



creepy crawlies
studying Anglesea's invertebrates

alcoa anglesea

environment report

2009
january



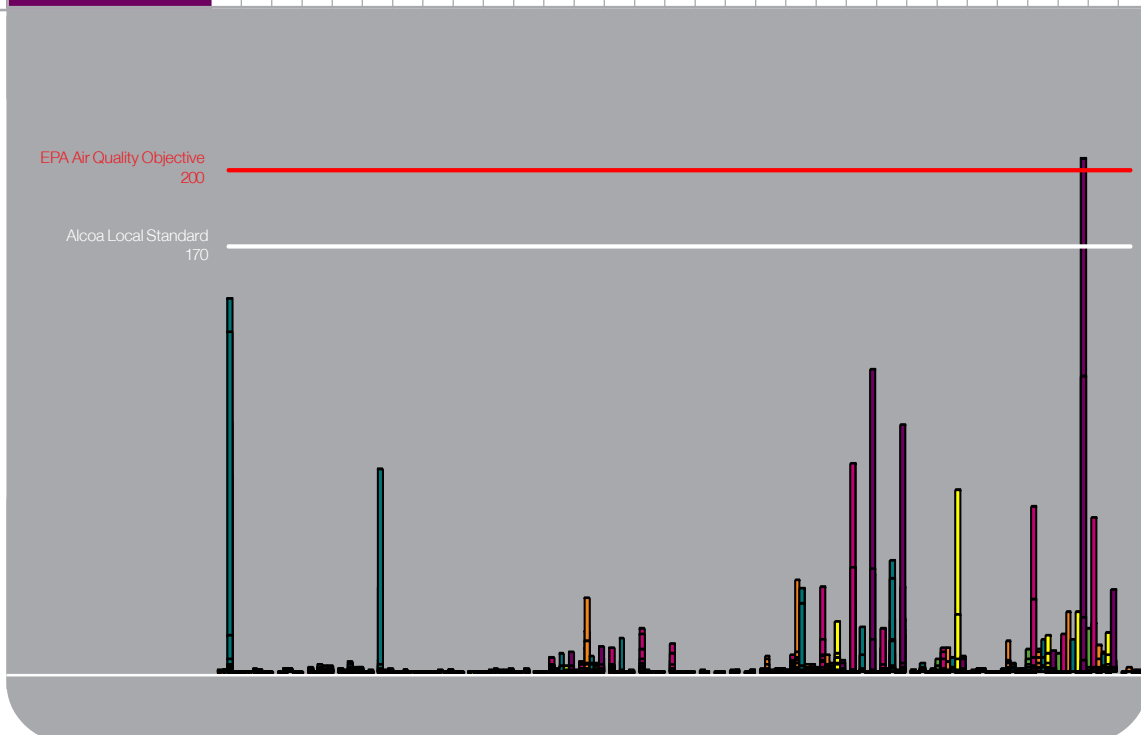
australia's aluminium

air

Air Monitoring	Average	Maximum
Stack Monitors		
Opacity g/m ³ 10-minute average	0.092	0.337
Stack SO ₂ kg/min 1-hour average Licence limit 100kg/min	62.16	79.75

Ambient Monitors	Average	Maximum
SO₂ 1 hour ppb		
Community Centre	0	17
Primary School	1	83
Mt Ingoldsby	1	37
Scout Camp	2	149
Camp Wilkin	0	73
Camp Road	2	205

Ambient Monitors																															
SO ₂ Maximum 1 hour averages (ppb)																															
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Community Centre	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	-	0	0	1	2	0	0	0	5	0	0	9	7	17	0
Primary School	0	0	0	2	1	0	0	0	0	1	0	5	4	9	17	11	0	0	1	6	34	83	17	1	9	0	1	66	15	61	0
Mt Ingoldsby	1	1	1	0	0	0	1	0	0	1	1	1	29	0	1	0	0	1	6	37	6	0	1	0	9	1	12	9	24	11	2
Scout Camp	149	1	1	3	4	81	0	0	0	0	0	7	6	13	0	0	0	0	0	33	3	17	44	3	6	1	3	13	13	8	1
Camp Wilkin	0	0	0	2	2	1	0	0	0	1	0	2	4	0	0	0	0	0	1	3	20	0	1	0	73	0	1	14	24	16	0
Camp Road	0	0	0	2	2	1	0	0	0	1	0	8	10	0	0	0	0	0	1	3	5	121	98	1	6	0	1	8	205	33	1



water



Water Storage

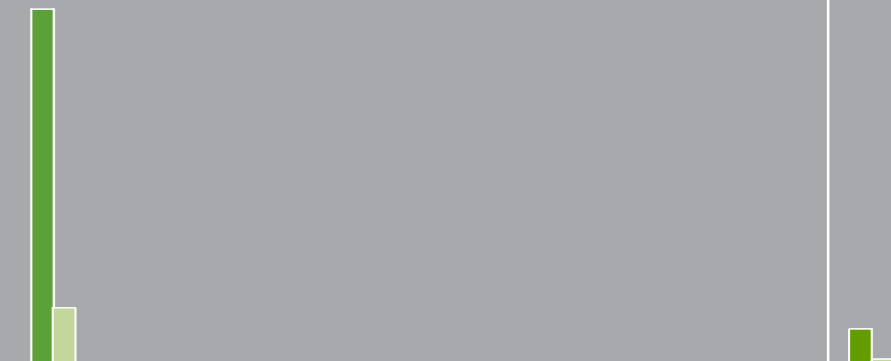
Barwon Water storage levels for the Geelong system at 23.4% capacity. Stage 4 restrictions apply with a Daylight Savings exemption to permit limited residential garden watering.

Water Discharge ML	January	Total
Ashponds (SP1)	139	139
Mine (SP4)	0	0

Water Monitoring 23/01/2009	SP1 Ashpond		SP4 Mine		SP3 Final	
	EPA limit	Lab Result	EPA limit	Lab Result	EPA limit	Lab Result
pH	4-10	8.4	3-9	no	5-9	7.3
Susp. Solids	100	< 4.00	100	discharge	30	< 4.0
Colour	50	4.0	50	at	50	6.0
Aluminium	10	0.11	10	time	5.5	0.084
Iron	10	0.082	0	of	4.0	0.079
Zinc	0.4	< 0.01	2.0	sampling	0.30	0.013

WATER WATER USAGE PER MONTH (ML)

Date	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
Town Water	2.5												2.5
Bore Water	288												288
Mine Water	46												46



creepy crawlies in the rehab

Some people may think butterflies are beautiful ...but what about wasps, spiders, earwigs, flies, moths, scorpions or mites?

Whilst many of these small critters have a bad reputation, invertebrates account for the majority of the world's animals and without them life as we know it would not be the same. Insects are involved in many of the natural processes we may take for granted such as improving the health and structure of soil, providing pollination and seed dispersal, and breaking down leaf litter into nutrients available to plants. These processes are very important in the rehabilitation process of land that has been mined, and without the functions performed by insects, rehabilitation cannot be successful.

Julia McKenzie, a vacation student from the University of Melbourne, has spent her summer holidays examining Alcoa's rehabilitation sites for the presence of these creepy crawlies. The project has involved studying the invertebrate community at four rehabilitation sites aged 1, 3, 5, and 6 years old, to compare them with the invertebrate community in the surrounding heathland vegetation. In addition, a recently burnt site was examined to compare the differences between the disturbance of mining, with a disturbance that the environment is adapted too, such as fire.

So far the rehabilitated sites appear to be progressing well with high numbers of invertebrates and many different types of creatures returning to the sites. Surprisingly, the number of invertebrates

has even surpassed the numbers in the undisturbed heath. However, the species returning to the rehabilitation are not necessarily the same and may be more tolerant to environmental change. The rehabilitation may need more time to develop as the sites are still relatively young and have a different vegetation structure to the surrounding heath. Further monitoring will be required to assess whether the rehabilitation sites begin to approach a likeness to the heathy woodland community and begin to perform the same functions as that ecosystem.

The impact of fire through the heath is not as severe as the impact of mining, with a reasonable number of invertebrates and a wide variety of creatures returning to the site only six months after the fire occurred. This is confirming that natural processes, such as fire, are not as destructive to the ecosystem as human-driven processes, in this case mining.

Due to human activities and the increasing impact of climate change, the preservation of biodiversity and invertebrate communities are extremely important. The environment relies on invertebrates just as we rely on the environment. For example, recent reductions in bee populations have alarmed the global agricultural industry as they rely on bees for pollination, and are concerned about the potential for global food shortages. Therefore, encouraging invertebrates onto the Alcoa rehabilitation sites is a very important part of a global need to support invertebrate communities and the wider environment.

ANIMAL OF THE ANGLESEA HEATH

ACROBAT ANTS (*Crematogaster* sp.)

Size: 5mm
 Identification: reddish brown with a distinct heart-shaped abdomen
 Distribution: is an ecologically diverse genus of ants found worldwide

Crematogaster workers are moderately aggressive and will attack when disturbed. They have well developed chemical defenses and are avoided by most other ants.

Nests are found in a range of sites including in soil with or without coverings, in cracks in rocks, in dead wood and arboreally in trunks and twigs. Individual colonies are often composed of several small nests a few metres apart and may contain more than one queen. The entrances of these separate nests can sometimes be connected by well worn trails several centimetres deep.

Crematogaster are generalist predators, foraging on the ground as well as on low vegetation and trees.

ACROBAT ANTS



LAND

RAINFALL (mm)

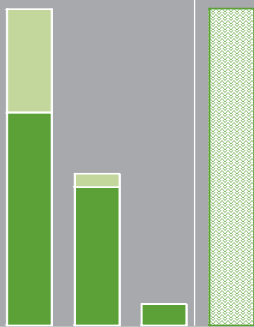
Month	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
2009 Rainfall	5.0												5.0
1968-2008 Average	43.9												43.9



WATER

TOWN WATER USE (ML)

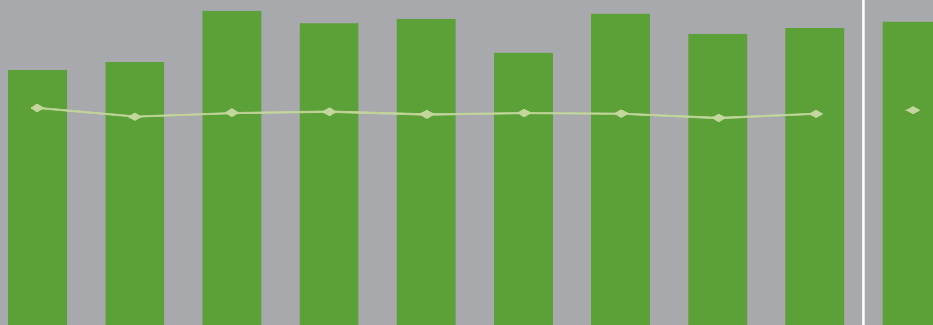
	2000	2008	2009	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Process	23.9	15.5	2.5	2.5											
Amenity	11.6	1.5	0.0	0.0											



AIR

GREENHOUSE GAS (GHG) TOTAL (Mt) & GHG EMISSION EFFICIENCY (t/MWh)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
GHG Mt	1.23	1.27	1.50	1.45	1.47	1.31	1.49	1.40	1.42	1.46
◆ GHG t/MWh	1.24	1.19	1.21	1.21	1.20	1.21	1.20	1.18	1.20	1.23



environmental improvement

Environmental Management Targets	January	2009 Total	Forecast	2009 Target
Reportable Environmental Incidents	0	0	0	0
Env Near Miss vs Env Incident Run Rate (ratio)	1	1	1	2.5
Monthly EHS ASAT Audit Completion (%)	100	100	100	90

Air Emission Targets	January	2009 Total	Forecast	2009 Target
Ambient SO ₂ (no. readings > 200ppb)	1	1	12	0
Stack SO ₂ (no. hrs > 100kg/min)	0	0	0	0
SO ₂ Load Reductions (lost MWh)	1467	1467	17608	N/A
GHG Efficiency (t CO ₂ e/MWh)	1.23	1.23	1.23	1.20
Opacity (10 min av > 0.25g/m ³ normal operation)	0	0	0	0

Water Targets	January	2009 Total	Forecast	2009 Target
Town Water (ML)	2.5	2.5	30	14.1
Bore Water (ML)	288	288	3456	4000

Waste Targets	January	2009 Total	Forecast	2009 Target
Waste to Landfill (t)	0.0	0.0	0.0	8.0
Solid Prescribed Waste to Landfill (t)	0.0	0.0	0.0	0.0

Mine Rehabilitation Targets	2009 Total	2009 Target
2009 Area to Clear (ha)	0.0	0.0
2009 Area to Rehabilitate (ha)	0.0	0.0

OUR ENVIRONMENT AND OUR EMPLOYEE

Julia, you have spent your summer holidays with us, what have you been up to? During my time here I have conducted an assessment of the invertebrate communities on the rehabilitation sites to determine whether the rehabilitation work has been successful thus far, and collect baseline data for long term monitoring. This has involved collecting invertebrates from the sites to identify back at the lab, and then performing statistical analysis to examine the differences between sites and the surrounding heathy woodland.

What interested you in doing vacation work with Alcoa? In my opinion it is very exciting that Alcoa invests time and money into environmental research and remediation, and I wanted to be part of that. Getting out of Melbourne and living on the coast was also a big drawcard.

What have you learnt during your time at Alcoa? Over these past few months I have developed skills and relevant experience in environmental research that will hopefully be useful for future employment.

What are your plans now? In light of the current global situation the kind of work I'm looking for may not be available, so it may be a good time to either do a PhD, start volunteering or go travelling.

...JULIA MCKENZIE

