

## Buller Community Support

Solid Energy has been proud to support many community initiatives in the Buller this year. These include:

**Karamea Area School** for students attending the South Island Volleyball Championships and the New Zealand Area Schools National Tournament

**Buller Country Music Club** Best of the West Awards 2005

**Buller Basketball Association** Junior Basketball Competition

**Buller Primary Schools Sports Association** representative Primary School Teams

**Westport North School** sponsorship of the Urban Experience 2007

**Buller REAP** holiday programme

**Buller High School** sports funding

**Buller Axemans Centre** South Island Wood Chopping Championships at Reefton

### Buller Marathon

**Westport Kindergarten and Westport Early Learning Centre** combined active movement and gymnastics programme

**MAPPS Inc** for Millerton track maintenance

**Buller Outdoor Learning Trust** sponsorship of Youth Adventure Race

**Buller Hockey Association** sponsorship of centenary book and travel for junior teams to festival of hockey.

**Waimangaroa School** sunhats for students

**Karamea Golf Club** for Annual Winter Tournament

**Granity-Ngakawau Playcentre** all weather PVC curtains for play area

**Granity School** sponsorship of sunhats and reading programme

**Buller Rugby Football Union (Inc)** for 2006 NPC competition

**Granity Judo Club** for two club members

representing New Zealand

**Rangimarie Croquet Club** for club trophies

**Friends of the Hill** laptop, printer and newsletter

**Friends of Waiuta** bags for centenary celebrations.

**Reefton Rodeo**



Buller boys hockey team

## Leicester's Legacy

In July this year the Millerton community lost a well-loved friend and environmental campaigner when Leicester Kyle passed away.

Over the years Solid Energy had worked with Leicester on many projects, but most significantly in the setting up of the Millerton Botanical and Historical Reserve. Solid Energy's Buller Senior Geologist, Stu Henley, who worked closely with Leicester on this project, reflects on Leicester's immense contribution:

In early 2001, a newspaper article reported that Solid Energy was planning to "mine Millerton". This article caused understandable distress to many of the Millerton residents who interpreted the article as meaning Solid Energy was set to mine Millerton Township. A meeting was held with local residents where we explained it was not the township we were planning to mine but the "Millerton Block" of the Stockton Coal Mining Licence. The concerns of the residents were the catalyst for the formation of the Millerton and Plateau Protection Society (MAPPS) and Leicester was the prime driver of this group.

From that time, regular meetings between Solid Energy and MAPPS were held and these meetings provided a useful forum to debate the conservation of the land around Millerton, and Solid Energy's mining plans. Leicester was instrumental in developing the ideas for a botanical and historical reserve in the area. His passionate arguments for the reserve were very compelling and we agreed to look at the preservation of historic features above the old dip section of the Millerton Mine.

In 2003, an area of 350 hectares was placed into a non-mining reserve as a result of an agreement between MAPPS and Solid Energy, and this ensured a buffer zone between Millerton and Stockton Mine. Leicester and a band of Millerton residents then began to clear some of the old tracks and access to mining relics. Later, discussions with the Department of Conservation and Buller District Council resulted in the addition of 200 hectares more to the reserve. At Leicester's initiative, the old doctor's surgery was converted into a visitor information centre.

The culmination of Leicester's endeavours occurred on 6 August 2005. On a beautiful sunny day, the agreement for the Millerton Botanical and Historical Reserve was signed and the reserve was opened. Many visitors came to the open day and Leicester's continual smile was very obvious as he enthusiastically explained the ecology along the restored pack track.

### Stu Henley

Solid Energy expresses its condolences for all of those who knew and loved Leicester. We look forward to continuing to work with MAPPS for the benefit of the Millerton community.

### Contact

If you would like further information on any aspects of Solid Energy's Buller operations please contact Buller senior geologist Stu Henley in the Westport office on 03 788 9300 or Mike Lynn, Stockton Mine Manager, on 03 788 9400 or email [info@solidenergy.co.nz](mailto:info@solidenergy.co.nz).



Leicester Kyle at Millerton last year.

Any comments will be recorded in a register and followed up where investigations are required. Website: [www.coalnz.com](http://www.coalnz.com)



## Work starts on Stockton water clean-up

After extensive planning, Solid Energy has started to work cleaning up the water at Stockton Opencast Mine.

This includes the almost completed "A Drive" dam, the first of a series of structures - mainly earth dams or sumps - designed to treat mine water at Stockton.

This is the first step in a multi-million dollar project Solid Energy unveiled last year to improve the quality of water discharging into the Mangatini Stream and, from there, to the Ngakawau River. The first phase of the project aims to reduce the amount of suspended solids (coarse sediment/dirt) in water runoff in operational mining areas and to reduce the amount of water-borne fine coal particles (fines) through systems design and more efficient coal handling.

In August preparatory work started on a second dam, designed to reduce the amount of coal fines in Ford Creek Stream, a tributary of Mangatini Stream.

### Dams and slumps

The compacted earth-fill dams and sumps, connected by channels or pipeline systems, are being built in working areas of the mine - Ford Creek, The Rockies,

Mangatini Block, Webb Block and A Drive - and will feed runoff containing coal fines into a large-scale water treatment facility to be built near the Mangatini Stream. These structures will significantly reduce the amount of coal fines discharged from mining operations into the Ngakawau River.

Solid Energy is currently finalising the details of other structures needed to treat mine water and will seek the necessary consents for these in the near future.

A new plant is planned to treat water runoff from coal mining areas before it is discharged to the Mangatini Stream. The water treatment plant should be operational by mid-2007. This, together with lime dosing of the Mangatini Stream (see story page 3) will raise the pH of the stream and, as a result, improve the water quality.

Solid Energy has lodged resource consent applications with the West Coast Regional Council to discharge treated mine water and settled stormwater into the Mangatini Stream as part of opening up a new mining block - "4 West" - within

the Stockton Coal Mining Licence; and to carry out limestone dosing in the Mangatini Stream (see page 2).

### Target agreed

The Stockton Consultative Group, comprising Ngakawau Riverwatch, West Coast Conservation Board, Te Runanga O Ngati Wae Wae, the Department of Conservation, regulatory bodies and Solid Energy, has agreed that an appropriate target to improve water quality in the Ngakawau is to improve the environment for native fish, such as whitebait, and the water's visual clarity and turbidity. We will monitor improvements at a site above the tidal influence of the Ngakawau River.

### Fish Survey

A University of Canterbury native fish survey in the Ngakawau, Waimangaroa and Mokihinui Rivers in late 2005 evaluated the influence of acid mine drainage from historic and current mining activities on the distribution of migratory freshwater fish. [Story continues inside...](#)



Dam construction works underway at Stockton.

## Managing effects of acid rock drainage



Environmental Operations Manager, Dr Phil Lindsay examines oxygen probes on a fly ash capping trial at Stockton. The alkaline fly ash is being used as a capping material to prevent the penetration of oxygen and water into overburden dumps.

Minimising the effects of acid rock drainage (ARD) on the local environment is one of Solid Energy's key environmental priorities on the West Coast. At Stockton, coal is extracted from the Brunner coal measures which were formed in a marginal marine environment and, as a result, have high pyrite (iron sulphide or "fool's gold") content.

The rock at Stockton also tends to have high aluminum levels, as well as pyrite. There are other shiny, brassy yellow minerals, but pyrite is the most common and is often mistaken for gold.

When coal is mined at Stockton, the rock covering it (overburden) is placed in engineered landforms. This rock is then exposed to water and air. The high level of pyrite in some of the Stockton rock can produce a mild sulphuric acid or ARD.

Over the past five years, Solid Energy has carried out significant research looking at the most effective options for minimising and treating the impact of ARD.

### Minimising ARD

We have two major projects investigating ways to minimise acid generation. The first is **selective waste rock placement**, a process designed to reduce acid generation by placing potentially-acid-forming rock in the centre of an engineered

landform and surrounding it with low-acid-forming material.

The second is **saturated cover technology** where the rock is covered by material that will remain saturated and prevent oxygen and water entering the engineered landform. This **saturated cover** layer can include screened granite, non-acid-forming mudstones, and coal combustion products such as fly ash. Topsoil is placed over this layer to reduce erosion and for replanting vegetation.

In the last year, we have capped over 30 hectares of waste rock dumps with weathered granite and will cap up to a further 62 hectares in the coming year. Small 500-tonne field trials have also shown that 30 cm of material such as coal ash can reduce oxygen content from 21% to between 5 and 11%.

More recently, Solid Energy conducted a full-scale industrial trial. In this case, we capped 15,000 tonnes of sulphide-rich rock with fly ash waste from industrial coal use. The results from this trial have been very successful with oxygen contents typically less than 3%.

### Fly Ash Capping

Solid Energy is seeking consents for the return to Stockton, and reuse, of coal ash. This will include coal ash from Fonterra's Clandeboye factory near Timaru. The

Clandeboye coal ash will be used to cover and seal the sulphide-rich rock in addition to the oxygen – water exclusion benefits the coal ash also provides a source of alkalinity that will seep done through the overburden rock neutralising acidity. This means that we can turn our acid rock drainage research into a regular part of Stockton's mining operations. Previously, coal ash was viewed as waste and sent to landfill.

The coal ash acts as a very effective barrier to water. In fact, our trials with the 500-tonne pads have shown that during heavy rains which we often get at Stockton, the water will not soak in more than 10 cm. However, once it is wet, it holds this moisture and reduces the capacity for oxygen to pass through into the underlying sulphide-rich rock.

### Treating ARD

Earlier this year we carried out trials, approved by regulatory bodies, to test the effectiveness of limestone dosing in the Mangatini Stream to improve downstream water quality. A pH of 5 was achieved which, if it can be successfully maintained, should encourage increased biodiversity and whitebait back to the Ngakawau River. Solid Energy plans to discharge up to four tonnes per hour of ultrafine limestone into the Mangatini Stream. A rise in the pH level will, at the same time, reduce concentrations of trace elements in the water.

This work is being extensively peer reviewed by independent experts and has the support of local stakeholders: the local community, the West Coast Regional Council, the Buller District Council and the Department of Conservation.

### Cover story continues...

fish species in these catchments. This will provide valuable shared baseline data to incorporate into and measure the impact of the water management work.

The second phase of the water management project, which will run in parallel with the first, will treat water runoff

from roads, rehabilitation sites and other mine areas, all of which may have low pH levels. Solid Energy expects to finalise plans for treating this water in the near future. Options include a large dam and/or water treatment facility on the Mangatini Stream. Solid Energy aims to complete the water treatment project by 2010.

## The 'orange' river

In March 2005, Solid Energy began stripping overburden (material above the coal) in The Rockies area of Stockton Mine.

This proved to be almost 100% mudstone, producing more than twice as much acid and associated dissolved metals as the mixed sandstone-mudstone overburden normally found at Stockton.

As a result, the mean dissolved iron concentrations in Mangatini Stream, a tributary of the Ngakawau River has doubled since March 2005. The dissolved iron in the site runoff converts to a non-toxic iron hydroxide when the pH level is between 3.5 and 4.2, showing as an orange sediment on the stream bed. Until March 2005 this type of impact had been confined to a small area in the Ngakawau River at the base of the Mangatini waterfall.

Since then pH in the Mangatini Stream has been often less than 3.5. When the Mangatini Stream mixes with the Ngakawau River the pH rises above 3.5 and, as a result, the iron hydroxide precipitation

reaction is now occurring more often in the main Ngakawau River. When river flows are low the orange sediment can be seen in the Ngakawau for at least 500 metres below the Mangatini waterfall.

This sediment is only harmful to ecology if it 'cements' in the stream bed and stops macroinvertebrates living in ecological niches. But it is constantly washed away by the frequent large flows in the river. Although this is a recognised aesthetic issue, the current ecological effects are minimal, and will be addressed by limestone dosing.

The recent limestone dosing trials in the Mangatini Stream have successfully reduced dissolved iron concentrations by 90%. The planned limestone dosing will visibly reduce the amount of orange sediment in the river bed.

Some of the orange sediment in the Ngakawau River catchment is actually iron bacteria, a natural bacterial slime that occurs when bacteria feed on natural iron in water. Charming Creek, a tributary of the



Ngakawau River

Ngakawau River, is not greatly affected by ARD but has significant natural iron bacteria living on the stream bed.

## What is Acid Rock Drainage?

Acid rock, or acid mine, drainage (ARD) occurs naturally in many environments as part of the weathering process of rocks that contain sulphide minerals such as pyrite. It is intensified by large-scale earth works typical of mining and other large construction activities (e.g. roading).

ARD is the outflow of acidic water from disturbed sulphide-rich rock and may contain high concentrations of dissolved irons. The formation of ARD is a natural process that occurs when sulphide minerals are exposed to water and oxygen, although the rate of formation is increased by quarrying processes.

ARD affects natural waterways by decreasing the pH level of the system and this in turn may have negative impacts on the aquatic ecosystem.

Neutral water has a pH value of 7.0. Anything below that is more acidic; anything above is more alkaline. Natural dissolved organic acids may affect the pH of the water which can result in pH values of about 4.0, which is common for the brown waters of the West Coast.

ARD can also contain higher levels of dissolved metals depending on the composition of the rock that is exposed. These can include iron, aluminum, nickel and zinc.

*Solid Energy's Dr Phil Lindsay and environmental graduate, Ashley Shadbolt examine a limestone drain channelling stormwater away from mined areas. By lining on site drains with limestone, water quality is improved.*



## Millerton Reserve and Walking Tracks

The Millerton Reserve tracks are maintained by Millerton resident John Ferguson and supported by Solid Energy. The reserve has two main tracks, the Escarpment Track and the Pack Track.

The Escarpment Track is a hearty 45-minute walk to the top of the ridge, suitable in almost any weather, with breathtaking views (on a good day) over the township and sea. The Pack Track is a 3 km walk along the side of the ridge, passing through the Old Dip Mine entrance, a grove of ancient Rata, under a warm waterfall and sulphurous stream and winding its way

towards the Stockton aerial ropeway at No 4 Station. There are several clear lookouts along the way. The track is best traversed on dry days with a sturdy pair of boots and steady footing for the few steep creek crossings. A bridge for crossing some of the more difficult creeks may be created in the future.

John is also maintaining a number of other Millerton tracks that lead to spectacular views of the Millerton waterfall, the old Millerton water supply dam and the brake house from the Granity Incline. John and other Millerton residents ensure

that the Information Centre established by Leicester Kyle (see page 4) is opened each day for visitors.

Other maintenance and development projects currently being worked on at Millerton include: the 100 steps (part of the historical miner's trek to work each day), the bathhouse and the precise stonework of the mine portals.

The possibility of reopening part of the Granity Incline tunnel to connect with existing walking tracks in the area is also being investigated. These could possibly link with redundant parts of the Millerton Road.