THE MAND POST

SPRING 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 sustainable post-mining land uses in Victoria.



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From the Acting CEO

Welcome everyone to our Spring 2021 Mine Land Post. Following on from our July webinar, we're continuing the theme of the timescales involved in mine land rehabilitation. In addition to the timeframes for different rehabilitation scenarios for the Latrobe Valley's brown coal mines, we've also presented several case studies on land revegetation timeframes. I hope you find these interesting.

We have been busy recruiting and saying farewell. One of our technical specialists, Mark Pratt retired in September, and we wish him all the best for his well-earned retirement. Since then our team has grown to include Nathan Gardiner, Technical Specialist, Suzanne Fussell, Executive Assistant and Ellie-Rose Rogers, Graduate. You can read their stories in the Meet Our Team section, and I hope the community gets a chance to meet them in person soon. ned our Mineland Chats n opportunity for community to ask us questions and provide on mine rehabilitation. Rae ur Board Chair, and I have very byed answering your questions

We launched our Mineland Chats series as an opportunity for community members to ask us questions and provide feedback on mine rehabilitation. Rae Mackay, our Board Chair, and I have very much enjoyed answering your questions and listening to your thoughts, ideas and concerns. One theme I've picked up on is people's interest in understanding what opportunities may arise from rehabilitated mine land, and when they might become possible.

On 30th September, we were referred an investigation by Minister for Resources Jaala Pulford, regarding rehabilitation at Hazelwood mine. Throughout the investigation, the Authority will provide advice to government on the requirements for assessing ground stability and erosion risks at Hazelwood. The investigation will be undertaken over a five-month period.

Yours,

Rhonda Hastie Acting CEO

In this issue

In this issue we highlight the timescales involved in mine land rehabilitation. Along with a discussion on likely timescales involved in rehabilitating the Latrobe Valley's brown coal mines, we present several case studies on how long soil restoration and mine rehabilitation can take. Two case studies are based on soil restoration projects in Germany's Garzweiler and Hambach brown coal mines, the third is a local example on topsoil development and batter revegetation trials at Loy Yang.

Mine rehabilitation timeframes for the Latrobe Valley

Our July webinar included a presentation on the different potential timeframes for rehabilitation options for the Latrobe Valley's brown coal mines and the implications of these timings.



A full pit lake, which places the mine void into equilibrium, would take approximately 20-25 years to achieve at Hazelwood and Yallourn mines, assuming an annual fill rate of 30 billion litres (gigalitres, or GL). It would take up to 30 years at Loy Yang, assuming a 50 GL per year fill rate. These fill rates are based on currently allocated surface and groundwater sources for each mine and power station.

Climate change is likely to reduce surface water availability in the future which would affect fill rates. If fill rates were halved, the timeframes would double, meaning that achieving a full pit lake could take 50-60 years.

Partial pit lakes, where the mine is only filled to the point of weight balance (only sub-floor pressures acting on the mine are equalised, not lateral pressures), would have a marginally shorter timeframe for Hazelwood (20 years) and Loy Yang (25 years). A non-water based rehabilitation outcome, where soil and rock are mined from elsewhere to achieve weight balance could also reasonably take approximately 30 years for both Hazelwood and Loy Yang (ignoring the practicality of sourcing the material to achieve this outcome).

Under Yallourn's former 2032 closure timeframe and mine plan, weight balance was expected to be achieved via backfilling with overburden (materials removed to access the underlying coal). As such, additional rehabilitation works were not considered necessary to achieve weight balance, and thus a time hasn't been calculated. Weight balance requirements are currently undergoing recalculation at Yallourn. An empty pit, where the mine walls are reshaped and exposed coal is covered, but equilibrium or weight balance isn't achieved (except at Yallourn), likely requires 10 to 15 years.

Based on the above timeframes it is likely that in the Latrobe Valley, mine rehabilitation won't be complete and all mine licences relinquished until after 2080. Long-term, intergenerational processes, such as mine rehabilitation, mean that design and approvals processes must have a view to the future needs of the region and ensure as far as possible that any future impacts are minimised.

Click <u>here</u> to watch a recording of the webinar on our website.

Rehabilitating Germany's brown coal mines

Landscape rehabilitation at brown coal mines in western Germany has been underway for several decades. Following are two case studies, the Garzweiler and Hambach mine demonstrating mine land rehabilitation methods.

Transforming mine land into farmland

Rehabilitation of mined land to a point where farming can once again take place is a complex process that has been refined in the German coalfields.

Loess, a clastic/detrital sediment that is formed by the accumulation of wind-blown silt, forms the foundation of this process, which after excavation during coal mining is stacked and left to settle for three months. Loess as a substrate has an ideal texture for recultivation and for the reduction of acid mine drainage, and once conditions are right (weather, moisture), the stacks are levelled and the transformation into soil can begin. To avoid compaction of the substrate, grading is conducted during dry periods with specialist equipment. Alfalfa is typically planted as a perennial pioneer crop. Its deep tap roots help to loosen and stabilise soils, thriving in the 7.5 pH of the loess soils.



Wide-track bulldozer during initial grading. Photo courtesy of RWE.



Deep tap-roots of alfalfa stabilise and loosen soils and build nitrogen levels for subsequent crops.

The plants are chopped after three years and left in the field to support the accumulation of organic matter and formation of hummus. Alfalfa also collects nitrogen from the atmosphere, storing it in its root space and creating ideal soil conditions for subsequent wheat crops.

Winter wheat, then winter rye and/or barley are sown with the addition of various nutrients. Small scale experimental crops, such as sugar beet or potatoes, various softwoods and industrial plants such as Chinese reeds, have been planted to assess their potential benefits. During this time processes such as wide strips and gentle ploughing are utilised to ensure care for the emerging soils, which are more sensitive to external pressures.

Overall, time is the crucial factor to achieve fertile soils, in a process that is continuously refined by the latest science. After a minimum of seven years of recultivation works, the rehabilitated land can be handed back to farmers with complete documentation of the processes used on the land during rehabilitation.

The Garzweiler Mine

Located to the west of Cologne, near the Netherlands border, Garzweiler is one of three mines in the area and has been supplying brown coal for over 100 years from seams 40 to 210 metres below the surface.

Unlike the Latrobe Valley brown coal mines, the mines in Germany's Rhenish mining district have a high overburden to coal ratio. At Garzweiler for every kilo of coal extracted, over seven kilos of overburden (gravel, sand etc.) are removed and reused to backfill the pit as mining progresses.

Garzweiler operations have a footprint of 7,535 ha, of which 4,333 ha has been recultivated, an area approximately equal to the Loy Yang pit. Most of which has been returned to agriculture (3,446 ha). As described in the previous article, agricultural scientists have derived a process for transforming the restored overburden into arable soil using a restoration process that takes between 7 to 10 years to complete.



Recultivation at Garzweiler mine, Germany. Photo courtesy Rhonda Hastie.

During the initial three years, mulching and planting of crops such as alfalfa helps to establish topsoil. In the following four years these are replaced by cash crops (e.g. wheat, sugar beets, potatoes) that can provide reliable indications of soil health. When the soil is healthy enough to allow for sustainable agriculture, the land is relinquished back to farmers.

To read more about the Garzweiler mine click <u>here.</u>



The Hambach Mine

The Hambach mine near Cologne is the largest open pit coal mine in Germany. With a footprint the size of Manhattan, the mine provides enough electricity to power 8 million households.

Spoil comprising of loess, gravel and sand excavated from the pit has been set aside for future reclamation purposes.

Since 1978 part of this spoil was used to create the Sophienhöhe hill woodland, which at 200 m above sea level is the largest artificial hill in the world. The creation of the woodland included the planting of 10 million trees and the creation of 120 kms of hiking trails.

Spoil is also used in preparation of mined land for recultivation - at Hambach so far 1,560 ha of land has been restored (15 ha for agriculture and 1,545 ha for forestry).

The current plan for rehabilitation is the creation of a lake. At almost 400 m deep and covering 4000 ha (40 sq km), the lake would be the second largest and Germany and also the deepest. Filling of the open pit using a combination of rising groundwater and water piped from the Rhine River is expected to take several decades.

Filling is planned to commence as early as possible around 2030, with rapid filling potentially allowing for a large lake area to be available from 2040. More conservative filling strategies would lead to establishment of a full pit lake by 2100.

Alternate uses of the mine site have also been floated, including use of the pit for pumped storage of wind energy, or establishment of a renewable energy and research hub. Most locals, however, generally favour a lake, and value increased biodiversity associated with a return to more wooded terrain.

To read more about the Hambach mine click here.





View of the Hambach mine from the Terra Nova viewing site. Photo courtesy of www.dw.com



Batters and artificial soils at Loy Yang

One of the critical factors for the rehabilitation of disturbed mining areas is topsoil. At Loy Yang, much of the land is re-established as pasture to provide soil stability and interim grazing use.

Topsoil is not always available where and when it is required for rehabilitation which led to investigations of alternatives to topsoil to support plant growth and provide erosion protection. There are currently a number of trials and initiatives underway to investigate and source alternative products. These include composts to enhance and bulk out poorer quality soil leading to the 'creation' of artificial topsoil and utilising materials (particularly wastes) available in the region.

The use of compost products to allow poorer quality soils to be utilised is successful, but expensive. In response, options are being pursued to create compost and utilise green waste generated on site. Compost has been used on steeper mine rehabilitation slopes quite successfully, as it can replicate how topsoil absorbs and regulates surface water.



Batters at Loy Yang.





Artificial soil trial sites at Loy Yang.

The creation of artificial soil has been challenging, but still looks promising. Trials supported by Monash University have progressed from laboratory, to greenhouse and up to field scale. The challenge has been to create both the chemical and physical properties of fertile topsoils, particularly texture, water holding behaviour and pH for nutrient availability for plant growth. An advantage for pursuing these other options is the utilisation of wastes such as clay, compost, and waste coal. In particular artificial soils that trialed combinations of subsoil, waste paper pulp and power station ash.

While these trials are progressing, natural topsoil is still the preferred medium for rehabilitation. Usually pasture established using topsoil can be grazed after two years, while in contrast artificial soils require more time to stabilise - typically three to four years to allow grazing.

At present there are no rehabilitation processes involving the use of artificial soil that confidently permit grazing. With improvements in the artificial soils pasture establishment could be achieved in less than five years . Any longer would mean that the process isn't financially viable as the maintenance and rework cost would negate any benefit.

Article and photos courtesy Jon Missen, Rehabilitation & Closure Principal, AGL Loy Yang

In the news

Meet our Team

We are very please to welcome our new team members who have joined us over the past few months.

Suzanne Fussell joined us as our Executive Assistant in July, Nathan Gardiner, our Technical Specialist joined us at the beginning of September, and Ellie-Rose Rogers joined us in October as our Graduate. You can read more about their story below.





Meet Nathan our Technical Specialist.

A Melbournian with one foot perpetually out the door to somewhere green. I've worked previously as a petroleum geologist in Australia, Africa, Europe, and the Middle East, but I'm most interested now in adapting these skills to land rehabilitation in an evolving energy landscape. Out of hours you'll mostly find me chasing my daughters, baking sourdough, or sipping lattes.



Meet Suzanne our Executive Assistant.

I'm very excited about the opportunity to work with the talented team at the MLRA. As a 'city slicker' who was coaxed into a tree-change 10 years ago, in my spare time you will find me out on the farm busy with the cows and calves, or in the garden where there is always something to be done.



Meet Ellie-Rose our Graduate.

I'm a graduate with DJPR's Science and Planning graduate program having studied a Bachelor of Science with an Honours in Geography. I love nature and travel, and really appreciate any opportunity to get away from my desk and talk to people or explore.

Upcoming events



We are excited to announce the launch of the Mine Land Rehabilitation Authority's Mineland Chats!

Join us for an informal and interactive chat hosted by our Acting CEO Rhonda Hastie and Board Chair Rae Mackay, where you can ask questions and give your opinions on matters relating to the rehabilitation of the Latrobe Valley's brown coal mines.

Upcoming session include:

Access to Water

Wednesday 10 November: 10.00-11.00am (in person at Morwell). Click <u>here</u> to register.

Environmental Assessments and Approvals

Wednesday 17 November: 12.30-1.30pm (online). Click <u>here</u> to register.

Wednesday 24 November: 4.30-5.30pm (in person at Morwell). Click <u>here</u> to register.

Registered participants will receive a link and instructions on how to join the online session or where the in-person sessions will be held.

As there are a limited number of places, please make sure you book early. If you are not able to book a place but wish to do so, please send us a message via email at contactus@mineland.vic. gov.au.

Please note, if in-person COVID19 restrictions are reintroduced, all sessions will be held online.

MLRA Annual Report



The MLRA Annual Report was tabled in the Parliament of Victoria on Thursday 28 October, and is now available to download from our website.

To read and download the report click <u>here</u>.

Have Your Say

Our Monitoring & Evaluation Framework is coming soon.

We have developed the MLRA's Monitoring & Evaluation Framework, and will be looking for your feedback.

Coming soon, so keep an eye on our website and social media.



Upcoming events (cont.)



Integrating values in post-mining transitions: the experience of Lusatia Germany, with guest speaker Karsten Feucht and hosted by the MLRA and FedUni on behalf of the Latrobe Valley CRC TiME Hub, a live and online event.

Date: Monday 15 November.

Time: 4pm - 6pm. Doors open at 4pm and the webinar starts at 4.30pm. Venue: Morwell Innovation Centre. To register please click <u>here</u>.

On behalf of CRC TiME's Latrobe Valley Hub, the MLRA invites you to attend a talk by Karsten Feucht from Germany's IBA-Studyhouse on the importance of identifying and disseminating the values that are important to community and the region when redesigning rehabilitating mine landscapes and regions. Germany's IBA (Internationale Bauausstellung or International Construction Exhibition) program focuses on urban redevelopment and landscape transformation, and since 2000 has been centred in the Lusatian brown coal mining region in Germany.

Karsten, is an architect specialising in developing innovative methods for community participation in perceiving and developing value, and applying those to spatial design. His talk will present how these mediation methods were successfully applied in the post-mining transition for the Lusatia region, incorporating the recovery of the industrial heritage, urban redevelopment and landscape redesign. Karsten has over 20 years of experience in these processes, enabling him to provide a complex picture of multidisciplinary landscape-design methodologies and how to integrate social and community concerns in post-mining landscape transitions.

The event can be attended both in person and via online.

If you are attending in person, you are required to provide proof of vaccination before entering the venue.

If you are attending online you will receive a link and instructions on how to join the session.

Please note, if in-person COVID19 restrictions are reintroduced, the event will be held online.



Photos courtesy top to bottom: IBA, Michael Klug, Rainer Düvell and IBA, Steffen Rasche.

Get in touch

We have moved to our new office at 65 Church Street, Morwell. You can call our team, who are working remotely, on 1800 571 966 during normal business hours. You can also email us at contactus@mineland.vic.gov.au, or visit our website <u>mineland.vic.gov.au</u>.

