brown coal mines produce final voids and therefore pit lakes covering large areas and large in volume because strip ratios of overburden to coal extracted are very low; and there is insufficient overburden material to backfill the void created.

There are many examples of how mine pit lakes can be successfully utilised with minimal environmental impact. Uses include recreation and tourism, wildlife conservation, aquaculture, irrigation, water storage for various supplies, potable water, industrial water, and provision of environmental values. Brown coal pit lakes have the same utilisation potential. Another perhaps less obvious use of pit lake water is its ability to replace mined material backfill, where these are lacking, to provide support and geotechnical stability to pit walls and where underlying groundwater pressures exist causing floor heave. This feature is important in brown coal mines where the geological materials are inherently weak.

Examples of brown coal mine pit lake utilisation are less numerous compared to the variety of pit lake uses in other mine pit voids because globally there are fewer brown coal mines.

In Texas USA, the Tatum lignite mine has been converted to a series of wetlands and the pit lake utilised for sport fishing. Also in the USA, the Oxbow Mine in Louisiana has pit lake water used for watering cattle and wildlife. Probably the most cited lignite mine pit lakes are those in Germany. Here pit lake water provides stability to pit walls and the water and final landscape are commonly and very successfully used for recreational purposes. Some German lignite mine pit lakes are also used as flood mitigation systems.

Within the Latrobe Valley, rehabilitation of the Yallourn North Extension Open Cut Mine included partially backfilling the central portion of the former open cut pit. The pit filled with water in 1991, creating a small lake of 15 approximately metres in depth with a surface area of approximately 9 hectares. A study of the environmental condition of the lake found water quality suitable for recreational or stock watering purposes. Brown coal mine pit lakes are shown to be successful rehabilitation and closure options with the potential for many water and landform uses.

Lake Kewari. Courtesy Collie Chamber of Commerce & Industry Inc



Yallourn North Extension Lakes System - rehabilitation success



Yallourn North Lake System. Courtesy ENGIE.

The State Electricity Commission Victoria (SECV) undertook mining at Yallourn North Extension Open Cut, located approximately 4.5 km east of Yallourn North township, from 1955 until 1989 with 9.4 million tonnes of brown coal mined.

After mining ceased, SECV undertook interim rehabilitation of the site, including partially backfilling the central portion of the former open cut pit, creating a small lake in its north portion and a fire service pond in the south west. The SECV left the former pit's western coal faces intact for potential future mining and so they remain in an exposed condition, extending 5-7m above the lake's water line. All other mine batters were regraded, clay covered and grassed.

The lake is surrounded by open grazing land and two revegetated external overburden dumps. Filling in 1991 to create a lake, with an approximate maximum depth of 15 metres and a surface area of approximately 9 hectares.

In 2018, ENGIE Hazelwood commissioned Mine Lakes Consulting to study the environmental condition of the lake as a local case study for brown coal pit lake water quality. The study, which included water, sediment and ecological sampling and surveys, reported good lake water quality suitable for recreational or stock watering purposes, with slightly brackish water (total dissolved solids less than 1,000 mg/L), potentially due to freshwater inflows mixing with naturally occurring low-salinity springs seeping into the lake. Lake pH is neutral (ranging between 6.5 and 7.5). Likewise, lake sediment samples, which comprised both overburden and exposed coal were of good quality with no metals concentrations exceeding sediment quality criteria.

The study reported that while riparian vegetation surrounding the lake is limited, the lake itself had a good mix of aquatic vegetation observed at up to 3m deep from the lake's edge. Observations of fauna comprised water birds (Pied Cormorant) and fish (Redfin Perch). Macroinvertebrate (e.g. worms, shrimp larvae and midges) abundance and diversity were moderately high; an indicator of good ecological function.

While this pit lake is smaller and shallower than those proposed for Hazelwood, Yallourn and Loy Yang, the study is a good indicator of what we can expect with respect to water quality and ecosystem function should the larger mines be rehabilitated as pit lakes.

With thanks to ENGIE Hazelwood for providing: Mine Lakes Consulting, 2019, Yallourn North Open Cut Environmental Study.

In the news



Yallourn Power Station. Courtesy ABC Gippsland

Energy Australia Yallourn Closure Announcement

On 10 March, 2021, Energy Australia announced it will be ceasing mining and power generation at Yallourn in mid-2028, four years earlier than its planned closure in 2032. With respect to rehabilitation of the mine void, due to the mine's longevity, early closure will not have a significant difference on rehabilitation requirements. At this stage, the conceptual rehabilitation plan is to stabilise the mine as a full pit lake, which will require approximately 740 gigalitres of water. The MLRA will be working closely with Energy Australia and the Regulators on the implications of the shorter closure timeframe and on the approvals of the mine's final rehabilitation plan when this is submitted in the next few years.

MLRA webinars

In February the MLRA held two webinars on the Latrobe Valley Regional Rehabilitation Strategy (LVRRS) Implementation Actions.

Webinar 1 of 2 LVRRS Actions 1 & 3 held on 2 February with guest presenters from DEWLP Anna May, Director, Water Resource Assessment and Planning, and Geoffrey Steendam, Senior Manager, Hydrology discussing Climate Change Guidance (Action 1) and Water Sharing in the Latrobe Valley (Action 3).

Webinar 2 of 2 LVRRS Actions 4 & 5 held on 9 February with guest presenters Anna May, Director, Water Resource Assessment and Planning, DEWLP, and Anthony Feigl, Acting Director Coal Resources, DJPR discussing Feasibility of Alternative Water for Mine Rehabilitation (Action 4) and Identification of non-water and contingency rehabilitation options (Action 5).

We are pleased to let you know that the videos of the webinars are now available to watch on our website. Please visit our [webinars page](#).

Upcoming events

The MLRA is attending online and presenting at the Life of Mine Conference that runs from 28-30 April on:

1. Coal Hole: community engagement using experimental art; and
2. Overseeing Latrobe Valley Mine Rehabilitation: Implementation of the new Mine Land Rehabilitation Authority

For more details about the conference please click [here](#)

Get in touch

Our office at Suite 5, 55 Grey Street Traralgon, is closed for the time being in line with COVID-19 restrictions.

You can call our team, who are working remotely, on 1800 571 966 during normal business hours, email contactus@mineland.vic.gov.au, or visit our website at mineland.vic.gov.au.

Please feel free to connect with us on Facebook [@MLRAVictoria](https://www.facebook.com/MLRAVictoria) or on [LinkedIn MLRA Victoria](https://www.linkedin.com/company/mlra-victoria).

