The Future of the Mataura Valley

Landcare Mataura

Landcare Mataura has a simple objective:

" to maintain and enhance the land and surrounding environment within the Mataura Valley"

We are deeply concerned about recent proposals for extensive coal mining in the area, in particular the lack of relevant information available to the general public. We would like to start a much needed debate about the Mataura Valley and its future. We hope this document will provide some much needed background information on lignite, the mining projects proposed and the effects of such activities. For those interested in further reading and on-line material we have provided suitable links in the endnotes.

ALL ABOUT LIGNITE

What is Lignite?
Lignite, or brown coal, is a low grade form of coal containing relatively high moisture and low energy. Consequently, using lignite causes high emissions of carbon dioxide, the principal greenhouse gas. Products made from lignite have large carbon footprints.

Why do we have lignite at all?
Coal in the South Island occurs within defined layers deposited within the Cretaceous and Cenozoic sedimentary sequence. These layers rest unconformably on a greywacke basement. Over millions of years as the layers have moved, forced up and down by tectonic pressure, the depressions formed allowed fluvial (river) sediments to be deposited along with coal measures. Regional subsidence that allowed the sea to cover large areas of Southland resulted in marine transgression, and some of the fluvial sediments were deposited in a marginal marine setting. All of these deposits have been compressed and deformed by plate boundary collisions and uplifting over time, further fluvial deposits accumulated in adjacent tectonic basins. Continued uplift caused localised deformation of these basins where sediment became unconformably overlain again by younger fluvial deposits. Successive uplift and erosion of the whole sedimentary sequence has resulted in the present complex topography we see today.

SOUTHLAND LIGNITE

The Southland lignite reserves
Parliament's chief environmental watchdog Dr Jan Wright, the Parliamentary Commissioner for the Environment (PCE), estimates Southland has at least 6 billion tonnes of lignite. The main deposits lie under Gore, Croydon, Waimumu, Mataura, Edendale, Morton Mains, Ashers-Waituna, Waimatua and Makarewa, and further sites exist in the Home Hills and Hawkdun. [13] One of the largest deposits stretches from just north of Gore to the Hokonui mountains, down the Mataura Valley to Edendale. Seam depths vary from 80m – 200m, however some studies indicate a depth of 300m. The Mataura valley sits 60-80m above sea level, with the majestic Mataura river flowing through it. This essential watercourse could end up no more than 800 metres from the main lignite mine and its facilities. For a better understanding of the lignite reserves in the Mataura Valley, see the map supplied.

Southland Lignite: What is being proposed?
There are a number of major projects under consideration. They involve the conversion of lignite to liquid fuels, urea and processed heating fuels. Those companies holding exploration permits or mining licences are Solid Energy, L&M Group and a recent newcomer to the scene: Greywolf Goldmining, a joint partner with Qinghua Group. As of January 2011 no consents have been lodged, but a number of reports have surfaced in local and national newspapers outlining the proposed projects.

THE PROPOSED PROJECTS

The Briquette plant
A pilot plant will cost $15 million to build and produce about 100,000 tonnes of briquettes for the domestic market. If a full scale plant is built, Solid Energy claims that it would produce up to 1 million tonnes for export by 2014, creating 12 permanent jobs.

The Lignite to Urea plant
A possible investment of $1.5 billion for a lignite-to-fertiliser plant producing 1.2 million tonnes of Urea from 2 million tonnes of coal per year by 2016, which would be about twice New Zealand's current urea use. Reports have speculated that 200 jobs will be created but there has been no clarification on how many would be permanent. Depending on world urea prices, potential earnings are claimed to be up to $377 million a year.

The Lignite to Diesel plant
"The 1.35 billion tonnes of lignite in the Gore district would be enough to create about 170 billion litres of diesel. If produced tomorrow, it could run New Zealand's entire diesel vehicle fleet for more than 55 years." [1] There are an estimated 6 billion tonnes of recoverable Lignite with Southland and Otago region.

Solid Energy's proposal is to produce 35,000 barrels of diesel a day or about 2 billion litres per year. It would utilise 12 million tonnes of lignite, and cost upwards of $1-$2 billion. [2]

L&M Group's proposal is even bigger. It would produce 50,000 barrels a day or 3 billion litres of diesel per year, equivalent to New Zealand's entire diesel use, from 12-17 million tonnes of lignite per year. [2]

What does this all mean in practical terms?
Initial planning is underway for small scale prototype facilities, but significant obstacles need to be addressed before such projects can progress. Yet it is not the logistics of mining operations, or even the commissioning of processing facilities - prototype or otherwise - that should be our biggest concern. The greatest threat to the future development and wellbeing of the area is the inherent risk of undertaking such a massive project.

The projected costs for facilities alone will be into the billions, at full capacity, never mind the total upgrade of roading and rail infrastructure and port facilities needed. Then you have to consider the government's attitude to Emissions Trading Scheme (ETS) costs, how much of the carbon generated will fall within the ETS and who will be made to pay for it. As discussed below, our liabilities could be from $275 million to $1 billion per year.

Finally, if Carbon Capture and Storage (CCS) is attempted for these projects, the cost could easily be as much or greater [10], especially since we have no natural storage location for carbon dioxide close to the lignite deposits. To amplify the risk, all of this time, effort and investment could be halted in its tracks if a global mandate to restrict carbon production becomes enforceable.

MASSIVE PROJECTS, MASSIVE RISKS, MASSIVE ENVIRONMENTAL EFFECTS

If all three projects reach full production within the next 10 years, the Mataura Valley could see up to 6 million tonnes of transportable products leaving the area a year, which equates to 114,000 trucks or 3782 train loads every year. That is over 300, 53 tonne trucks or 11, 30 wagon long trains running per day. This doesn't even take into account transportation of lignite between mining and processing plants - a further 33,000,000 tonnes of transportable products - , or redistribution of overburden, for which no figures are available.

Solid Energy now owns over 3000ha of land in the area and continues to buy more. L&M Group has exploration permits over 20,000ha, but we have no information on how much land they actually own.

"Greywolf is taking over a lignite permit at Waimumu, near Gore, which has an estimated recoverable 1 billion tonnes of low-grade lignite under permit" [3]

There is growing pressure to start lignite mining and development, but with little strategy in place from those participating or leadership from our Government.

Local environmental effects: Land usage
The coal reserves under the ground are vast and widespread, but they are also complex. This has led to continued exploratory drilling to further understand what lies within the Mataura Valley. Whatever the outcome of such work, there is little doubt that if investment into the hundreds of millions or possibly billions of dollars is forthcoming the drive for extraction of lignite will be accelerated. This extraction would cause irreversible change to the topography of the valley and the greater region, especially if you take into account the need for increased infrastructure to support such activities.

Projects of this size bring great risk. With the coal industry under increasing scrutiny of its economic benefits and its environmental and safety record, both local and national authorities will need to consider just who will gain from such an enterprise.

The talk so far has been about setting up small scale development projects, and there have been reassuring statements about reclamation of land after the coal reserves have been removed. The reality is once the top soil has been broken we will never see this wonderful fertile soil again. It will be sold on to other parties, and we will be left with the tailing and back fill from progressive mining. Soil substructure will be destroyed.

As each project comes on stream and land is cleared for factory expansion, the landscape will change from pastoral to industrial. Noise from the mining operation and the transportation of millions of tonnes of coal, diesel, fertiliser, and briquettes along with increasing dust and pollution will transform the area. Those on the borders of this enterprise will quickly come to realise that their lives will never be the same again.

"Solid Energy's new energy general manager Brett Gamble says the company will use opencast mining to recover the lignite but details, such as depth, were still being worked through as part of pre-feasibility studies. A lot depends on the scale of the mine, what technology is selected and where the company decides to mine, Mr Gamble says. The New Vale mine, at Waimumu, has been mined to a depth of about 80m but lignite does go deeper in parts. " [1] Some seams go down to 300m in depth [4].

The removal, processing and transport of lignite, soil, tailings and back fill in such quantities will destroy the environmental integrity of the Mataura Valley.

Local environmental effects: Water pollution
Water is and will become a increasing concern for every New Zealander. The Mataura Valley has a massive water catchment area. Any possible disruption to water supply, or contamination of waterways or aquifers, and the effects of industrial processes on supply will bring considerable economic consequences to the region - in particular the outlying farming community. The mining industry in New Zealand has a poor record when it comes to preventing the contamination of waterways.

"It is estimated, however, that approximately 125 kilometers of streams are adversely affected by AMD" *(note: AMD = Acid Mine Drainage, These are rivers located on the west coast of the South Island.)* [5]

Although little evidence exists to demonstrate the risk of AMD through pyrite weathering at the New Vale mine located closest to Gore, low levels of acidification have been found due to the oxidation of iron sulfide, thus mitigation processes may need to be undertaken. [6]

"Modern open-cut coal mining results in large-scale surface disturbance and locally deep excavations. Waste rock is dumped in large piles for long-term storage. These operations result in exposure of large amounts of fresh rock to atmospheric weathering and rainfall run off, which can give rise to lowered water quality." [6]

It is important to understand the geology and mineralogy of the proposed mining site. The detailed data provided from extensive test drilling will help predict the environmental effects of mining in the Mataura Valley. This data should be made widely available and there should be an extensive monitoring program to ensure water quality is not affected by mining activities.

Far too often we are not given relevant data due to claims of commercial sensitivity. This has to stop.

Regulations for treatment and prevention of known environmental issues such as AMD are vague and lack real enforcement. That is demonstrated at Solid Energy's Stockton mine which operates to government environmental

requirements under the Resource Management Act (RMA) but has still managed to poison the Mangatini Stream and Ngakawau river , which flows off the mine. Under such circumstances you have to query government regulation.

New mining developments will have to comply with the latest standards but if these are determined by background base measurements in part defined by the mining industry, then those standards will be compromised by economic rather than environmental and safety requirements. There needs to be a proper independent review of such standards which is constantly updated. The mining industry's overwhelming concern will be to keep running costs to a minimum. They cannot be trusted to self-regulate.

A note on flooding and water quality
As far-fetched as it may seem, until January 2011, no-one would have considered the flooding of an open cast mine plausible. Sadly, though, after the traumatic January floods in Queensland we may now have to consider the possible environmental hazard a major disaster could cause if toxic deposits from tailing ponds are washed or pumped from a flooded mine. This is ironic considering that the burning of coal is seen as a major contributor to climate change.

Local environmental effects: Air pollution
Toxic metals such as cadmium, lead, chromium, selenium, nickel, vanadium, copper, sulphur and fluorine as well as radioactive elements such as uranium, thorium and radium, have been identified as potential risks in mining operations. Every mining operations has its own profile of toxic elements and those peculiar to our region will have to be identified. Dust levels should be monitored at 2.5 microns.

It isn't simply the risk from mining coal but the toxic excretion of heavy metals found in overburden piles, leaching into waterways or transported on hot windy days that will cause detrimental health effects. Even the act of coal transportation brings its own risks to those situated on the main transport routes such as road and train lines if transport wagons are not properly covered.

The potential addition of tens of thousands of extra trucks on our roads together with massive mining vehicles all pumping diesel exhaust into the air will mean increased levels of diesel particulates consisting of carbon monoxide, carbon dioxide, sulfur dioxide and sulfur trioxide from the sulfur in the fuel, nitrogen oxides (NO and NO2, in combination termed NOx) and a number of low molecular weight hydrocarbons such as simple aldehydes.

All these pollutants, singly or in combination, could cause major detrimental health effects in the region. If Southlanders are to stay healthy, all the above will have to be monitored to strict environmental standards. Whoever gets the task of monitoring air quality must be seen to be independent, with the power to enforce stringent health and safety requirements if safety limits are exceeded.

Fly ash from power generation used for the processing of lignite can contain concentrated levels of heavy metals. Such toxic waste needs to be disposed of within properly regulated sites. Other industries are already disposing of such waste, albeit in smaller quantities. The question will be whether such practices are sufficiently robust to ensure safe disposal of toxic waste considering the magnitude of the proposed projects.

Dr Peter Lewis, the Northern Sydney Central Coast area director for public health, in his submission to the Department of Planning about a South Korean company's plan for the Wallarah No 2 mine in the Wyong Shire, said:

"Any increased exposure to particulate pollution is associated with increased adverse health outcomes, even if the levels are below the current guidelines," [reference needed here]

This has opened the door to questions about government pollution levels in Australia, which has tended to favour industry expansion over public health issues. This statement could have far-reaching effects on the coal industry in Australia and in other countries. Dr Lewis's submission said mines on the scale of the Wallarah 2 plan "must be considered in the context of the whole region, not as a stand-alone development".

You can read a short article and some very interesting comments on this decision on-line at the *Newcastle Herald*. [8]

One post by steve robinson, 30/10/2010 8:10:55 AM, on The Herald, describes the experiences of the local population:

"I confirm that 64% of those living within 3km of an open cut mine in the Gloucester Valley, where there is no power station, believe their health has been damaged by the mining. Those living 3 to 5km away from a mine had about half the number of symptoms but this was still substantially more than those living more than 5km away. Another subgroup studied was of people who lived very close to the railway but 7km from the mine. These results came from a survey of 101 households with domestic rain water tanks. further results about heavy metal levels in the water and soil are pending. I understand the Wallarah 2 mine will be an underground mine but their coal dump will be above ground and will have a cumulative impact with Vales Point power station emissions. We need to be told which poisons are from overburden dust, unwashed coal, coal processing chemicals, blast gases, mining vehicle emissions, train emissions. different houses have exposure to different combinations of these sources and protective measures will vary accordingly. Overseas GE CoalPlus has recently advertised antioxidant and dust suppression processes which deserve examination for possible local application."

LIGNITE AND CLIMATE CHANGE

Exploiting lignite: a major contributor to climate change
In November 2010, the Parliamentary Commissioner for the Environment, Dr Jan Wright, released a report entitled *Lignite and Climate Change: the high cost of low grade coal*. [2] This report covers both the immense quantity of greenhouse gases that would be created by exploiting Southland's lignite reserves, and the financial implications of the carbon costs of these greenhouse gases.

Greenhouse gas emissions: the quantity
According to the PCE report, there are more than 6 billion tonnes of economically recoverable lignite reserves. Taking 6 billion tonnes as a conservative quantity, and using the New Zealand government's own greenhouse gas emissions factor of 1.45 (from http://www.mfe.govt.nz/publications/climate/seip-reporting-guidance-coal-under-nzets/page3.html), we can see that at least 8.7 billion tonnes of CO2eq (CO2-equivalent) greenhouse gases will be released if all these lignite reserves are exploited.

8.7 billion tonnes sounds like a lot, and it is. By comparison, New Zealand's total CO2eq emissions in 2007 were 75.6 million tonnes. Of course, the greenhouse gases from exploiting Southland lignite wouldn't all be released at once, but exploiting Southland lignite would still cause a major leap in New Zealand's contribution to world greenhouse gas emissions.

Greenhouse gas emissions: the cost
In her report, the Parliamentary Commissioner for the Environment said:

"Responding to climate change demands behaviour change. New Zealand has made an international commitment to reduce its greenhouse gas emissions to between 10% and 20% below the 1990 level by 2020. Yet, we are on track to exceed the 1990 level by 30%. This is a huge, and very expensive, gap. One lignite-to-diesel plant will increase our national greenhouse gas emissions bill by 20% – that is an extra cost of $275 million per year at a carbon price of $50 per tonne. At a carbon price of $200 per tonne this would cost more than $1 billion per year extra by 2020.

Even without lignite use, the projected gap between our international commitments and our projected emissions is huge (24 to 30 million tonnes of CO2eq per year in 2020) and too costly to ignore. On our current path this gap will cost New Zealand in the order of $1 billion to $6 billion per year by 2020." [2]

Can we ignore our responsibilities
We could choose to ignore our international commitment to cut greenhouse gases, stating economic reasons. That would put paid to our Clean Green 100% Pure image, erode confidence in our stated desire to tackleclimate change and provide ample evidence to our export competitors that New Zealand's carbon footprint is out of control. Eventually this will lead to protectionism and closed markets. Can we risk that? Importantly, do we have the right to forego our moral and legal responsibilities to the future generation of New Zealanders?

THE SCIENCE

Making Diesel
There is more than one way to make synthetic diesel from lignite. Neither Solid Energy nor the L&M Group have announced which particular technology they will use.

The Fischer-Tropsch process is a proven large-scale lignite-to-liquid fuels technology. This technology is likely to be the preferred choice for domestic liquid fuel production from lignite unless there are radical developments in other technologies. One new technology under development, known as Ignite, produces oil and black carbon (char) from lignite and is possibly less carbon intensive than other technologies. Although Solid Energy has publicly shown interest in this technology, and has indicated plans to build a pilot plant to test it, they recently announced difficulties in achieving the necessary licence agreements.

The Fischer-Tropsch process was invented in the 1920s and commercialised in Germany in 1936. It involves two steps. First, the feedstock (which could be lignite or other coal, natural gas, or wood) is converted into syngas, a mixture of carbon monoxide (CO) and hydrogen (H2). The syngas is then converted into a chosen liquid fuel, like diesel or jet fuel.

Emissions:
- Diesel from lignite using Fischer-Tropsch technology - 5.8 kg CO2eq per litre of diesel.
- Diesel from conventional crude oil - 3.1 kg CO2eq per litre diesel
- Diesel from wood using Fischer-Tropsch technology - 0.3 kg CO2eq per litre of diesel.

Making Urea
The commercial production of urea involves first turning source material (natural gas, coal, or lignite) into syngas, a mixture of hydrogen and carbon monoxide. The carbon monoxide is then converted to carbon dioxide by reaction with steam. The hydrogen component is reacted with nitrogen from air to make ammonia. Then the carbon dioxide is recombined with the ammonia, yielding urea. This last stage is known as the Bosch-Meiser process.

Emissions:
- Urea made from coal in China - 2.1 tonnes CO2eq per tonne urea
- Urea made from lignite - 1.3 tonnes CO2eq per tonne urea
- Urea made from natural gas in New Zealand - 1.1 tonnes CO2eq per tonne urea.
- Urea made from natural gas in the Middle East - 0.1 tonnes CO2eq per tonne urea

Making Briquettes
Lignite can be converted into a product equivalent to medium-grade coal product by drying it out. This lignite product, called briquettes, can be used as a source of process heat. A briquette plant using a process called GTL technology would produce briquettes with an emissions intensity of about 1.75 tonnes CO2eq per tonne briquettes. This is similar to the emissions intensity of sub-bituminous coal, which is about 2.1 tonnes CO2eq per tonne of coal. By comparison, making and burning wood pellets generate much lower emissions. Wood pellets are already produced for domestic and industrial heating, and for export. Torrefied (roasted) wood is an even better fuel, with an energy content similar to that of lignite briquettes, and an emissions intensity estimated at around just 0.2 tonnes CO2eq per tonne of wood pellets. [2]

CARBON CAPTURE AND STORAGE (CCS): IS IT JUST A FIZZER?

When challenged about the massive greenhouse gas emissions that result from burning coal, the coal industry often answers by pointing to experiments and test projects on Carbon Capture and Storage (CCS), and saying that storing carbon dioxide underground will solve the emissions problem. But CCS is still, at best, an experimental technology, for which the claims made greatly exceed the reality. Furthermore, even if CCS works at all, it won't work everywhere: there have to be suitable places to store the carbon. We look at the claims the industry makes for CCS, and then whether these claims match up to the reality.

What is CCS?
A key component to ensuring lignite mining complies with best environmental practice is the use of CCS to capture and store carbon. Carbon Capture and Storage (CCS) is the separation and capture of carbon dioxide from gases resulting

from combustion or industrial processing of carbon rich resources like black coal or lignite. The concentrated stream of carbon dioxide is then compressed, transported and injected below ground using many of the same methods already used by the oil and gas industry. The three main types of geological storage are oil and gas reservoirs, deep saline formations, and un-minable coal beds. Over the last two years, governments around the world have invested over $26 billion in large-scale CCS projects. Currently, 80 large scale projects are at various stages of development around the world, with five already operational and one is starting construction. In October 2009 the head of the International Energy Agency Nobuo Tanaka said:

"*there should be 100 major CCS installations around the world by 2020 and 3400 by 2050. But the costs could top $56 billion by 2020, with a further $646 billion required by 2030*"" [7]

As of 2007, four industrial-scale storage projects are in operation.

- Weyburn-Midale CO2 Project is currently the world's largest carbon capture and storage project - 1.5 million tonnes CO2/yr
- Norway's Sleipner gas field - 1 million tonnes of CO2/yr
- In Salah, Algeria is a natural gas reservoir -approx 800,000 tonnes CO2/yr
- Snøhvit is the name of a natural gas field in the Norwegian Sea, situated 140 kilometres (87 mi) northwest of Hammerfest, Norway - 700,000 tonnes of CO2/yr

Could CCS make a difference?
These 4 projects manage to capture approximately 4 million tonnes (4,000,000 tonnes) of CO2 a year. Unfortunately a study by Pacala and Socolow (2004) later quoted in an article for The Geological Society of America estimated that 3 gigatonnes (GT) (3,000,000,000 tonnes) of CO2/yr would have to be sequestered by CCS to make a difference [9]. If CCS is to become a viable prospect not only would we need to increase the number of CCS projects by a factor of 1000, but their capacity to store CO2 safely for several hundred years will also need to increase. Losing 0.5% of the CO2 per year over 200 years due to leakage amounts to a total loss of 64%. This means that in order to ensure that CCS is effective, one must be able to contain the CO2 and to predict and measure extremely low leakage rates.

You also have to consider the cost of CCS, McKinsey predict a range of 60-90 euros / tonne of CO2 and possibly rising to 200 euros, that would cost between 180-270 billion euros rising to 600billion (USD240-360-800 billion). [10]

Does CCS work, and is it safe?
As noted above, CCS has to work for a long time. Some projects established in favourable conditions, such as Norway's Sleipner project, appear to be working as planned so far. But the story is very different for some other projects.

Phase I of the Weyburn-Midale Carbon Dioxide Project in Weyburn, Saskatchewan, Canada has determined that the likelihood of stored CO2 release is less than one percent in 5,000 years, but The Canadian Press recently reported the following in January 2011:

Land fizzing like soda pop: farmer says CO2 injected underground is leaking
"A Saskatchewan farm couple whose land lies over the world's largest carbon capture and storage project says greenhouse gases seeping from the soil are killing animals and sending groundwater foaming to the surface like shaken soda pop"

The news article went on to say:

"Paul Lafleur of Petro-Find Geochem found carbon dioxide concentrations in the soil last summer that averaged about 23,000 parts per million — several times those typically found in field soils. Concentrations peaked at 110,607 parts per million. Lafleur also used the mix of carbon isotopes he found in the gas to trace its source."

"The ... source of the high concentrations of CO2 in the soils of the Kerr property is clearly the anthropogenic CO2 injected into the Weyburn reservoir," he wrote.

"The survey also demonstrates that the overlying thick cap rock of anhydrite over the Weyburn reservoir is not an impermeable barrier to the upward movement of light hydrocarbons and CO2 as is generally thought." [11]

As this article clearly demonstrates, some CCS projects running today are causing problems almost immediately. What might happen over the lifetime of such projects?

Is CCS feasible in Southland?
"In practice there are many difficulties in storing carbon dioxide underground. A CCS reservoir must be secure, empty and big enough. If the reservoir seal is broken the carbon dioxide could leak out. This can happen slowly over time or abruptly. Clearly, the leak-tightness of a reservoir must be understood before it can be considered a reliable place to store carbon dioxide. This is an expensive undertaking if the potential reservoir is deep underground, let alone under water. At present there is no known suitable reservoir to store carbon dioxide from a South Island lignite industry. While New Zealand has several sedimentary basins that might be appropriate for carbon dioxide storage, only the Taranaki Basin has been explored to any great extent. There may be suitable formations in Southland or offshore but none have yet been adequately characterised. One of the most promising storage prospects, the Great South Basin, may never be viable. ExxonMobil and Todd Energy recently announced that they were abandoning their current exploration licence there, because the area presented a "high technical risk... amplified by the remote location and the hostile environment." [2]

In summary, then, CCS is a highly expensive, unproven technology, and some test projects have already run into major difficulties. Even if CCS works elsewhere – still an open question – there is no evidence that it would work in Southland or be safe for Southlanders.

Storing carbon in new forests
When trees grow they remove carbon dioxide from the atmosphere and store the carbon in wood. Over long periods of time continual greenhouse gas mitigation requires a continually expanding permanent forest. This is because a forest stops removing carbon dioxide from the atmosphere when it is mature. Consequently, growing trees for mitigation cannot go on indefinitely. A plant making 35,000 barrels of diesel per day from lignite will emit an extra 5.5 million more tonnes of greenhouse gases per year than the same amount of diesel made from conventional crude oil. It would take between 190,000 hectares to 320,000 hectares of new plantation forest to offset these extra emissions. To make the diesel produced from lignite effectively carbon neutral, about twice this forest area would be needed. This would increase the total amount of land in plantation forestry in New Zealand by about 20% to 30%. Again, such a forest would only supply credits for about 25 years; after this time more forest land would be required. [2]

A final word
Although every attempt has been made to depict the activities of mining interests accurately, this document simply represents our understanding of the underlying coal reserves, the proposed plans to mine, and the risks involved. We feel this information should be open and transparent for all to see. No mining interest has yet made its final plans public. We hope you will join us in asking the questions that need to be answered. You can contact a member of landcare mataura at the following email address:

mataura_landcare@yahoo.co.nz

Resources
If you are interested in the effects of corporate mining on small communities then take a look at these videos on-line. The Four Corners presentations from Australia are approximates 45mins long and probably represent the closest thing to the challenges we will face in the Mataura Valley. The other videos give a small insight into the issues of letting big mining interests over run small communities. We have also included some other on-line resources.

Coal Ash, to find the video report type coal ash into the search box
http://www.cbsnews.com/

Clean Coal: Dream or Reality?
http://www.cbsnews.com/video/watch/?id=4969906n

Clean Coal Dilemma
http://www.cbsnews.com/video/watch/?id=4964182n

Four Corners – A dirty business
http://www.abc.net.au/4corners/special_eds/20100412/dirt/

Four Corners – The coal nightmare
http://www.abc.net.au/4corners/special_eds/20100412/dirt/

Coal action network
http://coalactionnetworkaotearoa.wordpress.com/

10 Reasons Why Converting Lignite Coal to Diesel is Insane (Denis Tegg, Transition Towns New Zealand/Aotearoa)
http://www.transitiontowns.org.nz/node/2904

Prospects, a movie about 1980s Coromandel communities faced with large scale mining
trailer: http://www.youtube.com/watch?v=QICSJK7LXGo
The whole film is for sale here: http://filmshop.co.nz/products-page/natureenvironmental/prospects/

Guy Pearse has written and published several interesting articles and on-line presentations on the mining influence in Australia. If you want to find out how the coal industry has affected Australia's economy, try this link:
http://www.themonthly.com.au/climate-series-quarry-vision-guy-pearse-coal-and-climate-change-peter-mares-1527

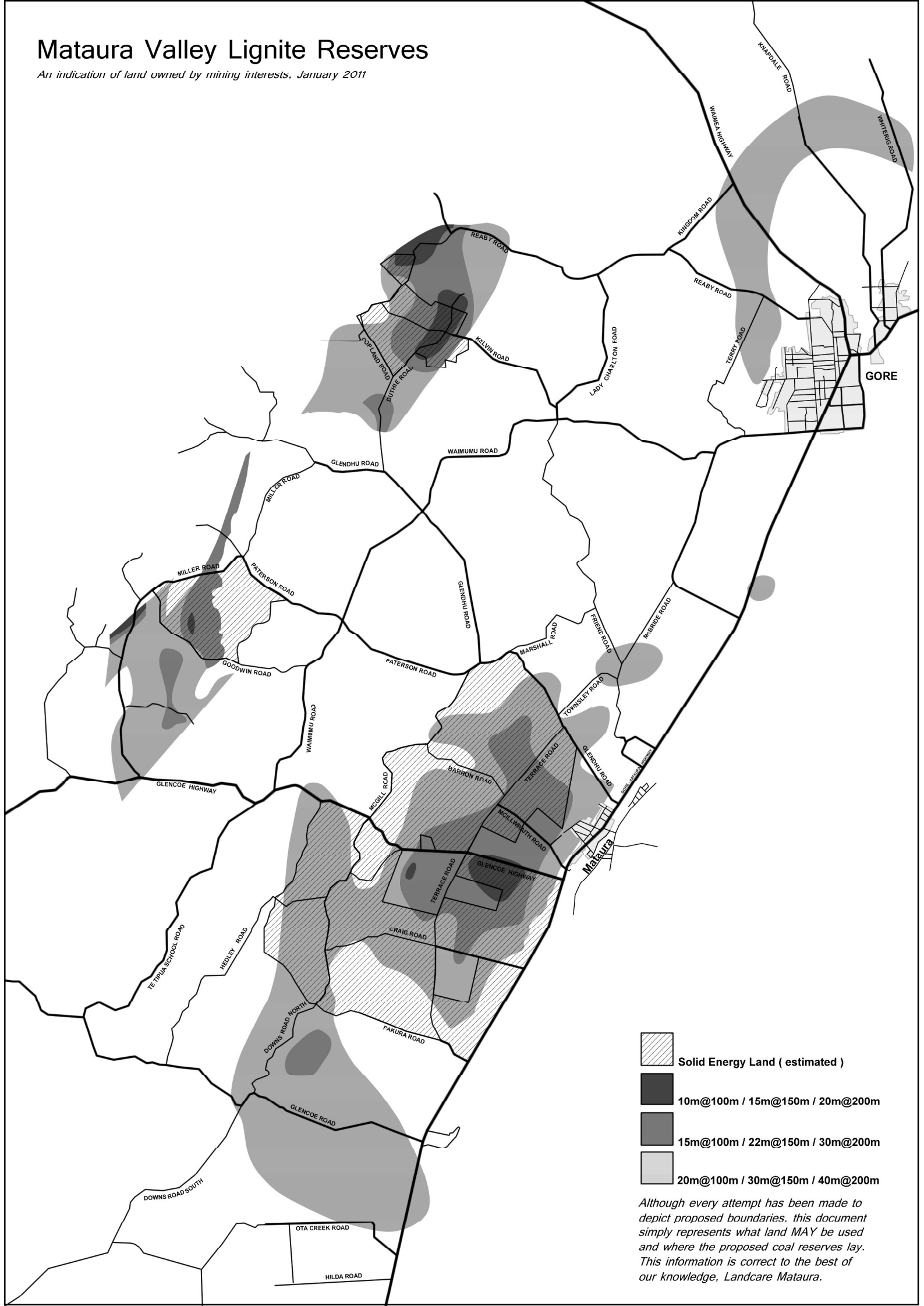
Endnotes

[1] - *(The southland times / Into the unknown / 2010_10_02 / Sonia Gerken)*
[2] - (*The Parliamentary Commissioner for the Environment / Lighnite and climate change: The high cost if low grade coal / Dr Jan Wright / November 2010) Available at* http://www.pce.parliament.nz/publications/all-publications/lignite-and-climate-change-the-high-cost-of-low-grade-coal/
[3] - *(ODT 08/12/2010, by Simon Hartley)*
[4] - (Sherwood 1987, http://www.minerals.co.nz/html/main_topics/minerals_industry_in_nz/coal/coal_overview.html)
[5] - *(Reclamation Matters issue 1, 2007, Acid Mine Drainage in New Zealand, Dave Truman, CRL Energy Ltd)*
[6] - *(Stratigraohical controls on water quality at coal mines in southern New Zealand, March 2008, Craw,D., Mulliner, T., Dept. of Scientific and Industria Research, Royal Society of New Zealand)*
[7] - *(* http://www.energyefficiencynews.com/i/2485/, 14/10/2009 *)*
[8] - *(* http://www.theherald.com.au/news/local/news/general/coal-dust-warning/1983284.aspx *)*
[9] – *Note: 3 Gt CO2/year needs to be sequestered by CCS to have a significant effect. To put this amount into perspective, this is about one-eighth of the current global CO2 production. Human CO2 emissions in 2008, from fossil fuel burning and cement production, was around 32 gigatonnes of CO2 (UEA).*

[10] - (What is the cost of CCS? http://www.bellona.org/ccs/ccs_blog/1237888153.43, McKinsey report, *November 2008 McKinsey,* http://www.mckinsey.com/clientservice/sustainability/ *, Realistic Costs of Carbon Capture,* http://belfercenter.ksg.harvard.edu/publication/19185/realistic_costs_of_carbon_capture.html *)*
[11] - *(By: Bob Weber and Jennifer Graham, The Canadian Press Posted: 01/11/2011,* http://www.winnipegfreepress.com/greenpage/environment/carbon-injected-underground-now-leaking-saskatchewan-farmers-study-says-113276449.html *)*
[12] - *(* http://blogs.crikey.com.au/pollytics/2010/06/15/how-profitable-is-mining/ *)*
[13] - *(Radio New Zealand News interview,* http://www.radionz.co.nz/news/national/63707/southland-lignite-should-be-off-limits-commissioner *)*

Mataura Valley Lignite Reserves

An indication of land owned by mining interests, January 2011



Although every attempt has been made to depict proposed boundaries, this document simply represents what land MAY be used and where the proposed coal reserves lay. This information is correct to the best of our knowledge, Landcare Mataura.

Lignite in the Matauar Valley - Key facts and figures

- 6 billion tonnes of recoverable lignite
- Seam depth 80m – 200m
- 3 major players, Solid Energy, L&M Group, Greywolf partner of Quinghua Group
- 3 projects proposed
  1. The Briquette plant
  2. The Lignite to Urea plant
  3. The Lignite to Diesel plant
- Yearly tonage of lignite removed, at full capacity, 33 million tonnes of lignite
- Yearly production of transportable goods, briquettes, urea, diesel, at full capacity, 6 million tonnes
- 114,000 truck or 3782 train journeys every year . That would be 300, 53 tonne trucks or 11, 30 wagon long trains every day, that would triple the capacity of freight trains in the Southland region
- Land under ownership or granted exploration permits 23,000ha
- Investment in proposed projects upwards of 6 billion, not including upgrade of infrastructure
- 8.7 billion tonnes of CO2eq (CO2-equivalent) greenhouse gases will be released if all these lignite reserves are exploited
- New Zealand's total CO2eq emissions in 2007 were 75.6 million tonnes
- 3 gigatonnes (GT) (3,000,000,000 tonnes) of CO2/yr would have to be sequestered by CCS to make a difference. The world creates about 24GT of CO2/yr
- Liabilities to the ETS scheme $275 million to $1 billion per year. On our current path this gap will cost New Zealand in the order of $1 billion to $6 billion per year by 2020
- Carbon Capture and Storage of 8.7 billion tonnes of CO2 eq greenhouse gases would cost over $108 billion at $12.5/tonne of CO2
- One lignite to diesel plant will create 5.5 million more tonnes of greenhouse gases per year than conventional crude oil.
- 190,000 hectares to 320,000 hectares of new plantation forest to offset emissions.
- 640,000 hectares to reach carbon neutral status, an increase of 20% -30% of land in plantation forest
- After 25 years more forest is required.