ANGAS ZINC MINE

# Strathalbyn Region Rainwater Tanks

## 2008 Survey of Water Quality

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*Care Of Our Environment*

## EXECUTIVE SUMMARY

As a part of Terramin's environmental monitoring program they have given an undertaking to the community and PIRSA to conduct an annual rainwater tank - water quality survey to demonstrate that there is no significant fallout of lead bearing dust and that their rainwater tank has not accumulated potentially harmful levels of mine related metals. This is the third annual rainwater tank survey conducted.

The metals investigated were: arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), nickel (Ni) and zinc (Zn). In order to provide a better picture of water quality the following analysis were also made; nitrite/nitrate as N (NOx_N), Total Kjeldahl Nitrogen as N (TKN_N), total nitrogen as N (TN), total phosphorus as P (TP). The latter group of compounds are indicative of nutrients most likely arising from bird droppings on roofs or fertilizer spreading in the district.

Water from 40 rainwater tanks within a 4.5km radius of Angas Mine was sampled as well as 2 field duplicates for quality control; purposes. None of the EPA Schedule 2, Water Quality Criteria for Potable Water were exceeded during this 2008 survey.

Zinc levels were high in 15 samples and all but one was from zinc-alum or galvanised tanks or roofs. The sample that did not come from a zinc-alum or galvanised system was only just above the irrigation guideline of 2mg/L at 2.22mg/L and below the NH&MRC taste level of 3ppm.

There were no significant differences in metal levels between the survey years of 2006, 2007 and 2008. The only significant differences were for TKN_N and TN which are not considered indicative of mining activities.

All metal levels except for zinc were lower than the baseline levels recorded in 2006. Zinc showed a decrease from the levels recorded in 2007 and all other metals were either lower or at a very similar level to that recorded in 2007.

NOx_N and TN levels have decreased consistently over the survey period, TKN_N was below the detection limit in 2008, and TP is slightly higher than 2007 levels but less than the levels recorded in 2006.

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# 1 INTRODUCTION

## 1.1 BACKGROUND FOR THE SURVEY

Terramin Australia Limited operates the Angas Zinc Mine in Strathalbyn. The mill was commissioned at the end of July 2008, at the same time as this survey. Therefore ore processing is not likely to have influenced rainwater metal content in the region Up to the time of the survey.

In June 2006 as part of their MARP monitoring criteria, and its commitment to the community Terramin Australia Pty Ltd established an annual survey of rainwater tanks within a 4.5km radius of the Angas Zinc Mine. This survey is designed to demonstrate that no metal bearing dust is contaminating rainwater tanks in the area. This is done through establishing baseline metal levels present in the rainwater tanks in the area and conducting annual surveys to detect any changes to the baseline levels.

This report presents the findings of the third annual survey. Baseline levels have been determined prior to the mining of any zinc-lead bearing rock to which the results of this survey are compared.

Forty (40) Tanks were again sampled in July 2008. Samples BL50 and BL51 are duplicates of BL25 and BL18 respectively collected for quality control purposes.

## 1.2 BACKGROUND OF THE SURROUNDING AREA

Strathalbyn is a rural town in the eastern Mt Lofty ranges in the Angas River catchment. Agricultural is the main commercial enterprise in the Strathalbyn District, the main activities include wheat, sheep, cattle, pigs and poultry but wine making and olive production are rapidly becoming significant activities in the district.

Light industry is also prospering in Strathalbyn mostly in support of the rural industry but there is also a growing urban population moving into Strathalbyn. Tourism, flour-milling, and quarrying are also important enterprises. On the northern portion of the mining lease lays the district's sewage effluent treatment pond and a commercial landfill is located on the eastern boundary of the mine. These non-mining activities may also give rise to modest levels of dust and emissions that may affect rainwater tanks.

## 1.3 LIMITS OF THE SURVEY

This survey did not look at agricultural pesticides or micro-organisms therefore it does not provide a complete picture of water quality in rainwater tanks. Variability between sites may be attributable to other factors particularly the composition of the surface rainwater contacts, that is the roof and tank material.

# 2 METHODS

Sites were selected to represent the many different roof and tank construction materials within a 4.5 kilometre radius from the mine, these tanks were distributed relatively at random in all directions around the mine, and Figure 1 shows the original baseline sites. All sites were located with a GPS for mapping purposes.

The roof and tank materials were recorded to help interpret the results. The material composition of the catchment roof and tank are presented in Appendix A.

Taps were run for a few minutes to wash any salts that may have accumulated in the plumbing. Water samples were collected in separate specially prepared bottles as shown in Table 1 and sent express airfreight to ALSE laboratories (NATA certified) in Melbourne in ice coolers with ice-packs. The analytical laboratory provided pre-treated and labelled sample containers, eskies and ice packs to maintain the NATA standards for field sampling.

### Table 1: Container Types and Preservative

| ANALYTE | CONTAINERS PER SAMPLE | LABEL COLOUR |
|---|---|---|
| | WATER SAMPLES | |
| Sulphate, pH, TDS, EC, Turbidity | 1 x 500 mL un-preserved clear plastic bottle | Green |
| Total metals | 1 x 150 mL nitric acid preserved clear plastic bottle | Red |
| Total N, Total P | 1 x 250 mL sulphuric acid preserved clear plastic bottle | Purple |

All samples were received within the allocated time frame. All quality control measures met the quality criteria for this survey (Appendix B).

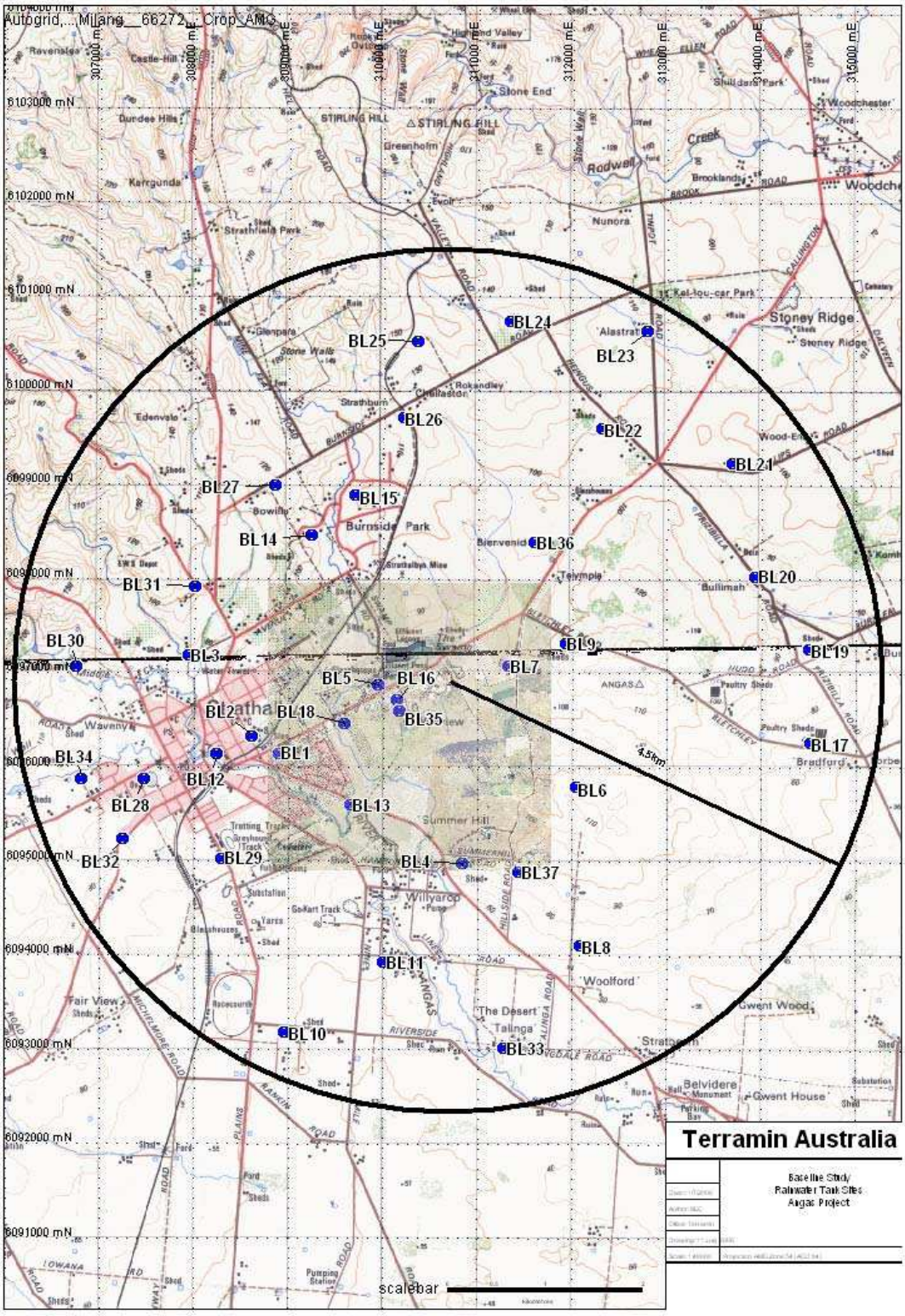


**Figure 1: Baseline soil sampling locations**

# 3 RESULTS DISCUSSION

The analytical results are presented in Appendix A. The levels of zinc recorded in the 2008 survey are not considered high for rainwater tanks in the area and are the same as baseline levels. However, according to the irrigation water quality guidelines zinc levels were high[1] in 15 of the 40 samples. Fourteen (14) of the tanks that tested high for zinc were either galvanised tanks or associated with galvanised or zinc alum roofs. The one tank that was not from a galvanised tank or galvanised or zinc alum roof was, at 2.22 mg/L just above the guideline of 2mg/L and below that guidelines associated with taste problems.

There were no exceedences of the Schedule 2, Water Quality Criteria for Potable Water (EPA- South Australia) and no detectable arsenic or total Kjeldahl nitrogen[2] (TKN_N) was found in any of the rainwater tanks sampled in 2008.

There is no statistically significant difference between any of the metals analysed in this survey and the levels found in previous years. Therefore it can be concluded that Angas Zinc mine is having no detectable impact on the quality of water in rainwater tanks within 4.5 km of the mine.

# 4 Conclusion

The rainwater tank, water quality sampling program demonstrates that mining activities at Terramin between 2006 and July 2008 have not affected rainwater tank water quality within 4.5 kilometres of the mine site.

[1] The NH&MRC 2004 drinking water quality guidelines state that above 3 ppm, Zn becomes a taste problem. Neither the SA nor NH&MRC guidelines give a health value.

[2] A method for measuring organic nitrogen and ammonia

## Appendix A: Analytical Results

| Date | Arsenic | Cadmium | Chromium | Copper | Lead | Nickel | Zinc | NOx_N | TKN_N | TN_N | TP_N | Tank | Roof |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Units | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | - | - |
| LOR * | 0.001 | 0.0001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.005 | 0.01 | 0.1 | 0.1 | 0.01 | - | - |
| | 0.007 | 0.002 | 0.05 | 2 | 0.01 | 0.02 | 2 | | | | | | |
| 21-Jul-08 | <0.001 | <0.0001 | <0.001 | 0.001 | <0.001 | <0.001 | 6.42 | 0.352 | <0.1 | 0.4 | 0.03 | Galv | Galv |
| 21-Jul-08 | <0.001 | <0.0001 | <0.001 | 0.022 | <0.001 | <0.001 | 5.97 | 0.738 | <0.1 | 0.7 | 0.03 | Galv | Galv |
| 21-Jul-08 | <0.001 | <0.0001 | <0.001 | <0.001 | 0.001 | <0.001 | 0.19 | 0.316 | <0.1 | 0.3 | 0.03 | Brick | Galv |
| 21-Jul-08 | <0.001 | <0.0001 | <0.001 | 0.024 | <0.001 | <0.001 | 2.22 | 0.29 | <0.1 | 0.3 | 0.02 | Concrete | Tiled |
| 23-Jul-08 | <0.001 | <0.0001 | <0.001 | 0.029 | <0.001 | <0.001 | 0.596 | 0.384 | <0.1 | 0.4 | 0.05 | Poly | Zinc Al |
| 21-Jul-08 | <0.001 | 0.001 | <0.001 | 0.004 | <0.001 | <0.001 | 0.4 | 0.918 | <0.1 | 0.9 | 0.06 | Poly | Galv |
| 21-Jul-08 | <0.001 | <0.0001 | 0.014 | 0.008 | <0.001 | <0.001 | 0.93 | 0.35 | <0.1 | 0.4 | 0.01 | Concrete | Zinc Al |
| 21-Jul-08 | <0.001 | <0.0001 | <0.001 | 0.001 | <0.001 | <0.001 | 5.56 | 0.869 | <0.1 | 0.9 | 0.05 | Galv | Galv |
| 21-Jul-08 | <0.001 | 0.001 | <0.001 | 0.001 | 0.001 | <0.001 | 5.03 | 0.55 | <0.1 | 0.6 | 0.02 | Galv | Tiled |
| 22-Jul-08 | <0.001 | 0.0001 | 0.018 | 0.018 | <0.001 | <0.001 | 0.074 | 0.525 | <0.1 | 0.5 | 0.04 | F/glass | Zinc Al |
| 22-Jul-08 | <0.001 | 0.0001 | <0.001 | 0.009 | 0.001 | <0.001 | 3.94 | 0.325 | <0.1 | 0.3 | 0.01 | Galv | Galv |
| 23-Jul-08 | <0.001 | 0.0002 | <0.001 | **0.109** | 0.006 | <0.001 | 1.19 | 0.126 | <0.1 | 0.1 | <0.02 | Concrete | Galv |
| 23-Jul-08 | <0.001 | 0.0003 | <0.001 | 0.004 | <0.001 | <0.001 | 0.46 | 0.766 | <0.1 | 0.8 | 0.11 | F/glass | Zinc Al |
| 23-Jul-08 | <0.001 | <0.0001 | <0.001 | <0.001 | <0.001 | <0.001 | **7.99** | <0.010 | <0.1 | <0.1 | 0.11 | Concrete | Zinc Al |
| 23-Jul-08 | <0.001 | <0.0001 | <0.001 | 0.002 | <0.001 | <0.001 | 0.856 | 0.321 | <0.1 | 0.3 | 0.03 | Poly | Galv |
| 22-Jul-08 | <0.001 | <0.0001 | **0.022** | <0.001 | <0.001 | <0.001 | 0.024 | 0.914 | <0.1 | 0.9 | 0.07 | Concrete | Zinc Al |
| 22-Jul-08 | <0.001 | 0.0001 | <0.001 | <0.001 | <0.001 | <0.001 | 7.13 | 1.32 | <0.1 | 1.3 | 0.07 | Galv | Galv |
| 23-Jul-08 | <0.001 | 0.0003 | <0.001 | 0.054 | <0.001 | <0.001 | 0.024 | 0.447 | <0.1 | 0.4 | 0.04 | Poly | Zinc Al |
| 22-Jul-08 | <0.001 | <0.0001 | <0.001 | <0.001 | <0.001 | <0.001 | 5.35 | 0.742 | <0.1 | 0.7 | <0.01 | Zinc Al | Zinc Al |
| 22-Jul-08 | <0.001 | 0.0004 | <0.001 | 0.001 | **0.01** | <0.001 | 4.11 | 1.15 | <0.1 | 1.1 | 0.14 | Zinc Al | Zinc Al |
| 22-Jul-08 | <0.001 | <0.0001 | <0.001 | 0.003 | <0.001 | <0.001 | 0.296 | 0.596 | <0.1 | 0.6 | 0.04 | Poly | Zinc Al |
| 22-Jul-08 | <0.001 | <0.0001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.863 | 0.099 | <0.1 | <0.1 | <0.01 | Galv | Zinc Al |
| 23-Jul-08 | <0.001 | <0.0001 | <0.001 | 0.004 | <0.001 | <0.001 | 0.252 | 1.01 | <0.1 | 1 | 0.09 | Poly | Zinc Al |
| 23-Jul-08 | <0.001 | **0.0011** | <0.001 | 0.001 | <0.001 | <0.001 | 0.428 | 0.284 | <0.1 | 0.3 | 0.09 | F/glass | Zinc Al |
| 23-Jul-08 | <0.001 | <0.0001 | <0.001 | 0.022 | 0.003 | <0.001 | 0.041 | 0.566 | <0.1 | 0.6 | 0.13 | Poly | Tiled |

## Rainwater Tank Water Quality Survey 2008

| Date | Arsenic | Cadmium | Chromium | Copper | Lead | Nickel | Zinc | NOx_N | TKN_N | TN_N | TP_N | Tank | Roof |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23-Jul-08 | <0.001 | 0.0001 | <0.001 | <0.001 | <0.001 | <0.001 | 6.87 | 0.424 | <0.1 | 0.4 | <0.02 | Galv | Galv |
| 23-Jul-08 | <0.001 | <0.0001 | <0.001 | 0.003 | 0.002 | <0.001 | 1.05 | 0.264 | <0.1 | 0.3 | <0.02 | Galv | Tiled |
| 23-Jul-08 | <0.001 | <0.0001 | <0.001 | 0.001 | <0.001 | <0.001 | 2.49 | 0.225 | <0.1 | 0.2 | <0.02 | Galv | Galv |
| 22-Jul-08 | <0.001 | 0.0001 | <0.001 | 0.003 | <0.001 | <0.001 | 0.119 | 0.796 | <0.1 | 0.8 | 0.03 | Poly | Zinc Al |
| 23-Jul-08 | <0.001 | 0.0001 | <0.001 | <0.001 | 0.004 | <0.001 | 4.43 | 0.152 | <0.1 | 0.2 | <0.02 | Galv | Galv |
| 21-Jul-08 | <0.001 | <0.0001 | <0.001 | <0.001 | <0.001 | <0.001 | 2.86 | 0.228 | <0.1 | 0.2 | <0.01 | Galv | P/Tiled |
| 22-Jul-08 | <0.001 | <0.0001 | <0.001 | 0.003 | <0.001 | 0.001 | 1.47 | **3.13** | <0.1 | **3.1** | **5.62** | Galv | Galv |
| 21-Jul-08 | <0.001 | <0.0001 | 0.01 | 0.107 | <0.001 | <0.001 | 0.058 | 0.682 | <0.1 | 0.7 | 0.04 | Concrete | Zinc Al |
| 23-Jul-08 | <0.001 | <0.0001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.026 | 0.341 | <0.1 | 0.3 | 0.04 | Poly | Zinc Al |
| 22-Jul-08 | <0.001 | 0.0001 | <0.001 | 0.006 | 0.002 | <0.001 | 0.271 | 0.705 | <0.1 | 0.7 | 0.02 | F/glass | Tiled |
| 23-Jul-08 | <0.001 | <0.0001 | <0.001 | 0.002 | <0.001 | <0.001 | 0.15 | 0.577 | <0.1 | 0.6 | 0.04 | Poly | Zinc Al |
| 21-Jul-08 | <0.001 | <0.0001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.052 | 0.674 | <0.1 | 0.7 | 0.04 | Poly | Zinc Al |
| 21-Jul-08 | <0.001 | <0.0001 | <0.001 | 0.025 | <0.001 | <0.001 | 0.897 | 0.316 | <0.1 | 0.3 | 0.01 | Galv | Zinc Al |
| 23-Jul-08 | <0.001 | 0.0001 | <0.001 | 0.007 | <0.001 | **0.002** | 1.26 | 0.722 | <0.1 | 0.7 | 0.03 | Galv | Galv |
| 23-Jul-08 | <0.001 | <0.0001 | <0.001 | <0.001 | <0.001 | <0.001 | 2.23 | 0.112 | <0.1 | 0.1 | 0.03 | Galv | |
| 23-Jul-08 | <0.001 | 0.0001 | <0.001 | 0.024 | 0.004 | <0.001 | 0.048 | 0.58 | <0.1 | 0.6 | 0.1 | Poly | Tiled |
| 23-Jul-08 | <0.001 | 0.0001 | <0.001 | 0.053 | <0.001 | <0.001 | 0.024 | 0.441 | <0.1 | 0.4 | 0.04 | Poly | Zinc Al |

All site labels have been removed at the request of the Strathalbyn Community Consultation Committee, property owners can obtain their individual data upon request from Angas Zinc Mine, Environment Department

* The limits of reporting (LOR's) are for samples that exhibit minimal matrix interference. Maximum recorded value for each element is highlighted in bold font, and values that exceed irrigation water quality guidelines are highlighted in lime green.

** Schedule 2 – SA EPW Water quality: pink = SA Potable criteria, lime green = irrigation water criteria. Note, there are no potable water criteria for zinc, NOx_N, TKN_N TN, and TP. There are criteria for nitrite and nitrate, which are 1 and 10 ppm respectively.

## Appendix B: Quality Assurance

| Substance | Site 1 | Rep S1 | RPD | Site 2 | Rep S2 | RPD |
|---|---|---|---|---|---|---|
| Arsenic | 0.001 | 0.001 | <3x | 0.001 | 0.001 | <3x |
| Cadmium | 0.0001 | 0.0001 | <3x | 0.0003 | 0.0001 | <3x |
| Chromium | 0.001 | 0.001 | <3x | 0.001 | 0.001 | <3x |
| Copper | 0.022 | 0.024 | -8.7 | 0.054 | 0.053 | 1.9 |
| Lead | 0.003 | 0.004 | -28.6 | 0.001 | 0.001 | <3x |
| Nickel | 0.001 | 0.001 | <3x | 0.001 | 0.001 | <3x |
| Zinc | 0.041 | 0.048 | -15.7 | 0.024 | 0.024 | 0 |
| Nitrite.Nitrate as N | 0.566 | 0.58 | -2.4 | 0.447 | 0.441 | 1.4 |
| Total Kjeldahl Nitrogen as N | 0.1 | 0.1 | <3x | 0.1 | 0.1 | <3x |
| Total Nitrogen as N | 0.6 | 0.6 | 0 | 0.4 | 0.4 | 0 |
| Total Phosphorus as P | 0.13 | 0.1 | 26.1 | 0.04 | 0.04 | 0 |

Values highlighted in blue were below the detection limit and have been assigned the value of the detection limit. Bracketed site names are dummy names for the site duplicates. Quality control criteria are set at 30-50% RPD or <3x the detection limit, all the results meet this criteria.