Open house session boards

The following information boards were presented at community open house sessions in May 2024.

Alcoa

Welcome

Alcoa acknowledges Wadawurrung People as the Traditional Owners of the land where we operate and we pay our respects to their Elders past, present and emerging.

Kuarka Dorla Dja, (Anglesea) is a place where Wadawurrung ancestors came to fish for mullet.

Bounded by intricate waterways flowing out to the Warri (salt water), sand dunes steeped in heritage, and the high point of country the Anglesea Heathlands, where the Mirri (sun) rises on the Warri (salt water) and sets across the heath.

We acknowledge Bunjil as the Creator Spirit, who continues to watch over the land and guide us all on our journey and responsibility to heal country.

*Artwork © Billy-Jay O'Toole, '**Kuarka Dorla Dja**', 2023.*

Alcoa

Mine Rehabilitation and Closure Plan

Delivering a space for community

Alcoa have a regulatory obligation to deliver the final Anglesea Mine Rehabilitation and Closure Plan.

Major earthworks and revegetation activities completed in 2020, have delivered a safe, stable and sustainable landform, which will require ongoing monitoring and maintenance over the next decade.

The key remaining aspect of the Plan is an approved strategy to fill and maintain the mine pit with water.

A range of potential options to support filling the mine pit in a timely manner have been investigated and of these, the only two currently feasible options are the use of groundwater from the Upper Eastern View Formation (UEVF) which would see the mine pit filled in seven to 10 years, or natural fill.

Options considered

- UEVF groundwater - Alcoa licence
  LEVF groundwater - Barwon Water licence
- Recycled water - Breamlea treatment plant
- Natural fill - estimated to take approximately 50 years
- Seawater and/or desalination
- Salt Creek restoration

Post completion of earthworks and revegetation 2022

Alcoa


Legend
1. Native grassland slope
2. Native dryland / wetland vegetation / rocks
3. Rediverted Salt Creek
4. Outlet to Anglesea River
5. Historical rehabilitation areas
6. Proposed areas for alternative uses
7. Proposed access route
Alcoa of Australia Freehold
WATER BODY
Peregrine Track
Peregrine Track
Anglesea Heath
Anglesea Heath
Salt Creek
Bald Hills Rd
Anglesea River
Alcoa of Australia Freehold
Alcoa of Australia Freehold
Anglesea River
Coalmine Road
Messmate Track
Coalmine Rd
Anglesea Heath
Messmate Track
Anglesea Golf Club
Anglesea River
N
0m
50m
100m
250m
500m

Mine Water Filling Strategy

Approximately **18 gigalitres** of water is needed to fill the mine pit. As at April 2024, there is approximately **three gigalitres** of water present.

Alcoa's preferred option is to fill the mine pit over seven to 10 years, achieved through supplementing natural filling of the mine with a combination of UEVF groundwater and potential peak flows from Salt Creek. Extensive technical work undertaken over more than three years has not identified any adverse impact on groundwater dependent ecosystems, including the Anglesea River.

Why water?

Creating a water body supports:

- Benefits to the environment, the regional economy and the community from the future land use of the rehabilitated landscape
- A critical fire break to minimise fire risk to the Anglesea township
- Geotechnical stability through the weight of water at the base of the mine

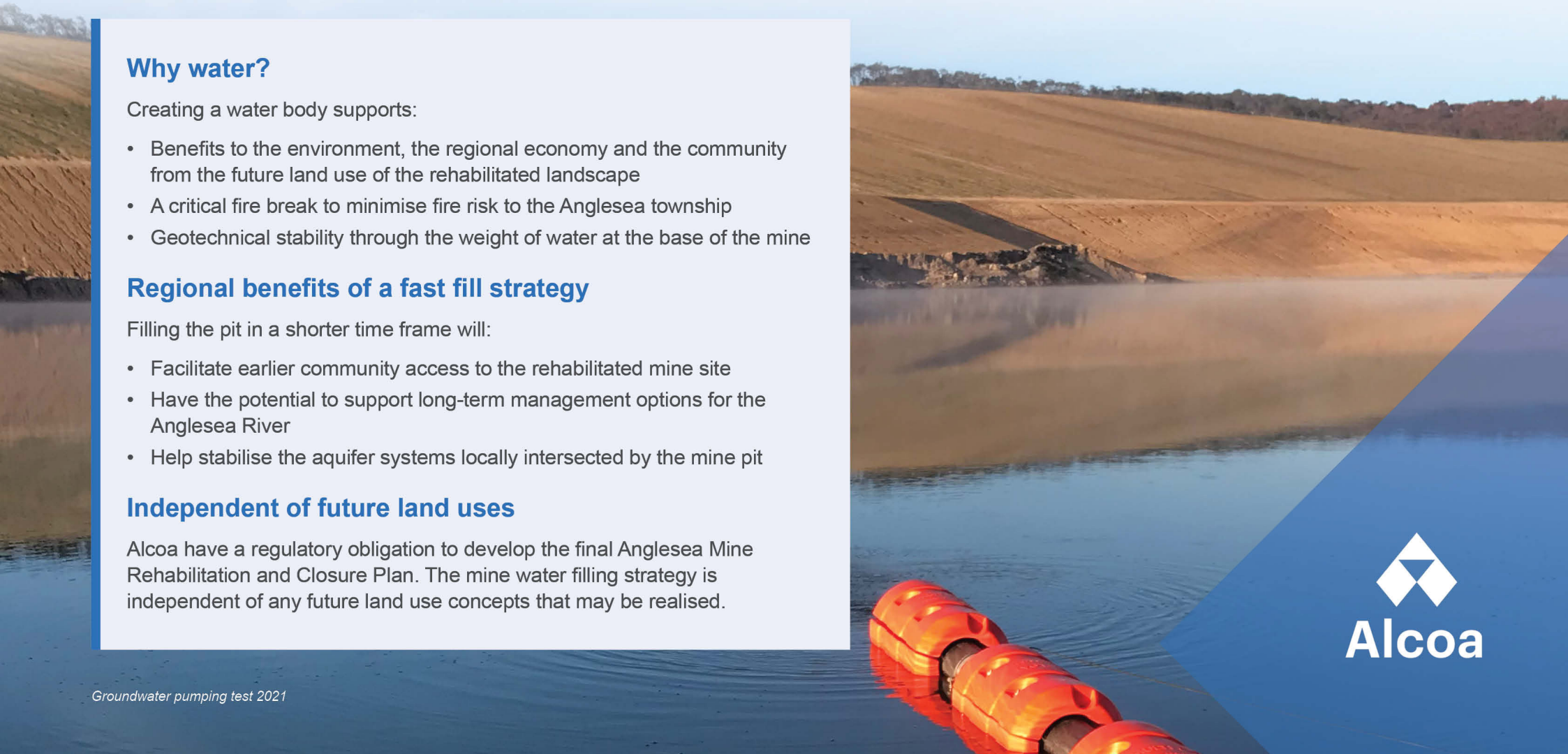
Regional benefits of a fast fill strategy

Filling the pit in a shorter time frame will:

- Facilitate earlier community access to the rehabilitated mine site
- Have the potential to support long-term management options for the Anglesea River
- Help stabilise the aquifer systems locally intersected by the mine pit

Independent of future land uses

Alcoa have a regulatory obligation to develop the final Anglesea Mine Rehabilitation and Closure Plan. The mine water filling strategy is independent of any future land use concepts that may be realised.



Groundwater pumping test 2021

Alcoa

What's below the surface?

Understanding the hydrogeology

Different layers of geology impact the interaction between groundwater and surface water.

The Upper Eastern View Formation (UEVF) hosts multiple sub-aquifers, located either in the upper section (upper sands) or lower sections (lower sands).

Separating the upper and lower sub-aquifers are multiple low permeability layers of coals and sandy clays.

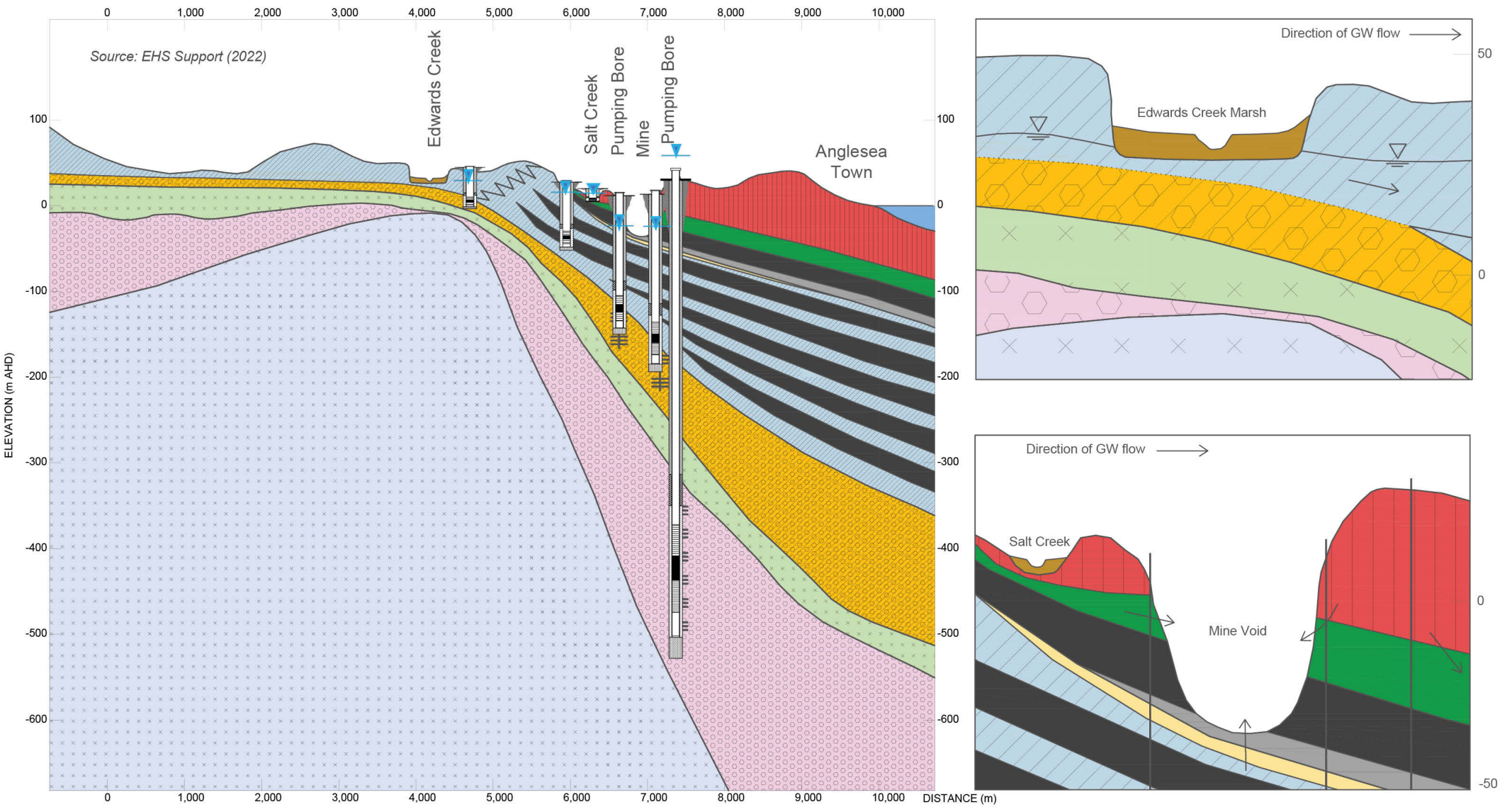
The permeabilities of these layers are typically equivalent to EPA specified landfill liner requirements.

Water pressure is higher in the saturated low permeability layers of coals and clays compared to the upper and lower sands – which indicates a degree of disconnectivity.

Clay also lines the base of the creek systems, inhibiting surface and groundwater interaction.

Surface water drain engineered in top soil revegetation

Alcoa



MATERIAL GRAPHIC

- Clayey Gravel
- Clayey Sand
- Well-graded Sand
- Siltstone
- Silt

GEOLOGY UNIT 1

- Channel Alluvial
- Upper Eastern View Formation (Coal Seam)
- Upper Eastern View Formation (Intermediate)
- Lower Eastern View Formation
- Demons Bluff Group
- Upper Eastern View Formation (Basal Clay)
- Upper Eastern View Formation (Lower Sands)
- Torquay Group
- Boonah Formation
- Upper Eastern View Formation (Upper Sands)
- Middle Eastern View Formation

H 1:20000
0 1000m 2000m
V 1:1800
0 50 100 150 200 250m
Coord.System: MGA94 Zone 55 Height Datum: AHD

EHS Support

TITLE

Alcoa of Australia Limited
Anglesea
Alcoa Anglesea Mine and Power Station

DRAWN	DATE	25/11/2021
CHECKED	DATE	25/11/2021
SCALE H 1:20000 V 1:1800		A3
PROJECT No AUS##C03093_2020	FIGURE No	

Exploring historical groundwater behaviour

What story does history tell?

Groundwater pressures in the lower sands of the UEVF have ranged between -90 to 0 mAHD. Since the 1990s when shallow aquifer monitoring began, this lower aquifer depressurisation has not impacted the shallow aquifers' water table, indicating the 'cone of depression' is confined to the pumped aquifer.

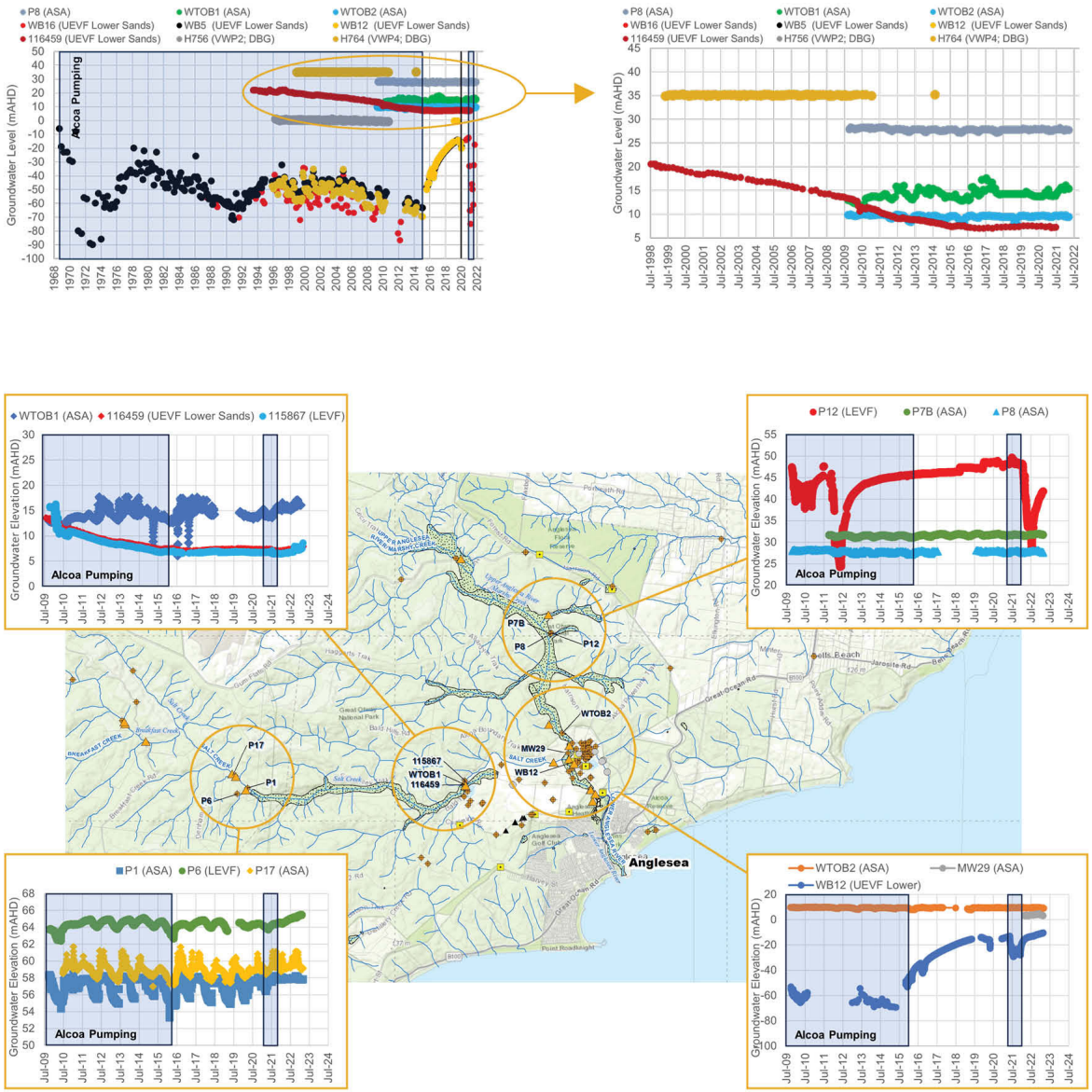
Groundwater levels in the alluvial swamp aquifer (ASA) respond closely to seasonal rainfall - declining when the proceeding months are low in rainfall and/or evapotranspiration is high.

Groundwater trends in the ASA behaves similarly regardless if the UEVF potentiometric surface or 'cone of depression' is higher or lower than the water table in the ASA.

For example:

P8 (screened in the ASA with potential gaining conditions) experiences similar behaviors as WTOB2 (screened in the ASA with potential losing conditions).

This indicates that at these locations, the base of the ASA is relatively impermeable with the clay layer retarding vertical water movement. Rather climatic conditions such as rainfall and evapotranspiration control water level behaviour and consequently, timing of surface water flow.



Groundwater pumping test

In 2021 Alcoa undertook a groundwater pumping test on the UEVF aquifer to help determine if UEVF groundwater could be used to fill the mine pit.

The test was undertaken by expert hydrogeologists between May and December 2021, with oversight by a Victorian government co-regulator technical working group. A total of 671.9ML was extracted during the test period.

What did the results demonstrate?

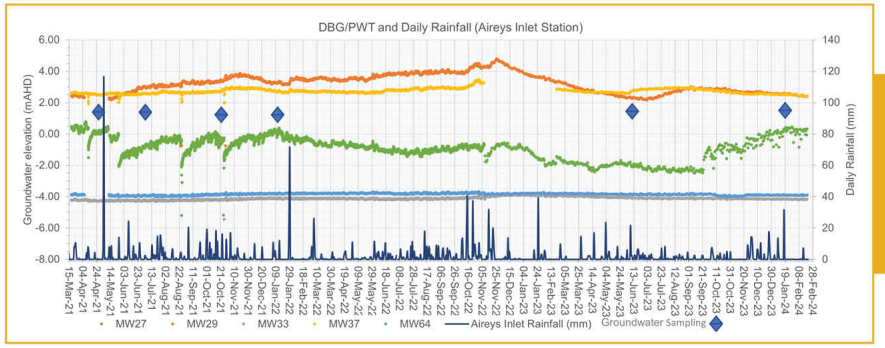
Science-based data collected throughout the process revealed groundwater dependent ecosystems, including the Anglesea River were not adversely impacted as a result of the pumping.

While the groundwater pressure reduced as expected in the UEVF lower sands, there was no impact in the UEVF upper sands or the shallow aquifer systems.

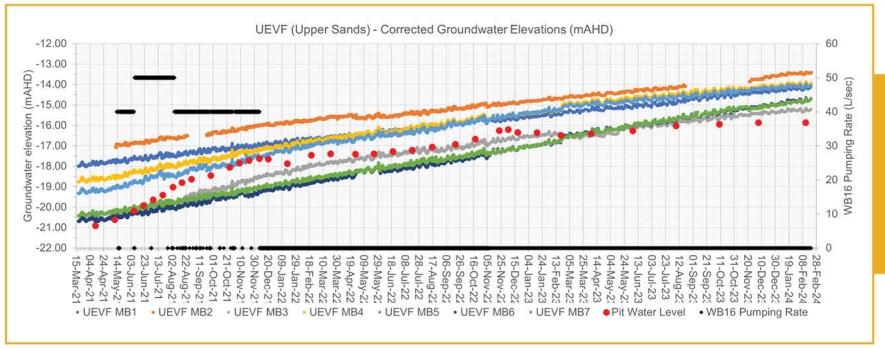
WB16 pumping bore

UEVF/DBG monitoring bore

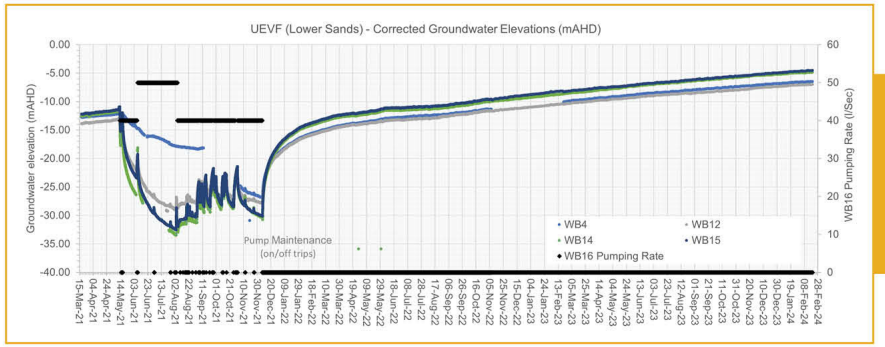
Discharge location



Groundwater level trends in the DBG/PWT aquifer (5-50m) shows response only to natural climate variations and no impact of pumping



Groundwater level (pressure) trends for the upper part of the UEVF aquifer (40-140m) show no impact of pumping



Groundwater level (pressure) trends for the lower part of the UEVF aquifer (200m) show declines as modelled

Groundwater Model

What is it?

The model allows Alcoa to examine how groundwater systems respond to different stressors and predict what may occur under future climate conditions. It is a mathematical estimation of how groundwater flows through rocks and sediments, and provides a forecast range of estimates (called uncertainty) based on running the model hundreds of times using different realistic parameters.

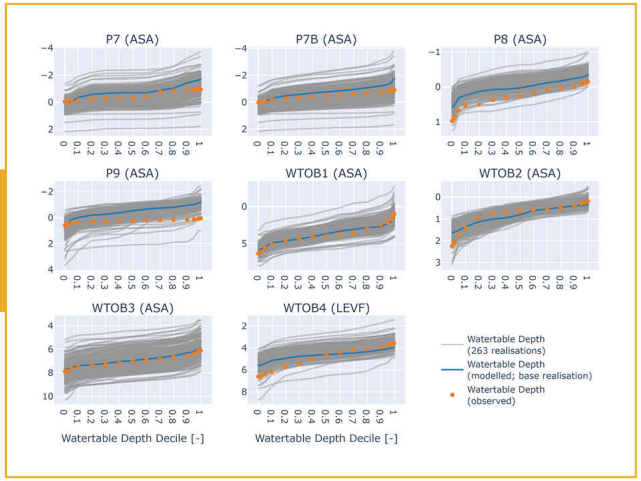
The model was reviewed by the Inter-Agency Group comprising DEECA, SRW and DJPR-ERR, and was supported by a Technical Review Panel consisting of independent experts from a wide range of disciplines including geology, hydrogeology, modelling, geochemistry, and ecology.

Initial modelling suggests there is a low risk of adverse impacts to groundwater dependent ecosystems, including the Anglesea River.

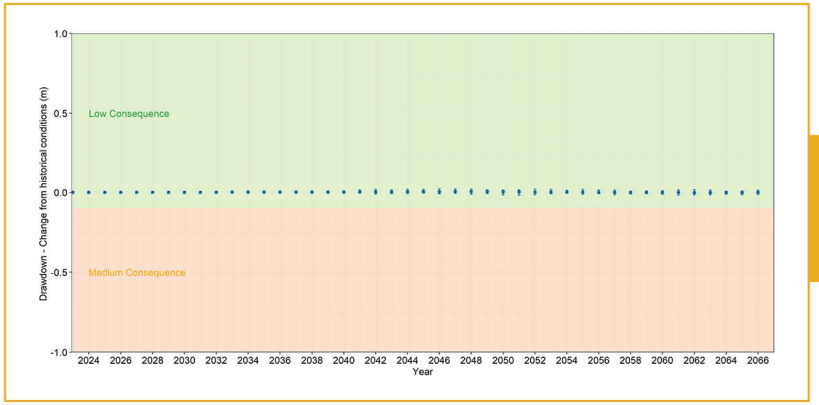
The model is one of many tools including the hydrogeological model, actual historical data, independent technical studies and groundwater pumping tests, used to help understand potential risks to groundwater dependent ecosystems, including the Anglesea River.

The model has been developed using:

- Data from more than 140 groundwater monitoring bores
- Data from six stream gauges
- Findings from historic and recent pumping tests
- Long-term climate data
- Recovery data obtained since Alcoa ceased pumping in 2016



Example of model calibration at observation bores



Groundwater level impact (WTOB1 - ASA)

What a potential application might look like

Mine water filling strategy figures

Alcoa are considering applying for a licence amendment with Southern Rural Water for the extraction of up to 1.5 gigalitres per year, for approximately 10 years.

Applying the precautionary principal, this is a conservative approach, being less than 40 per cent of the historical extraction rate.

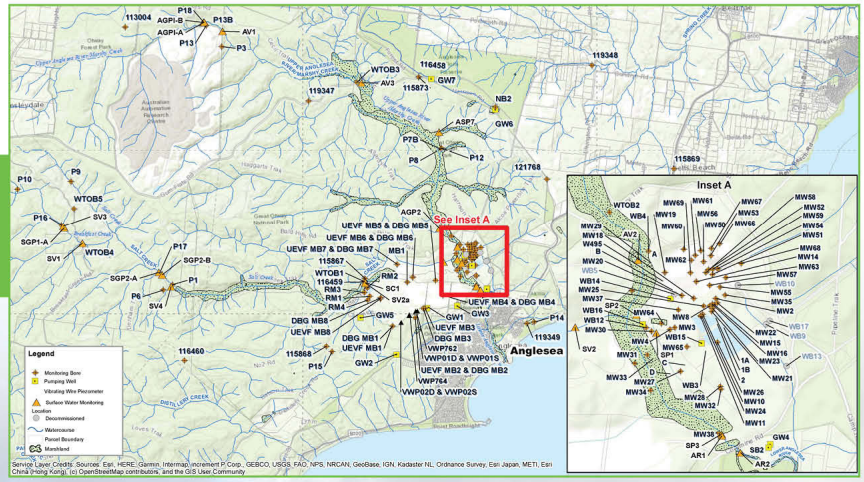
Mitigating risk

Alcoa would expect any future licence to have specific volume and extraction limits, and a variety of stringent and standard conditions.

To further mitigate any risk to the environment, as part of any application Alcoa would also propose an adaptive management approach which would include:

- A documented water management and monitoring plan
- Ongoing, comprehensive monitoring of all available bores across all aquifers
- Multiple bores (~30) in various aquifers selected as dedicated monitoring and/or trigger bores
- Nominated trigger bores with defined water level and/or water quality triggers and contingency actions (including cessation of extraction) in the event of a trigger exceedance
- Sharing of monitoring results with community and relevant stakeholders

Monitoring infrastructure



2021 pumping test monitoring and trigger bores

View of the mine pit across completed top soil revegetation works

Alcoa’s understanding of the river

Anglesea River was originally named Swampy Creek, and was changed in 1884 so as to not discourage tourists from the area[1].

Salt Creek and Marshy Creek are historically ephemeral waterways - meaning they do not flow all year round, only when the prevailing conditions allow.

Anglesea River has historically seen periods of sustained low flows, including pre-Alcoa in the 1930s and 1950s[1].

Both Anglesea River catchments have high levels of naturally occurring acid sulphate soils[2].

The lower Anglesea River appears to have historically acted in a more estuarine fashion than it does today.

In the mid-1960s Alcoa diverted the last two kilometres of Salt Creek around the mine into a clay and concrete lined diversion channel.

During operation Alcoa extracted up to 4 gigalitres per annum and discharged approximately 4.5 ML/day of pH 7 to 8 water into the Anglesea River. During low flow periods, this constituted a major portion, if not 100 per cent of flow inputs to the estuary.

There is an absence of continuous, historical actual river flow and water quality data, and little to no data before 1969.

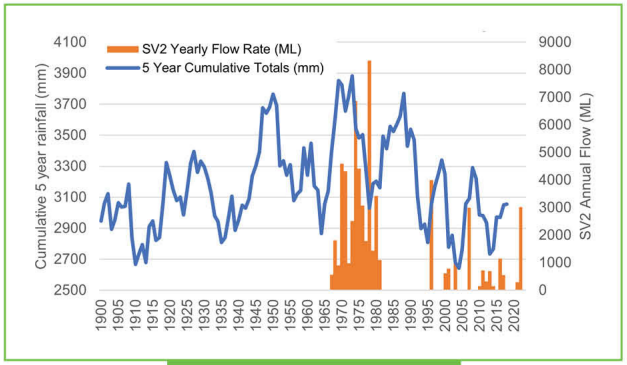
There has been numerous historical attempts to sandbag the mouth of the river, including the creation of a weir wall in 1975, ‘to keep the river at a constant level’.

Coogoorah Park was created in 1983 as part of the lower Anglesea River, increasing its volume and adding a potential acid sulphate risk.

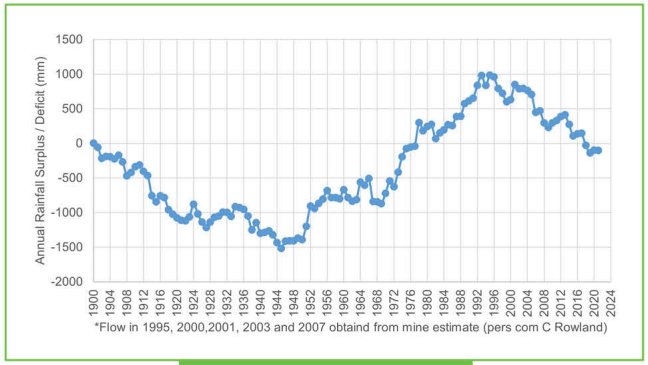
The region is going through a long-term drying cycle, using the annual rainfall/deficit versus the long-term average rainfall.

Two of the three driest five-year periods in the last century have occurred since 2006, and the two wettest five-year periods in the 1970s[3].

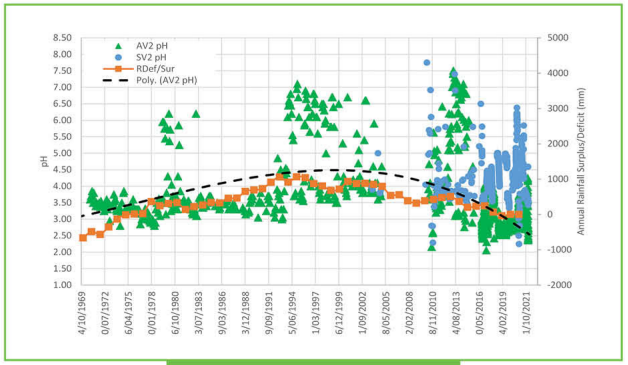
River flow is not just about how much rainfall, but also about when it rains and the prevailing conditions.



Rainfall and surface water relationship



Annual rainfall surplus/deficit[3]



AV2 pH data from 1969

[1]Prue and Graeme Weber (2010), The Grand Challenge: A History of the Anglesea Recreation and Sports Club 1911 – 2010. [2]Wong (2020), Monash University. [3]Queensland Government, SILO database, https://www.longpaddock.qld.gov.au/silo/.