HARRISON GRIERSON

17 June 2008

Elk Roofing
64 Kath Hopper Drive
Orewa
NORTH AUCKLAND

Attention Mark Probett

Dear Mark

Analysis of Roof Run-off Water from Asphalt Shingle Roofs
HG Ref 1014-126944-01

We are writing regarding the five water samples collected from your shingle roof water run-off for use as potable supply. All variables tested for in the samples are within the relevant Drinking Water Standards New Zealand 2005 (DWSNZ 2005) maximum allowable values (MAVs) and guideline values (GVs) with the exception of pH.

The pH of the water tested, except for the Barkwood 'Same Tank' sample, was slightly acidic varying between 6.25 and 6.79. This is below the DWSNZ 2005 guideline values of 7.0 to 8.5. Rain water is normally slightly acidic due to the carbon dioxide dissolving in the water from the atmosphere, therefore this is not a result of the asphalt shingle roofing. The low pH is not believed to be a significant problem.

The pH of the Barkwood sample taken from the tank had a higher pH than the other samples, at 7.27, which is within the DWSNZ 2005 guideline values. This is likely due to the fact the slightly acidic rain water (pH 6.25) was dissolving the lime in the cement. This is also supported by the increase in total alkalinity, carbonate hardness and total cations between the samples taken from the roof and out of the tank. The slightly greenish tinge to the tank water suggests microbiological contamination, however it could also be due to copper contamination from the gutter. It is difficult to make a definitive conclusion without testing the sample.

The slightly acidic pH makes the water more plumbosolvent and it is advised not to use lead in the roof flashing or gutter solder so that it cannot contaminate the water. Lead is not expected to be present in asphalt shingles, therefore any lead contamination will not be the result of this roofing material.

The samples taken directly off the roof valley intersections contained copper at levels below the detection limit, except for the Barkwood sample collected from the tank which flowed over the copper gutter system and contained traceable levels of copper. However this was still well below the DWSNZ 2005 guideline value. It should be noted that the acidity of the water would have contributed to the leaching of the copper, and this can

Harrison Grierson Consultants Limited
71 Great South Rd Newmarket
Auckland New Zealand
PO Box 5760 Wellesley Street
Auckland New Zealand
Ph 09 917 5000 Fax 09 917 5001
Email auckland@harrisongrierson.com
www.harrisongrierson.com
ISO9001 Quality Assured

be avoided with the use of different gutter material such as PVC. It is not part of asphalt shingle roof material.

The total dissolved solids content (TDS) of Shakewood and Charcoal roof runoff samples were significantly higher than that of the other samples (although still within the DWSNZ 2005 GV). This is unlikely to be caused by the roof type and is more likely to be caused by dirt accumulation on the roof, and is thus a function of the environment.

The roof rain water results are similar to the testing carried out on Elk roof water runoff in May 2000, with the exception of the pH being slightly higher and carbon dioxide being slightly lower than the previous results. It is possible that the current samples received more aeration, which would have decreased the free carbon dioxide in the water and hence elevated the pH.

It is important to note that roof water used for potable water supply should be treated for microbiological and airborne contamination irrespective of what roofing material is utilised. We would recommend that all water utilised for kitchen and bathroom supply be treated with cartridge filtration, 20μm followed by 1μm, for protozoa removal and then treated with UV for disinfection. This type of treatment system costs between $1200 to $2000 (incl. GST) depending on the flow rates, excluding installation.

Further information regarding the use of roof run-off water for potable water supply is attached along with the summarised test results and respective maximum allowable and guideline values from the DWSNZ 2005.

Yours sincerely
Harrison Grierson Consultants Limited

Irina Boiarkine
Graduate Process Engineer

N:\1014\126994_01\300 Comms\let-elk-001-iab.doc

Elk Asphalt Shingle Roof Runoff Water Test Results									
Variable	**Sample**	**Antique**	**Shakewood**	**Charcoal**	**Barkwood Off Roof**	**Barkwood Same Tank**	**DWSNZ 2005**	**GV or MAV**	**Reason for corresponding GV**
pH	N/A	**6.76**	**6.79**	**6.73**	**6.25**	7.27	7.0-8.5	GV	Low pH means high plumbosolvency
Total Alkalinity	mg/L	6	8	10	3	34	None		
Free Carbon Dioxide	mg/L	1	1	3	1	3	None		
Conductivity	mS.cm	22	154	211	12	101	None		
Approximate TDS	mg/L	15	108	148	8	71	1000	GV	Taste may become unacceptable from 600-1200mg/L
Calcium	mg/L	1.3	18	19	1	3	See hardness		Hardness
Magnesium	mg/L	0.4	1.1	1.5	<0.5	0.5	See hardness		Hardness
Carbonate Hardness	mg/L	5	8	10	2	9	None		
Non Carbonate Hardness	mg/L	0	41	44	0	0	None		
Total Hardness	mg/L	5	49	54	2	9	200	GV	Scale formation
Sodium	mg/L	5	10	10	3	20	200		
Potassium	mg/L	0.5	1	1.5	0.5	0.8	None		
Iron	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.2	GV	
Manganese	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.04,0.10	GV	Staining of laundry, taste
Zinc	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	1.5	GV	
Copper	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	0.06	2,1	MAV, GV	Staining of laundry and sanitary ware
Boron	mg/L	< 0.05	< 0.05	0.08	< 0.05	< 0.05	1.4	MAV	
Chloride	mg/L	1	5	3	0.6	7	250	GV	
Nitrate-Nitrogen	mg/L	< 0.05	0.16	0.1	<0.05	0.23	50	MAV	as mg/L nitrate
Ammonia-Nitrogen	mg/L	0.4	0.2	0.2	0.1	0.1	0.3,1.5	GV	Control of chloramine formation, odour threshold in alkaline conditions (mg/L) ammonia
Sulphate	mg/L	2	< 0.5	< 0.5	0.6	<0.5	250	GV	
Total Cations	meq/L	0.32	1.45	1.54	0.19	1.08			
Total Anions	meq/L	0.2	0.33	0.33	0.09	0.97			