Brennan Rory

Subject: FW: Submission - Review of Regional Water Quality and Security [SEC=UNCLASSIFIED]

Attachments: Environmental health risk assessment of nickel contamination of drinking water in a country town in NSW .pdf; Call For Environmental Health Study To Clear Lithgow 15 July 2009.doc; Toxic waste in town drinking water SMH 15 July 2009.doc; Lithgow council fined over creek pollution.doc; River killed by pollution Dec 2008.doc

From: Lithgow Environment Group [mailto:info@lithgowenvironment.org]
Sent: Friday, 25 March 2011 8:24 PM
To: Infrastructure Australia
Subject: Submission - Review of Regional Water Quality and Security

Mr Michael Deegan
National Infrastructure Coordinator
Infrastructure Australia

Dear Mr Deegan

Re: Submission from Lithgow Environment Group - Review of Regional Water Quality and Security

The membership of Lithgow Environment Group (LEG) fully supports the key recommendations of this reveiw which are to:

- Mandate compliance with Australian Drinking Water Guidelines through legislation or regulation
- Implement a nationally consistent Best Practice Management Framework for all regional water utilities
- Move toward more cost reflective pricing water pricing
- Develop a more highly skilled workforce to operate and maintain water systems in regional water utilities by developing a nationally consistent trade qualification
- Reform the governance structure of regional water utilities in NSW and Queensland.

Whilst our comments are specific to the small country town of Lithgow in NSW, we beleive they encapsulates many of the issues being experienced in other small towns across Australia with populations between 2,000 - 15,000 with a reticulated water supply.

Due to time constraints our group cannot provide a detailed submission, but have however included a number of attachments of various reports, other LEG submissions, and media releases which highlight some of the local water quality and water security issues. These include:

1. NSW Public Health Bulletin Vol. 19(9–10) 2008, pages 170 - 173: Environmental health risk assessment of nickel contamination of drinking water in a country town in NSW. *One of the authors of this report has confirmed to LEG in writing that the town of "Sampleton" is in fact Lithgow, and that the minewater which has been added to Lithgow's drinking water supply since 1985 is coming from Clarence Colliery. The references include 19. Lithgow City Council Drought Management Strategy.*
2. Sydney Catchment Audit 2010 http://www.environment.nsw.gov.au/water/sdwc2010.htm, specifiically Chapter 3: Land Use and Human Settlement, pages 30 - 32; Appendix C: Sub-Catchment Summaries, pages 9 - 20; and Chapter 7: Audit Recommendations.
3. National Water Commission - Cumulative Effects of Mining on Groundwater Resources Project http ://www.nwc.gov.au/www/html/2992-potential-effects-of-mining-reports.asp?intSiteID=1
4. Sydney Morning Herald 15 July 2009: http://www.smh.com.au/environment/water-issues/toxic-waste-in-towns-drinking-water-20090714-dk55.html

5. *Sydney Morning Herald 2 December 2008:*
   http://www.smh.com.au/articles/2008/12/01/1227979933075.html

6. The Hon Catherine Cusack MLC, NSW Parliament: Media Release 15 July 2009 - Call For Environmental Health Study to Clear Lithgow's Water.
7. ABC News 30 October 2007: Lithgow Council
   http://www.abc.net.au/news/stories/2007/10/30/2074554.htm?site=news
8. NSW EPA Licence Register
   http://www.environment.nsw.gov.au/prpoeoapp/searchregister.aspx - Lithgow Water Treatment Plant: Licence No. 2396 - for specific details of the 40 non-compliances recorded at this plant between 2000 and 2010.

The Issues

Since 1985 Lithgow City Council has been adding minewater from and underground coal mine (Clarence Colliery) into Farmer's Creek Dam and Lithgow's drinking water supply. This is known locally as the Clarence Transfer Scheme. From 1985, when the transfers to Farmers Creek commenced, until 2006, this discharge into stored drinking waters was illegal, because the Clean Waters Regulation 1972 prevented any discharges entering the stored drinking waters of Farmers Creek as these waters were mapped as Specially Protected. The Clean Waters Regulation 1972 was repealed on 1 May 2006, having the effect of legitimising discharges into this water supply. Council has plans to increase the minewater flow from an average 3.5 ML/day to 15 ML/day.

This discharge has resulted in significant pollution of Lithgow's water supply for over 25 years with a range of contaminants including dissolved manganese, cobalt, nickel and zinc above ANZECC and ADWG Guideline levels. During the 1990's when Clarence Colliery was using long-wall mining methods, the contaminants included a range of toxic substances present in water-soluble Solcenic hydraulic oils (similar to 'Fracking' chemicals), which are used in vast quantities (up to 1200 litres/day) in long-wall mining equipment.

Lithgow Council's basic sand-filtration and chlorination unit at the Oakey Park Water Treatment Plant cannot remove these metals or organic contaminants. Tripling the minewater flow to 15 ML/day will only exacerbate the level of contamination. Whenever the general public raise questions about the potential impacts of these contaminants on human health, they are met by the standard Council response of secrecy, cover-ups and denials. Clarence Colliery have denied to LEG that their minewater is the source of this contamination.

During a recent drinking water supply breakdown, the water-flow was reversed through the Cook Street reservoir, resulting in large quantities of contaminated sediment which had accumulated in the bottom of this reservoir entering the town water supply. Nickel levels were recorded at 60 times higher than ADWG limits, as were many other metals and contaminants. Council once again denied, covered-up and lied about this incident - but such events will continue to occur unless the contaminanted sediment build-up is controlled at the Treatment Plant, or the mine source.

In addition to the human health effects, this minewater discharge has caused deep erosion gullies in a large Newnes Plateau Shrub Swamp (listed as Endangered under the NSW TSC Act and Commonwealth EPBC Act) in the inner catchment of Lithgow's drinking water supply. The tonnes of sediment that have been lost from the swamp ends up in Farmers Creek dam, reducing its water holding capacity. Uncontrolled trail-bikes and 4WD's are similalry causing major erosion and siltation problems in the inner catchment of farmers Creek Dam. Siltation has already filled both the local Marrangaroo Dams with sediment. It is very difficult and expensive to clean out a dam without causing further problems downstream.

Despite LEG making Council aware of this, nothing was done to monitor, report on, or repair the damage to this swamp. LEG volunteers finally had no option but to bypass Council, and raise the swamp damage issue with the relevant State and Federal government agencies. Council has now been ordered to divert this flow around this nationally endangered swamp.

Clarence Colliery is the only mine in the Lithgow region that actually treats its mine wastewater. But even after treatment by aeration, and dousing with lime, potassium permanganate and alum floc at the mine site, the water still has high levels of dissolved iron, manganese, nickel and zinc metal ions. A CSIRO in 1993 identified elevated levels of manganese, cobalt, nickel and zinc in this mine effluent. Alam, Corbett and Ptolemy of the NSW Department of Health identified that Nickel levels were on average 50% and up to 10 times above the ADWG guideline upper limit between 2001 and 2005. Salinity levels are also 10 times higher (300 us/cm) than natural background levels (30us/cm). Council continues to record exceedances above ADWG upper limits for Aluminium, and Clarence Colliery continues to exceed POEO licence limits for Manganese.

The Department of Environment and Climate Change (DECCW) has for decades been aware, from Clarence Colliery Annual Reports under their Environmental Protection Licence (EPL), about the high levels of metals and contaminants in this minewater. Despite this, following the repeal of the Clean Waters Act in 2006, the DECCW on 24 September 2007 eased Clarence Colliery's limits for filtrable manganese in their minewater discharge from 0.05mg/L to 0.1mg/L, and on 5 July 2010 eased the manganese limit even further to 0.5mg/L.

Their are 2 catchment authorities supposedly looking after water quality in the local area - the Sydney Catchment Authority (SCA) and the Hawkesbury Nepean Catchment Management Authority (HNCMA) - yet neither has any control over licenced discharges which ultimately control drinking water quality (and human health of water users in the catchment). DECCW does not appear to have protection of human health as part of its charter, and seems to work counter-productively by easing discharge limits for contaminants such as manganese, and failing to set any limits at all for salinity or other dangerous contaminants in Solcenic water-soluble hydraulic oils. The Department of Planning continually approves more and more mining and power generation projects without taking cumulative impacts into account or heeding the advice of the DECCW or SCA. The only NSW Government Department that appears to be trying to protect human health is the NSW Department of Health, with limited sucess.

1. Non Compliance with ADWG

This is a serious human health and environmental issue in the Lithgow area. Lithgow Council does not have the will, the capacity, or the financial or human resources capabilities to properly and safely manage local drinking water quality or water security.

Current drinking water quality monitoring requirements expected of Council are not rigorous enough, and do not test for athe full range of contaminants.

Contaminated sediment that accumulates in the bottom of reservoirs and within the reticulation system **after** the treatment plant is not being cleaned up, and is regualrly contaminating drinking water supplies during system failures and pipeline breakdowns.

Sand filters, alum floccing, and chlorination at the Oakey Park Water Treatment Plant cannot remove the quantity or range of metal ions and other contaminants being introduced into Farmer's Creek dam through minewater discharges.

Licence discharge limits must be set for industry for salinity, heavy metals, Solcenic water-soluble hydraulic oils and other 'fracking' chemicals.

Mandatory compliance with Australian Drinking Water Guidelines must be implemented through legislation or regulation.

National standards are urgently required for water quality guidelines that will protect human health, far more rigorous monitoring standards must be required of local Council's, and severe penalties must imposed for failing to comply.

Nationally consistent Best Practice Management Frameworks must be imposed on Lithgow Council and all regional water utilities.

Nationally consistent trade qualifications and a more highly skilled workforce are urgently required to operate and maintain drinking water systems in regional water utilities.

2. Poor Catchment-Based Planning

The expansion of underground mining under Lithgow's drinking water catchment continues to act like a massive sub-surface drainage system, draining the aquifers that feed Farmer's Creek. To compenstae for the loss of water Council wants to increase the amount of minewater being discharged into the drinking water supply, but that mine water is now heavily contamanited with dissolved salts, iron, manganese, nickel and zinc metal ions, and other mine contaminants. There is no planning. The Department of Planning ignores cumulative impacts, no groundwater studies have been done. No government department, except for the Department of Health, appears to be protecting human health or the environment at present.

Whenever the Department of Health or local community groups try to raise water quality or water security issues, they are ridiculed by Council and industry and subjected to to the usual secrecy cover-up and dwnial routine.

Catchment Management Authorities must be allowed to do their job without political interference, the Department of Planning must be required to heed the advice of DECCW, Catchment Authorities and the Department of health. Where groundwater and other studies have not been done, then no development project must be approved until those studies have been completed.

3. Inadequate and Inconsistent Planning Frameworks

The Part 3A Planning Process in NSW must be repealed. Water quality, water security, and drinking water catchment protection must be given the highest priority for all planning decisions.

4. Cost reflective pricing water pricing

Lithgow Council, and we understand all NSW Councils, were required to increase water charges last year to a stae standard, under the threat of not receiving any further government grants or assistance if they did not comply. No improvement in service or water quality whatsoever accompanied this massive water price increase.

Water prices currently do therefore reflect the quality and service provided, prices must not rise, and in the Lithgow area should fall commensurate with the level of service - which is nil.

5. Reform the governance structure of regional water utilities in NSW and Queensland

LEG agrees that the current level of open-ness, honesty, transparency, accountability and governance of our local water utility most definitely needs reform. In particular the culture of secrecy, cover-up, denial and dishonesty that pervades everything to do with water management in our local area, and possibly throughout NSW, must be addressed. The protection of human health, groundwater dependent ecosystems, and the environment of drinking water catchments must take precedence over all other competing landuses.

Thankyou for givng our group this opportunity to have input into this reveiw.

Yours faithfully

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Lithgow council fined over creek pollution

http://www.abc.net.au/news/stories/2007/10/30/2074554.htm?site=news

ABC News - Posted Tue Oct 30, 2007 10:00am AEDT

The Lithgow City Council has agreed to pay a fine of nearly $50,000 for breaches relating to the pollution of Farmers Creek.

The Environment Protection Authority (EPA) prosecuted the council over the release of liquid and sludge material from its Oakey Park Water Treatment Plant and its failures to comply by orders relating to remediation.

The court heard in July 2004 liquid and sludge material from the plant that contained aluminium sulphate polluted Farmers Creek.

The council was then required to take certain actions including a study of upgrade options for the plant, but the court ruling says the council contravened those conditions.

The council pleaded guilty to the offences.

The Land and Environment Court has ordered the council to pay the EPA's court costs of $20,000.

Lithgow Mayor Neville Castle says the council is trying to carry out works at the treatment plant to prevent the problems happening again.

"Council were given a timeframe in which to remediate that," he said.

"Unfortunately we're going to be just outside that timeframe.

"Council just actually voted just over a month ago not only for the money but for the work.

"It's in the budget but, as I said, it's going to be just outside the timeframe of the EPA."

Environmental health risk assessment of nickel contamination of drinking water in a country town in NSW

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Abstract: Objectives: To assess the health risks associated with consumption of drinking water with elevated nickel concentration in a NSW country town named Sampleton. **Methods:** We used enHealth Guidelines (2002) as our risk assessment tool. Laboratory test results for nickel in water samples were compared with the Australian Drinking Water Guidelines 2004 and the World Health Organization's (WHO) Guidelines for Drinking Water Quality 2005. **Results:** The mean nickel concentration in the drinking water samples tested over a 4-year period (2002–2005) was 0.03 mg/L (95% CI: 0.02–0.04). The average daily consumption of two litres of water by a 70-kg adult provided 0.06 mg (0.03 mg × 2) of nickel, which was only 7% of the lowest observed adverse effect level (LOAEL) based on experiments on nickel-sensitive people in a fasting state. **Conclusions:** The mean nickel concentration in drinking water appears to have no health risks for the inhabitants of Sampleton.

Background and risk identification

Sampleton (not the real name) is a small country town in rural New South Wales (NSW). Until 2001, the inhabitants of the town had been supplied with drinking water sourced from a local surface water catchment. In 2002, the drought prompted the local authority to negotiate with a local colliery to release its extracted underground mining water into the local drinking water catchment. The local government authority (LGA) treated the water before supplying it as drinking water to its residents.

Between 2002 and 2005, the water samples at Sampleton recorded on the NSW Health Drinking Water Database intermittently exceeded the Australian Drinking Water Guidelines (ADWG) value for nickel of 0.02 mg/L.[1,2] The aim of this risk assessment was to assess the potential health risks associated with the consumption of drinking water with an elevated nickel concentration.

Risk assessment methodology

We used the enHealth Guidelines for Assessing Human Health Risks from Environmental Hazards (2002) as the risk assessment tool.[3] The ADWG and the WHO guidelines for nickel were used for the specific guidelines on nickel levels in drinking water.[2,4] Chemical analysis of water samples were undertaken by a laboratory accredited by the National Association of Testing Authorities (NATA).[5] Laboratory test results for nickel in the water samples were compared with the ADWG and the WHO guidelines.

Hazard assessment

Hazard identification

Ground water can contain dissolved metals including nickel (Ni) and chemicals naturally released from rock and soil, which can be harmful to humans.[6] The estimated average daily dietary intake of nickel is between 0.1 mg/day and 0.3 mg/day.[7,8] The intake of nickel from food is estimated to be less than 0.2 mg/day. Drinking water generally contributes 5–25 μg of nickel per day, which is approximately 2–11% of the total daily oral intake of nickel.[4] In Australia, the concentration of nickel in typical drinking water is less than 0.01 mg/L with the highest allowable value of 0.02 mg/L.[9]

Non-occupational sources of nickel exposure include food, air and water, but the amount of nickel found is usually much smaller than that typically found in occupational settings.[10] The primary source of nickel in drinking water is from metal pipes and fittings in contact with drinking water. Nickel concentrations in ground water are influenced by soil type, pH level and sampling depth.[4] Higher concentrations have been reported where drinking water is contaminated with nickel waste discharge from chemical, industrial or mining plants.[9]

10.1071/NB07043

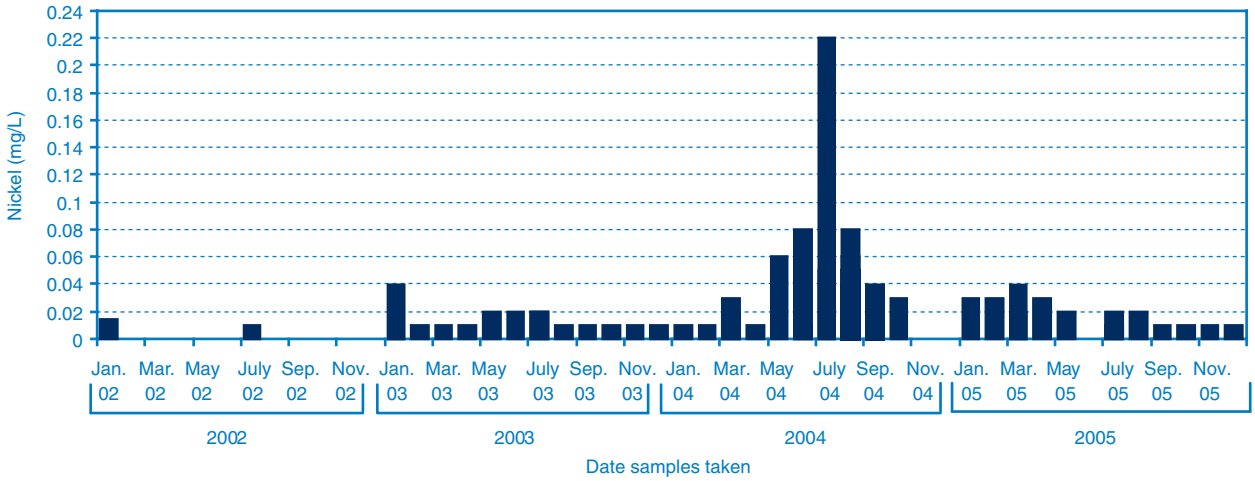

Figure 1. Concentration of nickel in samples of drinking water in Sampleton, NSW, 2002–2005.

The adverse health effects of nickel for humans depend upon the route of administration, water solubility (absorption) of nickel compounds, dose, bodyweight, sensitivity and duration of exposure.[4,11–13] Dermal exposure is the commonest cause of skin irritation to those allergic to nickel, with more females than males being affected.[14] The main adverse effect for this risk assessment is nickel allergic dermatitis, as it occurs at very low levels of exposure. The Expert Group on Vitamins and Minerals estimated that approximately 7–10% of the population in the United Kingdom, predominantly women, have this condition.[15] Allergic contact dermatitis due to nickel sensitivity increases with age and may affect as much as 4–5% of the paediatric population.[16–18] While for some people the reactions are limited to a minor skin irritation, for certain sensitised people the exposure to elevated nickel may cause or aggravate dermatitis. In about half of the sensitive people with vesicular hand eczema, the reactions can be very severe and can lead to loss of working ability.[15]

Dose–response assessment

Assessing the dose–response relationship in terms of nickel sensitivity is complex. Christensen and Lagesson observed wide variations in nickel concentrations in blood and nickel excretion in urine in healthy humans when equal amounts of nickel were ingested.[7] Such variation in sensitivity makes it difficult to estimate the true dose–response effect because a very small exposure to nickel may trigger a rapid response in some people due to their high level of sensitivity. The lowest observed adverse effect level (LOAEL) for an oral dose is reported to be 0.05 mg/kg bodyweight per day when skin is not sensitised.[8] But when the skin is sensitised, an oral intake of 0.012 mg/kg bodyweight per day may provoke contact dermatitis.[13]

Exposure assessment

In Sampleton, the mean nickel concentration in drinking water found in water samples taken between January 2002 and December 2005 was 0.03 mg/L (95% CI: 0.02–0.04) (Figure 1).

The high concentration of nickel appears to be a result of the introduction of mine water into the drinking water catchment and the reduction of the natural flow rate within the catchment due to the drought. The lowered flow rate in the catchment due to drought conditions was the main reason that the mine water was accessed to supplement the drinking water supply. The changes in nickel concentrations over the 3-year period could be attributed to changes in natural dilution and the level of demand of water sourced from the colliery to meet the supply requirements.[19]

Risk characterisation

The human health risk of nickel contamination of drinking water in Sampleton has been characterised in consideration of the following two guidelines:

The Australian Drinking Water Guidelines

The ADWG sets a safety standard value for concentration of nickel in drinking water.[2] The guideline value was derived as follows:

$$\frac{5\ \text{mg/kg bodyweight per day} \times 70\ \text{kg} \times 0.1}{2\ \text{L/day} \times 1000} = 0.02\ \text{mg/L}$$

where:

- 5 mg/kg bodyweight per day is the lowest observed adverse effect level (LOAEL) for altered organ-to-bodyweight ratios based on animal studies[20]
- 70 kg is the average bodyweight of an adult
- 0.1 is the proportion of total daily intake attributable to the consumption of water
- 2 L/day is the average amount of water consumed by an adult
- 1000 is the safety factor used for the uncertainty over applying animal studies to humans. In this case, the

safety value is applied as follows: 10 for interspecies variations, 10 for intraspecies variations and 10 to compensate for the lack of adequate studies on chronic effects and for increased intestinal absorption when taken on an empty stomach.[2]

The WHO guidelines

The WHO guidelines for drinking-water quality, based on human challenge studies done by Nielsen et al. (1999), recommend the safe nickel value in drinking water as 0.07 mg/L, which was calculated as follows:[4,13]

$$\frac{0.012 \text{ mg/kg bodyweight} \times 60 \text{ kg} \times 0.2}{2 \text{ L/day}} = 0.07 \text{ mg/L}$$

where:

- 0.012 mg/kg bodyweight, derived from a LOAEL based on human challenge studies[13]
- 60 kg is the average weight of an adult
- 0.2 is the proportion of total daily intake (TDI) of nickel from drinking water
- 2 L/day is the average amount of water consumed by an adult.

The WHO guidelines' value for nickel in drinking water is derived from the LOAEL of 0.012 mg/kg of bodyweight based on experiments in fasting adults with single doses on empty stomach.[13] Because this LOAEL of 0.012 mg/kg bodyweight was based on a highly sensitive individuals, WHO did not include an uncertainty factor (intraspecies or interspecies variations) to derive the TDI.[4] Using the LOAEL of 0.012 mg/kg bodyweight, the LOAEL for a 70-kg adult would be 0.84 mg/L per day (0.012 mg/kg bodyweight × 70 kg).

To our knowledge, there are no data available on the LOAEL for nickel consumption in children. However, it is likely that the LOAEL for children would be greater than the adult LOAEL of 0.012 mg/kg bodyweight as this value was calculated on a highly nickel-sensitive adult population.[13] Children are less likely to have been sensitised to nickel as nickel sensitivity increases with age.[16–18] The average intake of 0.03 mg nickel, assuming consumption of one litre of water each day and using the adult LOAEL of 0.012 mg/kg bodyweight would result in a childhood LOAEL of 0.16 mg/day (0.012 mg/kg × 13 kg) for a 13 kg child.[2]

The mean nickel content (0.03 mg/L) in the drinking water in Sampleton was one and a half times higher than the ADWG value but accounts for only 43% of the WHO guidelines value. The higher nickel level in Sampleton water was intermittent, with one-third of the total water samples tested exceeding the ADWG value over a 4-year period. The ADWG is based on animal studies that, when applied to humans, provide only persuasive rather than hard evidence for effects on humans.[2,20] The animal data may also not be sufficiently protective of people sensitised to nickel. The WHO guidelines value (0.07 mg/L), on the other hand, is the maximum effect value based upon experiments on nickel-sensitive people at a fasting state. Assuming a 70-kg adult drinks 2 L of water per day, the average daily intake of 0.06 mg (0.03 mg × 2 L) of nickel from drinking water in Sampleton was approximately 7% of the LOAEL of 0.84 mg (0.012 × 70 kg) based on experiments on nickel-sensitive adults at fasting state.[13] In children, it is difficult to provide a meaningful calculation of the risk as childhood bodyweights and consumption of drinking water are highly variable. However, assuming consumption of one litre of water per day, the average daily intake of 0.03 mg of nickel from drinking water in Sampleton was approximately 19% of the LOAEL of 0.16 mg/day (0.012 mg/kg × 13 kg) estimated for a 2-year-old child weighing 13 kg.

Assuming that the dietary intake of nickel in the Sampleton population is no different from that in the Australian population, and that the residents of Sampleton are all nickel-sensitive (which is unlikely), the mean nickel concentration of 0.03 mg/L (95% CI: 0.02–0.04) appears to have no health risks for the inhabitants of Sampleton.

The single high reading in the 4-year period of 0.22 mg/L in July 2004 (Figure 1) could have been due to a sampling error or measurement (laboratory) error. The particular sample was taken from the same outlet as all the other samples over the sampling period, so it is unlikely that there was an increase in nickel level due to other contamination sources such as plumbing. However, the nickel value of 0.22 mg/L at the daily intake rate of 2 L a day of drinking water for a 70-kg adult would still be only 52% of the LOAEL of 0.84 mg/day (0.012 × 70 kg) for adults based on studies of nickel-sensitive people.[13] For children, the observed nickel value of 0.22 mg/L at the daily intake of 1 L a day for a 13 kg child would be 138% of the childhood LOAEL of 0.16 mg/day (0.012 mg/kg bodyweight × 13 kg).[9] However, the LOAEL for highly-sensitive adults used in this calculation provides a safety factor for young children as they are less likely to be highly sensitised to nickel. Therefore, it is unlikely that this level of nickel in drinking water would have a significant effect on the younger population.

Risk management

Although the risk assessment found no obvious threat to the health of Sampleton residents, the LGA has been informed of the need to continue to monitor the water supply for nickel levels. The Council was advised that, under the NSW Health Drinking Water Monitoring Program, monitoring of the quality of drinking water should rotate between designated sample sites throughout the distribution system and over time.[1]

Conclusion

An enhanced surveillance of the chemical concentrations in the town water supply system has been recommended while mine water is being directed to the drinking water catchment. The use of alternative sources to supplement drinking water supplies during drought conditions, such as mine water in this case, may become more common in rural and regional towns as the drought conditions and water supply levels continue to fluctuate. While this risk assessment provides some reassurance that small increases in nickel in this town water supply are not a hazard to human health, the study does highlight the need for continued vigilance in relation to water quality when water scarcity forces supply authorities to choose alternative sources.

Acknowledgment

The authors would like to thank Ms Amanda Muir and the environmental health team at the local council for collecting water samples. Thanks to the Centre for Population Health, Sydney West Area Health Service for support in this assessment.

References

1. NSW Department of Health. NSW Health Drinking Water Monitoring Program. State Health Publication No: (EH) 050175. Sydney: NSW Department of Health; 2005.
2. National Health and Medical Research Council and Natural Resource Management Ministerial Council. Fact Sheets: Physical and Chemical Characteristics. Australian Drinking Water Guidelines 2004. Canberra: NHMRC; 2004. Available from: http://www.nhmrc.gov.au/publications/synopses/eh19syn.htm (Cited 23 June 2008.)
3. Department of Health and Ageing and enHealth Council. Environmental health risk assessment: guidelines for assessing human health risks from environmental hazards. Canberra: Commonwealth of Australia; 2002.
4. World Health Organization. Nickel in drinking-water (WHO/SDE/WSH/05.08/55). Available from: http://www.who.int/water_sanitation_health/gdwqrevision/nickel2005.pdf (Cited 24 October 2008.)
5. National Association of Testing Authorities. Home page. Silverwater, NSW: National Association of Testing Authorities; 2005. Available from: http://www.nata.asn.au/ (Cited 6 October 2005.)
6. Lehr J, Hyman M, Gass TE, Seevers W. Handbook of complex environmental remediation problems. New York: McGraw Hill; 2002.
7. Christensen OB, Lagesson V. Nickel concentration of blood and urine after oral administration. *Ann Clin Lab Sci* 1981; 11: 119–25.
8. Committee on Toxicity of Chemicals in Food Consumer Products and the Environment. Nickel leaching from kettle elements into boiled water. London: Committee on Toxicity; 2003. Available from: http://www.food.gov.uk/multimedia/pdfs/2003-02.pdf (Cited 24 October 2008.)
9. National Health and Medical Research Council and Natural Resource Management Ministerial Council. Fact Sheets: Physical and Chemical Characteristics. Australian Drinking Water Guidelines. Canberra: NHMRC; 2004. Available from: http://www.nhmrc.gov.au/publications/synopses/_files/adwg_11_06_fact_sheets.pdf (Cited 22 June 2008.)
10. International Agency for Research on Cancer. IARC Monographs on the evaluation of carcinogenetic risks to humans: chromium, nickel and welding: 49. Health Organization: Geneva; 1997.
11. Andersen KE, Benezra C, Burrows D et al. Contact dermatitis. A review. *Contact Dermatitis* 1987; 16: 55–78. doi:10.1111/j.1600-0536.1987.tb01382.x
12. Grimsrud TK, Berge SR, Haldorsen T et al. Can lung cancer risk among nickel refinery workers be explained by occupational exposures other than nickel? *Epidemiology* 2005; 16: 146–54. doi:10.1097/01.ede.0000152902.48916.d7
13. Nielsen GD, Soderberg U, Jorgensen PJ et al. Absorption and retention of nickel from drinking water in relation to food intake and nickel sensitivity. *Toxicol Appl Pharmacol* 1999; 154: 67–75. doi:10.1006/taap.1998.8577
14. Sharma AD. Relationship between nickel allergy and diet. *Indian J Dermatol Venereol Leprol* 2007; 73: 307–12.
15. Expert Group on Vitamins and Minerals (EVM). Risk assessment: Nickel. London: EVM; 2003. Available from: http://www.food.gov.uk/multimedia/pdfs/evm_nickel.pdf (Cited 24 October 2008.)
16. Beattie PE, Green C, Lowe G, Lewis-Jones MS. Which children should we patch test? *Clin Exp Dermatol* 2006; 32: 6–11.
17. Militello G, Jacob SE, Crawford GH. Allergic contact dermatitis in children. *Curr Opin Pediatr* 2006; 18: 385–90. doi:10.1097/01.mop.0000236387.56709.6d
18. Silverberg NB, Licht J, Friedler S et al. Nickel contact hypersensitivity in children. *Pediatr Dermatol* 2002; 19: 110–3. doi:10.1046/j.1525-1470.2002.00057.x
19. Lithgow City Council. Lithgow City Council Drought Management Strategy. Lithgow: Lithgow City Council; 2008. Available from: http://www.council.lithgow.com/reg_fishriver.html (Cited 21 May 2008.)
20. Ambrose AM, Larson PS, Borzelleca JF, Hennigar GR. Long term toxicologic assessment of nickel in rats and dogs. *J Food Sci Technol* 1976; 13: 181–7.

River 'killed' by pollution feeds city water supply

SMH http://www.smh.com.au/articles/2008/12/01/1227979933075.html
BEN CUBBY ENVIRONMENT REPORTER
2/12/2008 1:00:01 AM

Also in Qld Country Life, Western Advocate, Blayney News, related article in Lithgow Mercury 6/12/08, also picked up by various national and international websites.

A SECTION of the Coxs River in the Blue Mountains that supplies drinking water to Sydney is so polluted by industrial run-off that it is effectively dead, independent water quality tests show.

The contaminated river has high levels of heavy metals including zinc, copper and manganese, 125 times more sulphate than surrounding streams and just 5 per cent of the oxygen that most fish need to survive. Those results were obtained by testing river water next to Delta Electricity's Wallerawang coal-fired power station. Despite the environmental damage, discharges from the power station appear to comply with those allowed under its Environment Protection Authority pollution licence.

The river's pH levels, which measure the acidity of the water, are up to 1000 times higher than nearby creeks, the tests show. The river is also 80 times as salty as it should be, according to tests undertaken over a two-year period by researchers for the Blue Mountains Conservation Society, using Sydney Water-approved kits.

"We're really concerned that the upper Coxs River is turning into a dead river," the society's president, Tara Cameron, said. "We think the Government has to start taking the problem seriously and people feel let down because they feel they shouldn't have to push the Government to take steps to reduce the level of pollution."

The Sydney Catchment Authority has confirmed that the test results are accurate, but says the water becomes safe to drink as it flows towards Warragamba Dam.

"Water from the Coxs River [flowing] into Warragamba poses no threat to public health," an authority spokeswoman said.

"Routine and additional testing confirms that the elements in the upper catchment are not reaching Warragamba Dam at harmful levels."

The Department of Environment and Climate Change said some of the contaminated run-off could be attributed to the power station reusing its water because of the drought.

"We believe there is an issue with the amount of salt," a department spokesman, John Dengate, said. "The company is working on ways of reducing the salinity. We are monitoring the situation closely and we require that they do the best job that they can with the resources at their disposal."

Delta Electricity said it was talking with the Government about ways to limit chemical and saline discharges.

"Delta is currently operating within the conditions of its licence," a Delta spokeswoman, Margaret Miller, said. "There have been two minor breaches involving pH correction and total suspended solids, which resulted from plant failures. These incidents, which are a matter of public record, resulted in short-term 'exceedances' and were reported to [the department]."

But other green groups say the pollution of the upper Coxs River shows that coal-fired power generation is more important than clean water.