Costerfield Mine

Updated Public Information Briefing

Presented By
Andrew Helps

Prepared by:
Andrew Helps MD, Hg Recoveries Pty Ltd &
Ian Brown TD, Hg Recoveries Pty Ltd

Hg Recoveries Pty Ltd: A UNEP Global Mercury Partnership member.

Key Issues

- The Golder Report (in general)
- The Golder Report Data
- Risk Matrix Development
- Further testing (by Residents)
- Animal testing
- VCAT appeals
- The Mine's PR
- The Government PR

Summation

- The animal testing data proves that there are four toxic metals impacting the health of air breathing mammals in the Costerfield area.
- The Golder report only covered one of the four toxic metals in a peripheral manner and thus the advice issued by DOH, DSDBI and Mandalay is flawed and needs to be urgently retracted.

Summation (2)

- There are serious public and environmental health issues in the Costerfield area and the Chief Health Officer needs to apologise to the community for the publication of the erroneous advice in the Golder report.
- The Government must abandon its “whole of government approach” to this issue and start addressing the real health risks in this area as a matter of considerable urgency.

Golder Report - Synopsis

- This report was deeply flawed from the moment it was conceived; the Consultant was hired by the Mining Regulator (DSDBI) who has failed to regulate this mine.
- This report does nothing to inform the community of the risks it faces from the short and long term exposure impacts to antimony, arsenic, other heavy metals and silica in sub-micron dust particles emitted by this mine into the Costerfield-Heathcote environment.

Golder Report - Synopsis

- Test data was reported in milligrams/L for water (PPM).
- Water Standards are reported in micrograms/L (PPB)
- Antimony has an Australian Drinking Water Guideline (ADWGL) level of 3 ug/L (3PPB) and Arsenic has and ADWGL of 10 ug/L (10PPB).
- Was this an attempt to make the water levels appear insignificant?
- To make it easy for the scientifically uniformed reader why not report in PPB across the whole spectrum of tests?

Golder Report

- This is the technology used by Golder to measure dust particles.
- This technology is not compliant with the requirements of the SEPP 1191 – Mining and Extractive Industries
- For an extra $800 Golder could have also installed a wind speed and direction monitor. However, for some unfathomable reason, Golder chose not to determine this crucial information.

Golder Report

- The small flat box on the right is a “dust track” instrument which is very unreliable if not calibrated appropriately; there is no evidence that Golder carried out this twice daily calibration.
- Why did Golder use this instrument which can produce unreliable data and which cannot monitor wind speed and direction?
- Why did the Health Department then rely on this data to provide health advice to the Costerfield residents?

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AIR QUALITY
MONITORING
STATION

The Previous Slide

- The previous slide shows the air monitoring equipment required by the Mining SEPP.

- Despite misting sprays apparently being shut down by DSDBI, there is no monitoring of the water vapour or the metals in this vapour from the ventilation shaft.

Water Vapour?

Golder Report - Key Flaws

- DSDBI's chosen consultant endorses the Department of Health's continued use of the much outdated WHO 2003 maximum concentration of 6 micrograms/kg (ug/kg) Body Weight for Total Daily Intake (TDI) of a man made compound of antimony which does not occur in this ore body.

Golder Report - Key Flaws

- The latest and most up to date data from USEPA and Health Canada issued early this year by these internationally recognised leaders in toxicology that should have been used for antimony is 0.4ug/kg/day as a TDI; a concentration **15 times smaller** than the level DOH has used to inform the community and their doctors, in a press release dated 15th of May 2014.

Another Flaw

- Golder collected 43 water samples – only from Tanks and Taps.
- No attempt to test dam water
- No attempt to test the creeks downstream from the mine
- Why did Golder exclude determining such crucial environmental impacts assessment information?

Golder Report - Key Flaws

- Golder and DOH have obviously failed to read the WHO document (WHO/SDE/WSH/03.04/74 – 2003 revision) on which they base their "*safe*" antimony ingestion recommendations.

- *This same WHO document (Page 10, last paragraph) states; "the possibility of co-exposure of consumers to arsenic and antimony in drinking water would necessitate an assessment of the local geological conditions on a case-by-case basis. If both elements were found to be present, case specific risk evaluations for possible additivity and synergistic effects would need to be performed"*.
- How did Golder miss this crucial WHO statement?

New York DOH

- New York DOH uses this interpretive statement:

- *"Urinary antimony levels predominately reflect chronic exposure. Urine concentrations in unexposed individuals rarely exceed 1 ug/L and urinary antimony levels in excess of 10 ug/L are indicative of significant & potentially toxic antimony exposure"*

Golder Report - Key Flaws

- Golders own data indicates the presence of Arsenic in 5 tanks.
- The residents data indicates Arsenic in a number of tanks and also Cadmium.
- Why did Golder fail to recommend to the DOH further work on potential additivity/synergistic impacts?
- Why did Golder fail to mention the presence of other metals in drinking water tanks and the need for further work to be done to quantify these other metals?

Basic Documents

- Golder has made no attempt to develop a mine risk matrix to inform their work or to carry out the basic task of developing a cumulative effects flow chart for the mine's current operations.

Risk Matrix

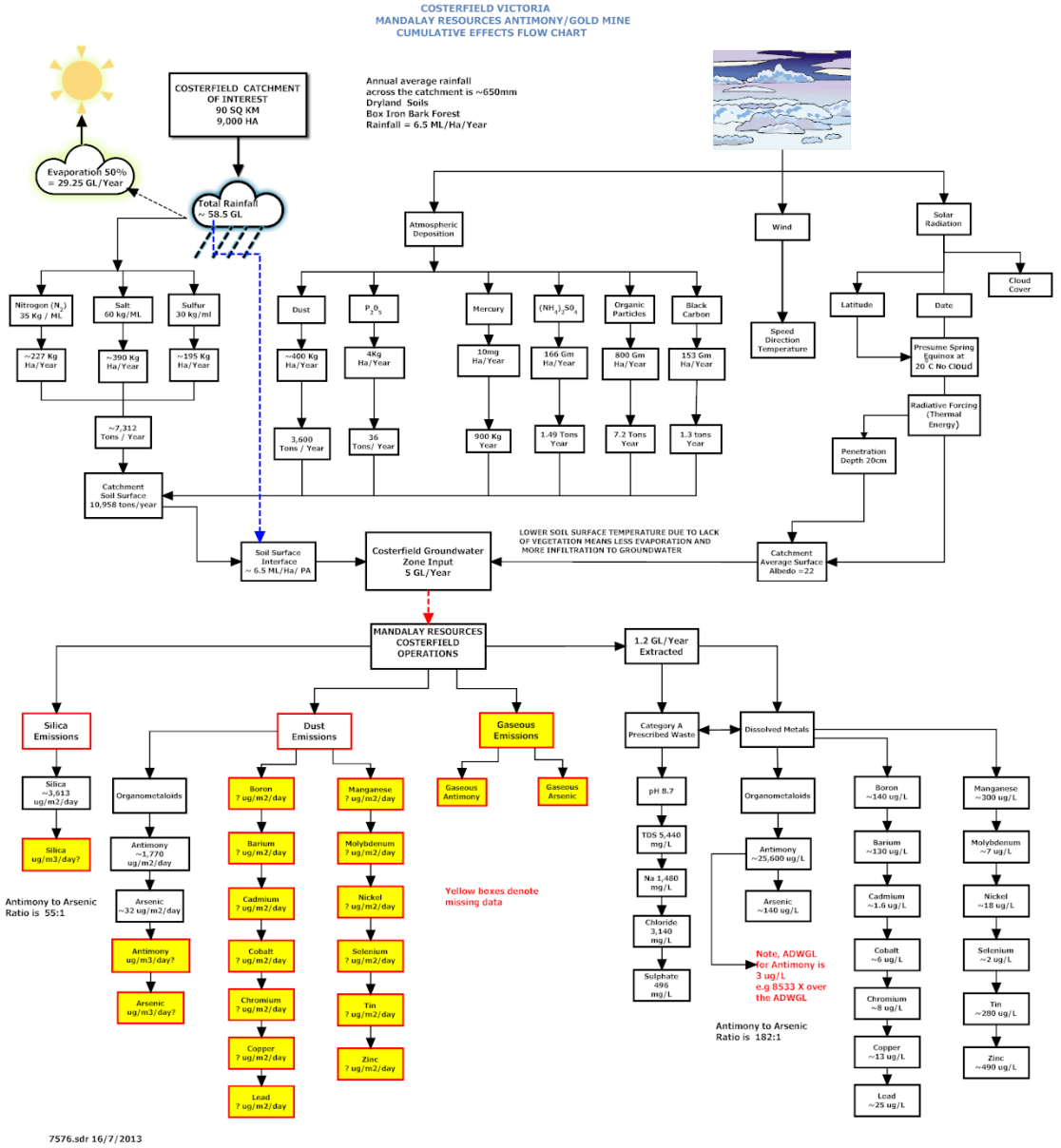
- Development of a risk matrix is the **first** task in this type of public and environmental health risk assessment – it informs all the work going forward. Golder has either failed to develop a risk matrix or if one has been compiled, Golder does not want to show it to the community for very obvious reasons.

Basic Documents

- In the case of Antimony Mines, there are well established processes that are carried out to identify all the risks posed by the Antimony mine:
  - 1. Site Discovery and Hazard Ranking (HRS);
  - 2. Remedial Investigation Feasibility study (RIFS);
  - 3. Human Health Environmental Risk Assessment (HHERA);
  - 4. Hazard Index Development (HI) for the Mine

Cumulative Effects

- Following on from the development of the previous documents, it is normal for a cumulative effects flow chart to be developed that identifies all the inputs and out puts of the polluting mine.
- This flow chart identifies all the known data in relation to the mine pollution and also highlights the issues that need to be investigated in required further studies


COSTERFIELD VICTORIA
MANDALAY RESOURCES ANTIMONY/GOLD MINE
CUMULATIVE EFFECTS FLOW CHART
COSTERFIELD CATCHMENT OF INTEREST 90 SQ KM 9,000 HA
Annual average rainfall across the catchment is ~650mm
Dryland Soils
Box Iron Bark Forest
Rainfall = 6.5 ML/Ha/Year
Evaporation 50% = 29.25 GL/Year
Total Rainfall ~ 58.5 GL
Atmospheric Deposition
Wind
Solar Radiation
Cloud Cover
Nitrogen (N_2) 35 Kg / ML
Salt 60 kg/ML
Sulfur 30 kg/ml
~227 Kg Ha/Year
~390 Kg Ha/Year
~195 Kg Ha/Year
~7,312 Tons / Year
Dust
P_2O_5
Mercury
$(NH_4)_2SO_4$
Organic Particles
Black Carbon
~400 Kg Ha/Year
4Kg Ha/Year
10mg Ha/Year
166 Gm Ha/Year
800 Gm Ha/Year
153 Gm Ha/Year
3,600 Tons / Year
36 Tons/ Year
900 Kg Year
1.49 Tons Year
7.2 Tons Year
1.3 tons Year
Speed Direction Temperature
Latitude
Date
Presume Spring Equinox at 20 C No Cloud
Radiative Forcing (Thermal Energy)
Penetration Depth 20cm
Catchment Soil Surface 10,958 tons/year
Soil Surface Interface ~ 6.5 ML/Ha/ PA
Costerfield Groundwater Zone Input 5 GL/Year
LOWER SOIL SURFACE TEMPERATURE DUE TO LACK OF VEGETATION MEANS LESS EVAPORATION AND MORE INFILTRATION TO GROUNDWATER
Catchment Average Surface Albedo =22
MANDALAY RESOURCES COSTERFIELD OPERATIONS
1.2 GL/Year Extracted
Silica Emissions
Dust Emissions
Gaseous Emissions
Category A Prescribed Waste
Dissolved Metals
Silica ~3,613 ug/m2/day
Silica ug/m3/day?
Antimony to Arsenic Ratio is 55:1
Organometaloids
Antimony ~1,770 ug/m2/day
Arsenic ~32 ug/m2/day
Antimony ug/m3/day?
Arsenic ug/m3/day?
Boron ? ug/m2/day
Barium ? ug/m2/day
Cadmium ? ug/m2/day
Cobalt ? ug/m2/day
Chromium ? ug/m2/day
Copper ? ug/m2/day
Lead ? ug/m2/day
Manganese ? ug/m2/day
Molybdenum ? ug/m2/day
Nickel ? ug/m2/day
Selenium ? ug/m2/day
Tin ? ug/m2/day
Zinc ? ug/m2/day
Gaseous Antimony
Gaseous Arsenic
Yellow boxes denote missing data
pH 8.7
TDS 5,440 mg/L
Na 1,480 mg/L
Chloride 3,140 mg/L
Sulphate 496 mg/L
Organometaloids
Antimony ~25,600 ug/L
Arsenic ~140 ug/L
Note, ADWGL for Antimony is 3 ug/L e.g 8533 X over the ADWGL
Antimony to Arsenic Ratio is 182:1
Boron ~140 ug/L
Barium ~130 ug/L
Cadmium ~1.6 ug/L
Cobalt ~6 ug/L
Chromium ~8 ug/L
Copper ~13 ug/L
Lead ~25 ug/L
Manganese ~300 ug/L
Molybdenum ~7 ug/L
Nickel ~18 ug/L
Selenium ~2 ug/L
Tin ~280 ug/L
Zinc ~490 ug/L
7576.sdr 16/7/2013

Golder Testing

- For some unexplained reason, Golder chose to test for only 8 metals in their water testing.
- A standard lab test includes 17 metals for both water and soil tests at no additional cost.
- Why would a supposedly competent consultant working in a toxic metal mining area not test for the other 9 crucial metals, including Cobalt, Chromium, Mercury, Manganese, Tin, Boron and Barium which are all known to be present in this area as already identified in residents testing?

Golder Testing

- For the same unexplained reasons, Golder chose only to test the soils for 5 metals?
- Golder never approached Mr Harris to seek access to the data that had been gained from the extensive testing that Mr Harris had instigated.
- Why would a company such as Golder fail to utilise this data?

Antimony Mines

- There are well established processes for estimating human exposure from Antimony mine pollution
- It is of grave concern that in this case the consultant obviously has no experience of these processes.
- The critical issue is to establish the extent of toxic metal pollution of the mammals in the area of the mine (usually regarded as a 50km radius)

The Other Residents

Indicator Species

- Costerfield is a farming area and the most common mammal in this area is Sheep.
- In China, the common indicator species in the vicinity of antimony mines is Goat.
- Sheep have a well understood physiology – the amount of air they breathe at any given age is known, they graze at ground level which is important because both Antimony and Arsenic in their gaseous forms are much heavier than air.

Indicator Species

- Any consultant experienced in toxic metal impacts from Antimony mines would have focussed on obtaining tissue samples from lambs of known age at Costerfield.
- This data from the indicator species would have provided the hard data to inform the public health advice
- The DSDBI chosen consultant did not do this.
- Interestingly, and shamefully for Golder, the Costerfield residents have obtained this data!

Indicator Species

- 3 x 8 month old lambs were selected at random from 3 sites – 2 close to the mine crusher and 1 animal 4.5 km from the crusher and in a location that is sheltered from the prevailing winds blowing over both the mine crusher and the mine vent pipe.

Indicator Species Data

- Testing was carried out by the Australian Government National Measurement Institute (NMI)
- 45 kg live weight animals
- 5 samples from each lamb were tested:
  - Loin Muscle;
  - Liver;
  - Lung;
  - Kidney;
  - Heart.

Minimal Risk Levels (MRL's)

- The Human Minimal Risk Levels for the 4 toxic metals in these samples are:
  - Antimony 0.4ug/kg/day - Oral
  - Arsenic 0.3 ug/kg/day - Chronic Oral
  - Cadmium 0.01ug/m^3 - Renal
    0.1ug/kg/day Chronic Oral
  - Lead 4.6 ug/kg/day
    2.5 ug/m^3

Indicator Species Data #1

Lamb - 4.5 km from Mine Crusher - All ug/kg				
Organ	Antimony	Arsenic	Cadmium	Lead
Muscle	**42**	<10	<10	<10
Liver	**60**	<10	**240**	**20**
Lung	**11**	**14**	<10	<10
Kidney	**29**	<10	**260**	**26**
Heart	**25**	<10	<10	<10

Indicator Species Data #1

- Antimony and Arsenic are clearly being inhaled, e.g., it must be airborne contamination either dust or gaseous forms – the dam on this property is below the ADWGL.
- Only Antimony is accumulating in the muscle
- Antimony, Cadmium and Lead levels in the Liver and Kidney indicate a pathway from grass probably by ingestion of dust on the grass
- Antimony is accumulating in the heart muscle which may be an indicator for humans in the area

Indicator Species Data #2

Lamb - Free Range 500 meters from Crusher				
Organ	Antimony	Arsenic	Cadmium	Lead
Muscle	**42**	<10	<10	<10
Liver	**150**	**18**	**100**	**19**
Lung	**29**	**23**	**12**	<10
Kidney	**81**	<10	**210**	**17**
Heart	**22**	<10	<10	<10

Indicator Species Data #2

- Antimony, Arsenic and Cadmium are clearly being inhaled, e.g., it must be airborne contamination.
- Only Antimony is accumulating in the muscle
- Antimony, Arsenic, Cadmium and Lead levels in the Liver and Kidney indicate a pathway from grass, probably by ingestion of dust on grass
- Antimony is accumulating in the heart muscle which may be an indicator for humans in the area

Indicator Species Data # 3

Lamb - Feedlot 500m from Crusher				
Organ	Antimony	Arsenic	Cadmium	Lead
Muscle	**17**	**15**	<10	<10
Liver	**22**	**16**	**55**	<10
Lung	<10	<10	<10	<10
Kidney	<10	**30**	**45**	<10
Heart	<10	**30**	<10	<10

Indicator Species Data # 3

- The lambs from this location are being fed pellets and have no access to local grasses
- Antimony and Arsenic is accumulating in muscle tissue
- Antimony, Arsenic and Cadmium are accumulating in the Liver indicating an inhalation pathway for dust and toxic gases in addition to ingestion
- Arsenic and Cadmium are accumulating in the Kidneys – Antimony may be accumulating below the PQL
- Arsenic is accumulating in the heart which is at odds with the grass fed animals. Again, there is only an inhalation pathway for this to happen and in this case it is likely to be a gaseous pathway

Minister Northe

- In a letter dated 23/7/14 Minister Northe MP states **“The independent consultant, Golder Associates, has specialist toxicology tertiary and post tertiary qualifications and has extensively practiced, applying recognised scientific methodologies.”**
- **The serious omissions and failure to follow internationally accepted investigative environmental methodology which are present in the Golder Report severely questions the validity of this statement!**

Toxic Metals

- The residents would be within their rights to ask why this politically lauded consultant failed to carry out such basic testing to identify the toxic metals accumulating through the sheep in the Costerfield area.
- **Now the State Government is proposing to give this consultant yet more work at Costerfield**
- To reinforce this point, the following four slides set out the key toxicological traits of the four toxic metals in the Costerfield sheep

Antimony

- **IARC class 2B Carcinogen (probably a human carcinogen)**
- Chronic poisoning
- Functional disorders of the heart
- Degeneration of the heart muscles

Arsenic

- **IARC Group 1 Carcinogen**
- Cancer (Lung Lymphatic)
- Liver effects (cirrhosis, hepatitis)
- Acute toxicity, including respiratory and gastrointestinal effects
- Nervous system effects
- Skin, eye, mucous membrane and respiratory irritation; skin sensitisation; contact dermatitis; keratosis

Cadmium

- **IARC Group 1 Carcinogen**
- Increased risk of Lung and Prostrate Cancer;
- Kidney damage;
- Acute pulmonary edema;
- Mild irritation of the upper respiratory tract, a sensation of throat constriction, a metallic taste and /or cough;
- Asphyxia

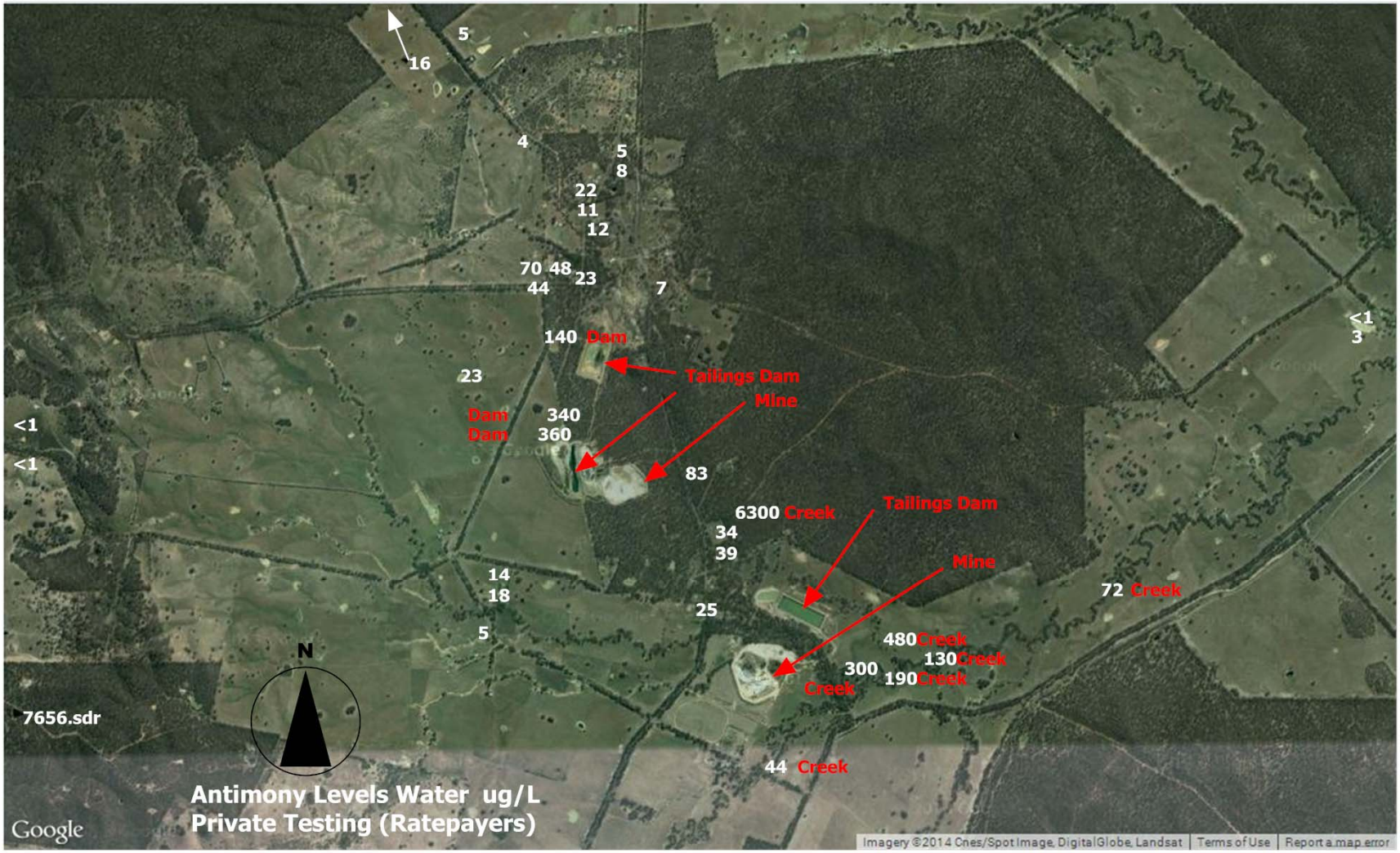
Lead

- **IARC class 2B carcinogen probably human carcinogen**
- Nephrotoxicity
- Reproductive Hazard
- Cumulative neurologic effects
- Cumulative blood effects

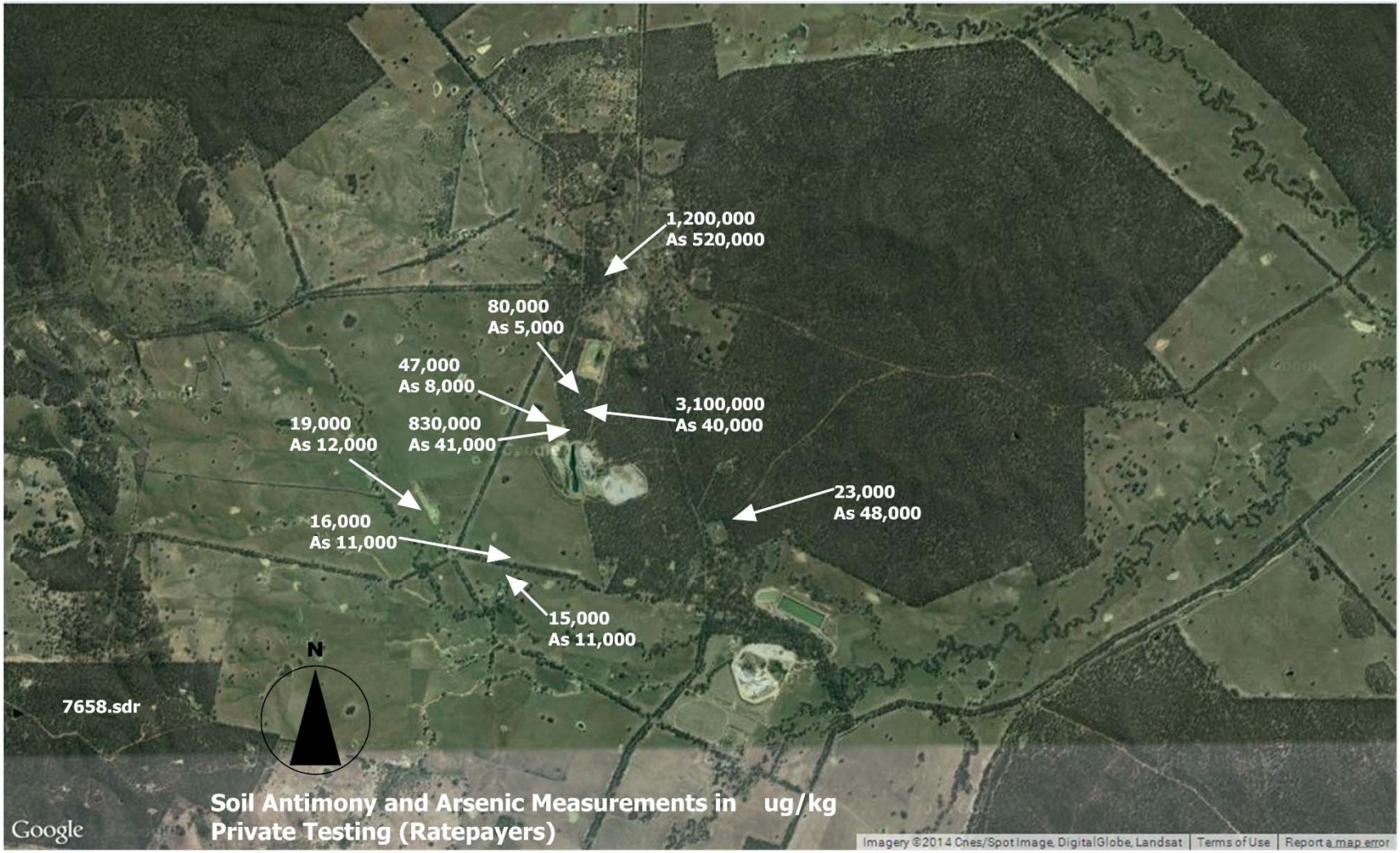
Water Testing

- The following slide shows the water test results for the residents samples.
- Golder's water test data is coded so its location cannot be identified.
- Further, Golder did not test any of the waterways. Which is one more highly crucial exclusion in their investigation and an impartial observer "has to wonder why this was so"?

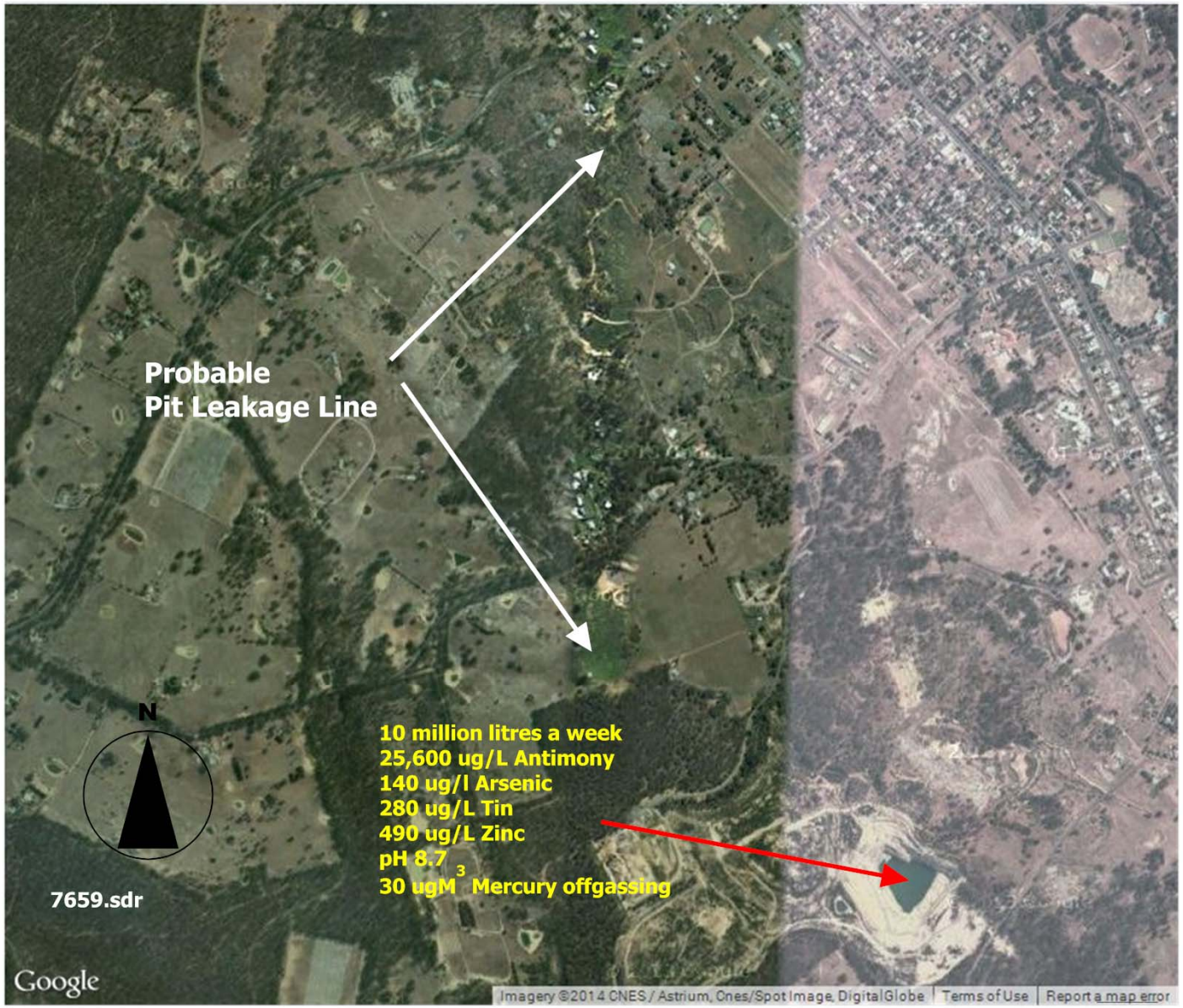
Tank/Dam and Creek Data



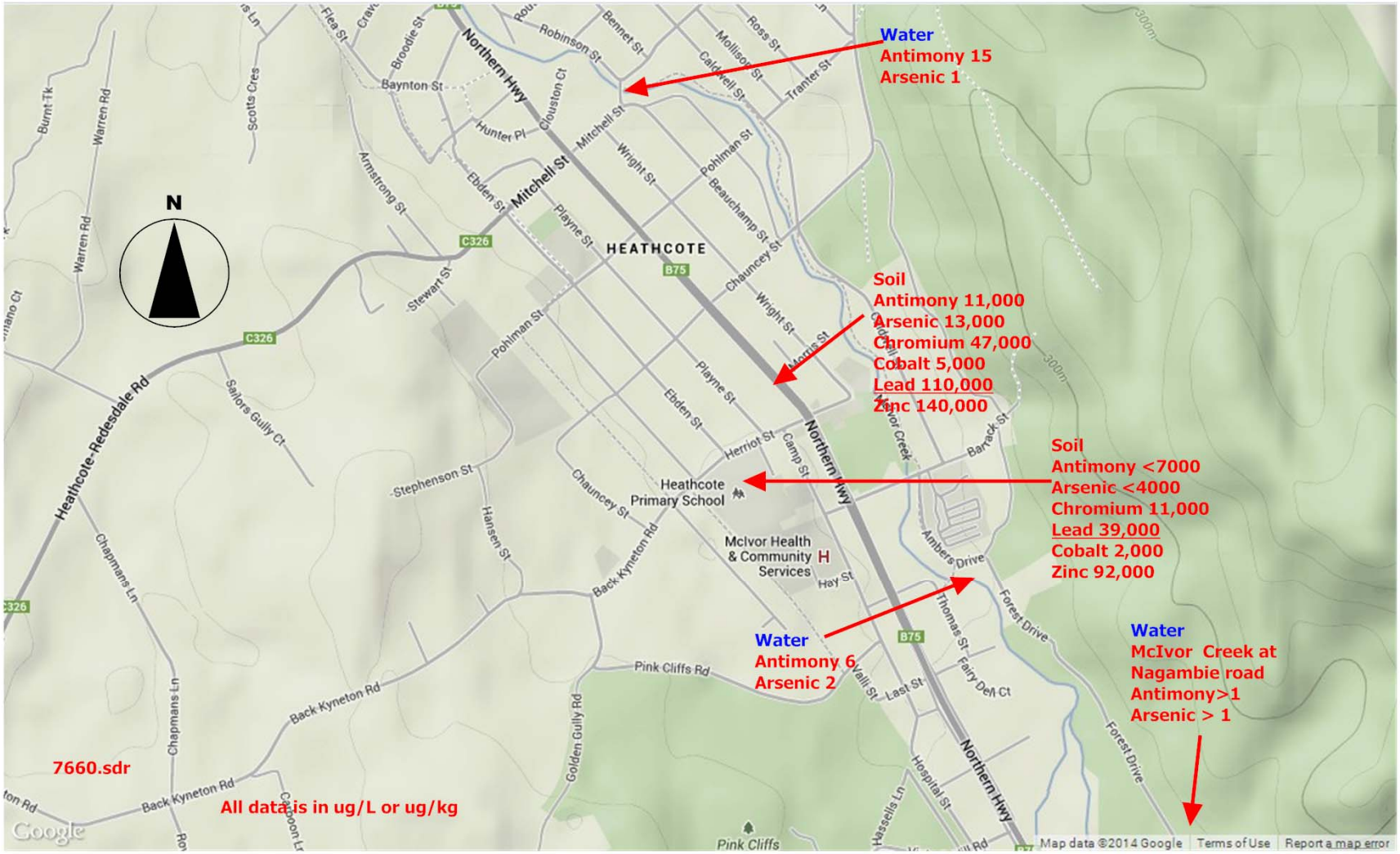
Soil Testing



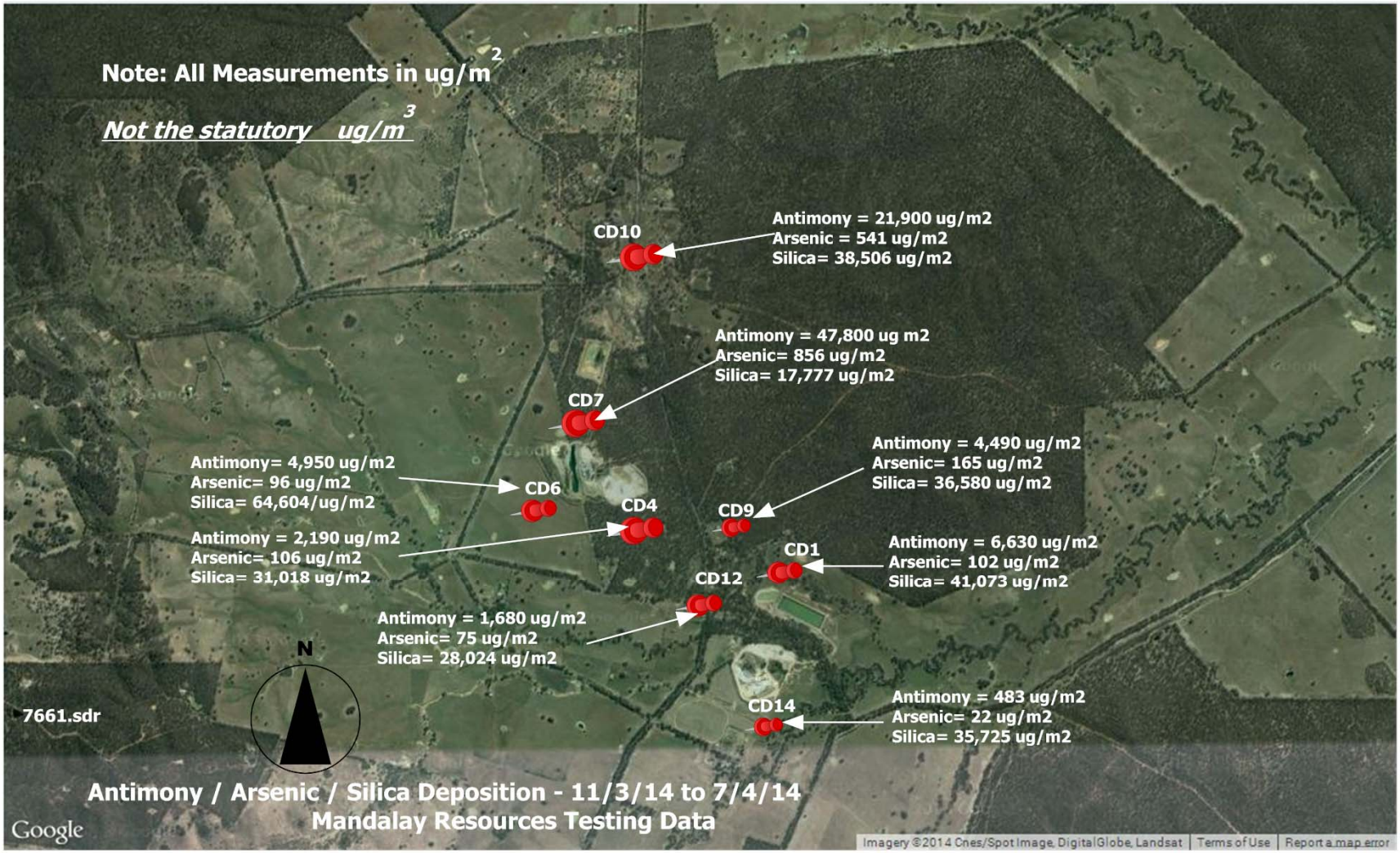
Heathcote Impacts



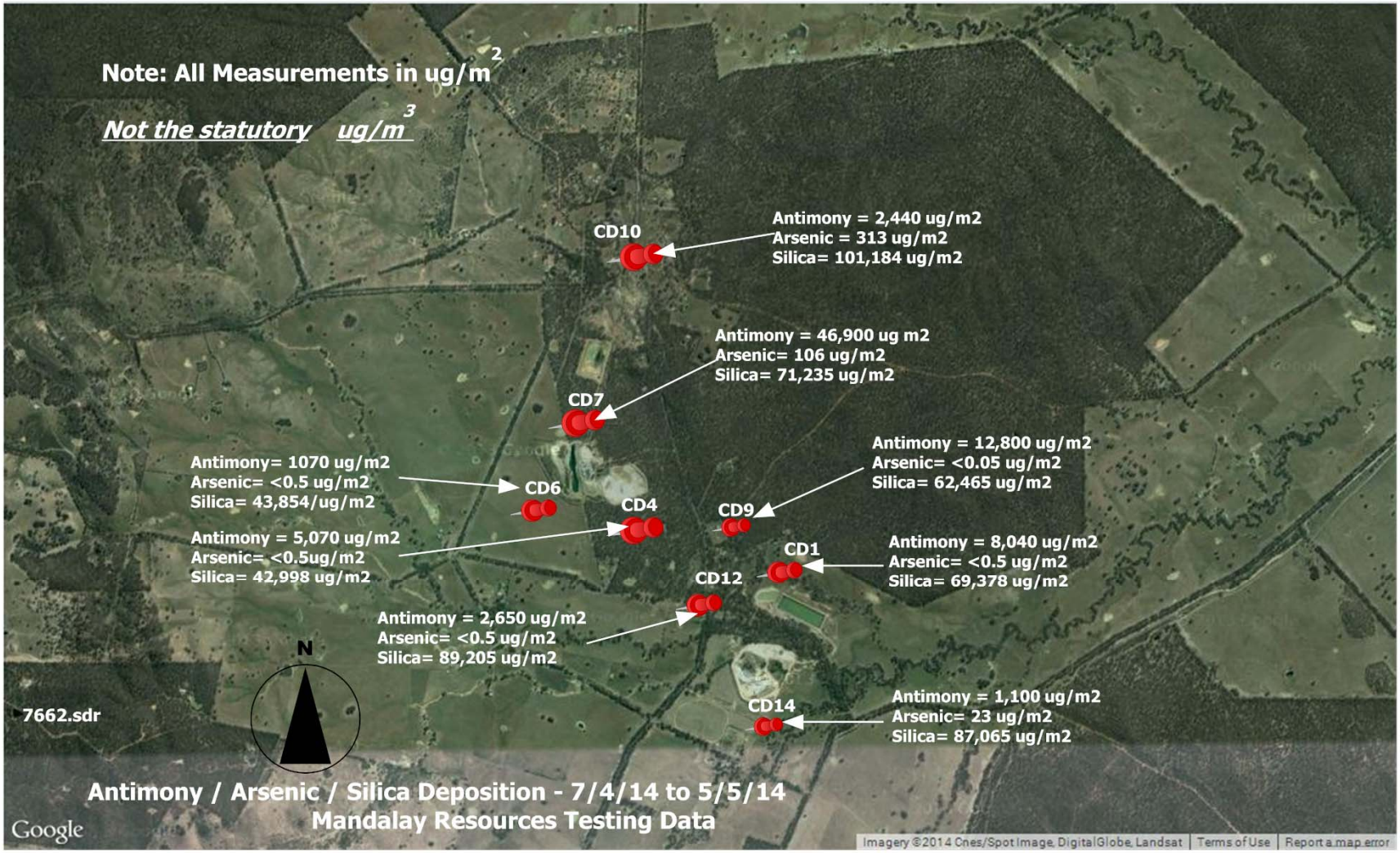
Heathcote Township



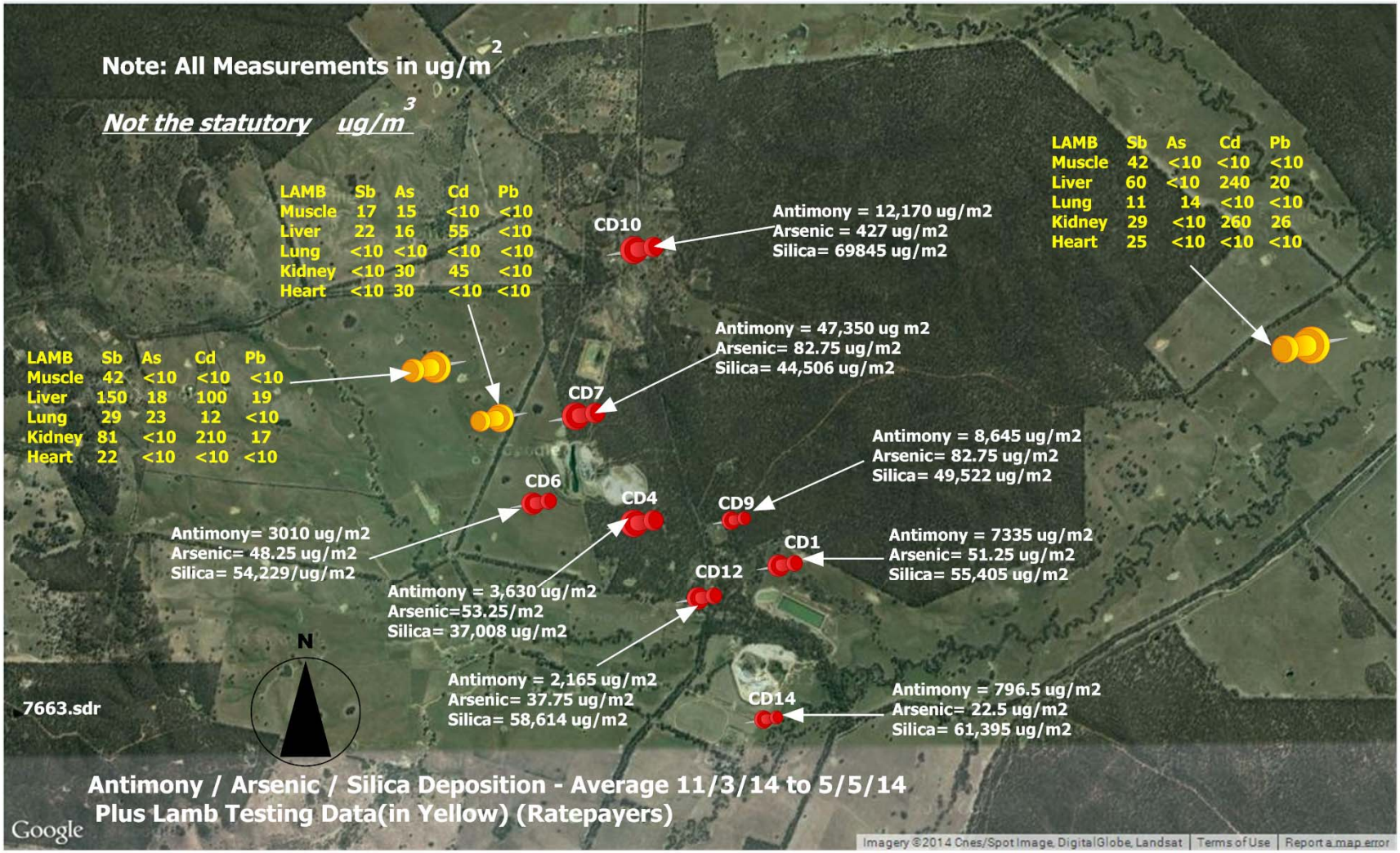
The Mines Dust Data



The Mines Dust Data



Lamb Testing / 2 months Av Data



VCAT Hearings

- There are two matters before VCAT at the moment:

1. Appeal against the issuance of a "bore" licence by GM Water – already agreed that there is a matter of law. Full hearing on 29/9/2014 – 1 day
2. Review of GBC's failure to issue a permit for two tailings dam extensions. Full hearing 3 days 1/9/14 to 3/9/14

The Mine's PR

- In a letter to Residents late in June 2014, Mandalay Resources wrote to residents regarding the Golder Report outcomes.
- Like the Golder Report this document failed to address the issues with other toxic metals and the advice to the residents was flawed.
- The residents should only be receiving health advice from the Department Of Health and not from the polluter.

Government PR

- DSDBI – the regulator that has failed to regulate this mine is now also issuing health advice to residents based on the flawed Golder report.
- The residents should only be receiving health advice from the Department Of Health and not from the regulator that has so comprehensively failed to regulate this mine.

Public Health Issues

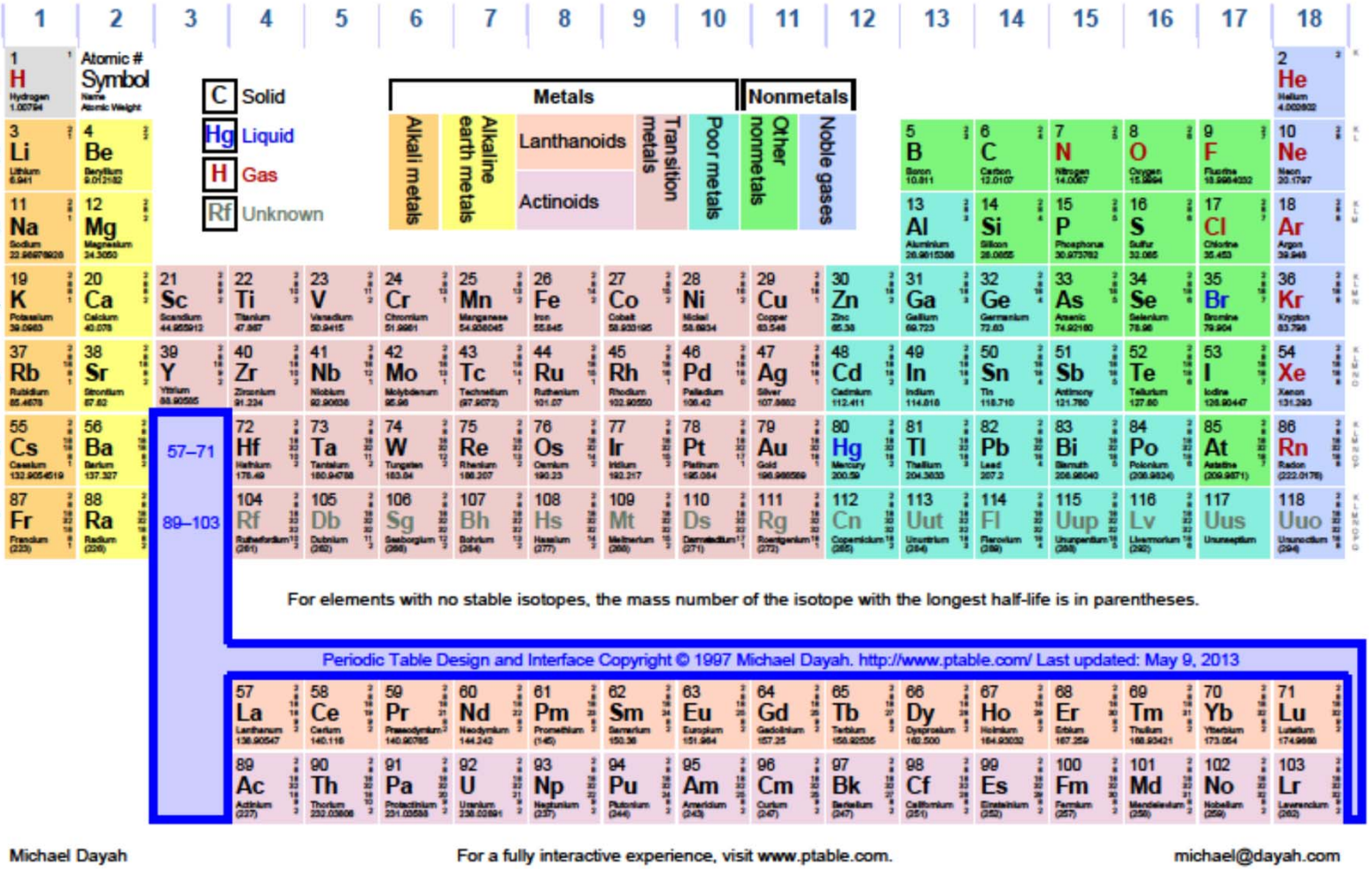
1. Contaminated drinking water;
2. Contaminated bathing water;
3. Inhalation of sub micron particles (PM_{10} and $PM_{2.5}$);
4. Inhalation of Respirable Crystalline Silica;
5. Inhalation of arsenic containing dust
6. Inhalation of antimony containing dust
7. Inhalation of other very toxic metals (Cadmium, Chromium, Cobalt etc

Regulation

- DSDBI have made regular press releases about tighter dust controls on the mine.
- If you were an uniformed Costerfield resident you would believe that the DSDBI has stopped dust and toxic gas emissions from the crusher at the mine (but not the ventilation shaft)
- The following photo was taken on the morning of the 19th of July – apparently the recommended "tighter" controls are simply not working!

Where to now?

- The serious deficiencies present in the Golder Report has exposed the 4 Regulatory Agencies responsible for regulation of this mine to at least a public perception of a clumsy cover up (commonly called Regulatory Capture).
- Minister Northe who has had carriage of this issue needs to endorse the Westminster Tradition and resign so that a more capable Minister can be appointed by the State Government.
- The new Minister should then immediately have this situation declared a disaster under the provision of the Emergency Management Act.

Thank You For Your Time Tonight

Periodic Table of Elements