Latrobe Valley 2100 Coal Resources Project

Final Report

September 2005

LATROBE VALLEY 2100 COAL RESOURCE PROJECT

FINAL REPORT

JULY 2005

Prepared by GHD Pty Ltd

For the Department of Primary Industries

funded on a grant from the

Australian Government Department of Industry, Tourism & Resources (DITR) under its Regional Minerals Program.

Other Sponsors:

Department of Sustainability and Environment

Gippsland Water

HRL Developments Pty Ltd

International Power – Hazelwood

Latrobe City

Loy Yang Power Management

Monash Energy Ltd

TRU Energy

VEMCO Australia

West Gippsland Catchment Management Authority

Executive Summary

This study assesses the potential development of the Latrobe Valley coal fields to the end of this century. It also reviews available coal resources and regional environmental, social and economic impacts of its use and recommends action to protect these coal resources for future use.

Latrobe Valley brown coal has been the primary energy source for electricity generation in Victoria during the 20th Century. However, its continued use throughout the 21st Century is less certain due to concerns about greenhouse gas emission levels that are relatively high. Other viable generation sources for growth and replacement include natural gas, nuclear energy, renewables – using wind, water or biomass resources, or interstate generation based on black coal. Nuclear energy has limited community support at this time and interstate generation requires substantial infrastructure without significant benefit.

Considerable research and development effort by government and industry is focussed on improving the efficiency of the utilisation of brown coal and in ensuring significantly lower greenhouse gas emissions. New technology developments are being considered for pre-drying of brown coal, gasification, power generation and CO_2 collection, transportation and geosequestration. It is expected therefore that new brown coal plants will be quite different from existing power stations. The coal will be directly gasified, pre-dried and gasified, or, processed in an ultra super-critical boiler resulting in significantly lower carbon dioxide (CO_2) emissions. Products from these new plants will include electricity, activated carbon, synthetic gas (syngas) or hydrocarbon products such as a low sulphur diesel.

This study examines alternative scenarios for generating electrical power to 2100. The purpose of these scenarios was to establish the range of possible brown coal usage over time based upon the likely thermal efficiency of emerging technologies. No attempt was made to analyse the relative costs or environmental impacts of these technologies as that was not necessary to achieve the objectives of this report. In each scenario examined, the use of natural gas and renewable energy for power generation was found to grow significantly from current levels. However, within the range of assumptions used, power generation from brown coal is expected to remain an important part of the National Electricity Market and the principal base load power generating energy source for Victoria. Brown coal is also likely to be utilised for the production of syngas and other hydrocarbon products.

This study demonstrates that continued extraction of brown coal for power generation and other saleable products will be required for the foreseeable future in the 21st Century and that it can continue to deliver acceptable economic, social and environmental outcomes. Protection of adequate quantities of this coal resource for the use of future generations is therefore essential. For planning purposes, Scenario 3, in which brown coal generation and conversion plants meet environmental requirements, are competitive and provide an industrial base for Victoria; is proposed as the basis of expected brown coal consumption to 2100.

The brown coal resources in the Latrobe Valley extend from Moe to Rosedale and include working mines and large coal resource areas which are yet to be allocated for development. All coal resource areas were reviewed and ranked after considering their geological setting and environmental, community and economic factors of utilisation. It is anticipated that mining activities will be within areas ranked 1 (most likely to proceed) and 2 (likely to proceed) in this study. It is recommended that these areas are protected by land zoning to prevent alternative incompatible land uses. This allows future generations to utilise those coal resources as the need arises. Protection of these resource areas requires changes to the land planning schemes in both Latrobe City and Wellington Shires.

A consequence of this study includes the release of land previously zoned for external overburden dumping at Andersons Creek and for a major Morwell river diversion to the east of Morwell. Government agencies and industry consulted during this study are of the view that both of these are no longer necessary.

Coal mines in the Latrobe Valley are deep and extend over large areas. Rehabilitation of land for long-term sustainable use is an important part of the utilisation of the resources. However as there is insufficient overburden to completely refill these mines alternative rehabilitation options have been reviewed. A long-term rehabilitation option was to fill the worked out mines with water. As it is now anticipated that there will be insufficient water to fully fill current mines at the end of their life lowered landscape options should be considered. As new rehabilitation standards are developed, these should be the basis for new project designs. However, for existing mines that have rehabilitation plans approved under the prevailing *Mineral Resources Development Act 1990*, alternative or transition arrangements may need to be negotiated with existing operators to incorporate new rehabilitation requirements. Opportunities to extend current mines rather than commence greenfield mines or to promote backfilling into adjacent mines and to avoid external dumps should be rigorously evaluated and facilitated by Government.

This study reviewed regional impacts from the continued use of brown coal. Water requirements for new technology brown coal plants are predicted to be significantly lower than for current plants. This, combined with the proposed Gippsland Water Factory and the proposed diversion of treated water from Melbourne's Eastern Wastewater Treatment Plant, provides opportunities for increasing environmental flows and other uses from surface water flows. Open Cut mining does require continued pumping from deep aquifers that will result in an extension of existing ground settlement. Ground settlement has been occurring for the past 40 years, is gradual and uniform and has little apparent regional impact. This study did not discover any regional issue that would prevent continued use of the brown coal resources. Nevertheless, each new project will have to meet contemporary environmental standards at the time ensuring low impacts on the Latrobe Valley.

This study has found that the major infrastructure services in the Latrobe Valley are adequate for present use and are capable of meeting future requirements. However, if new technology development result in high demand for rail, augmentation may be required. The impact of new facility construction on hard and soft infrastructure and employment depends on individual project requirements and their timing. Provision should be made in future Government strategic planning to meet construction peaks. Regional issues requiring government initiative are likely to result from CO_2 sequestration studies to collect, transport and store CO_2. In places, the Princes highway is close to, or covers coal resource areas, both to the west of Morwell and between Morwell and Traralgon. It is recommended that the Traralgon By-pass alignment and proposed new land uses west of Traralgon, should be located to minimise adverse impacts on the utilisation of the adjacent Coal Resource area. Alternative alignments for the transport corridor to the west of Morwell should be considered in long term strategy planning.

This project has established a range of likely brown coal demand scenarios, has identified the land requirements in the Latrobe Valley to 2100 and the associated planning changes necessary to protect the highest value coal resources for future use. It is anticipated that new brown coal technology will be more efficient, emit lower levels of greenhouse gases, use less water and that new projects can be managed so that the use of these coal resources can be achieved with acceptable impacts on the environment.

Context

"The Latrobe Valley 2100 Coal Resource Project (LV2100) will develop a strategy to guide planning and sustainable mine development practices for brown coal in the Latrobe Valley".

The vast Latrobe Valley brown coal resources have underpinned the supply of low cost, on-demand base load electricity to South East Australia for most of the 20th Century. In the first decade of the 21st Century the role that brown coal will play in the future is coming under considerable scrutiny. The adoption of sustainable development principles by communities, industries and governments is catalysing a fundamental reassessment of how societies will obtain their basic needs (water, food, energy) in the future.

Worldwide recognition of the threat of global warming, induced principally by anthropogenic carbon dioxide emissions, cannot be ignored. Further it is generally acknowledged that, in order to stabilise atmospheric greenhouse gas concentrations at levels which will minimise harmful impacts, deep cuts in global emissions will be required within the 21st Century. Some countries have already set long-term targets for such reductions. Australian governments, at both the Australian and state level, are committed to meeting the national target for greenhouse gas emissions under the Kyoto Protocol, although there is considerable debate about how best to achieve this goal. As brown coal use results in some 15% of Australia's total greenhouse gas emissions, it is inevitable that pressure to curb existing and future emissions will be an important consideration in the future debate regarding energy supply.

The need to adopt sustainable water use practices is also now firmly on the policy agenda for government. Again the practices of the 20th Century are now recognised as unacceptable and unsustainable and major changes to water pricing, use and reuse are being developed and implemented. Power generation using brown coal currently requires large amounts of water and will therefore be part of these considerations.

Fortunately, the brown coal resources in the Latrobe Valley are very thick resulting in low land disturbance in relation to the amount of coal produced. Even with this small mining footprint, mining does affect relatively large areas of land within the Latrobe Valley and it is natural that the consideration of sustainability principles will focus attention on how land can be best rehabilitated for use in the post mining stage.

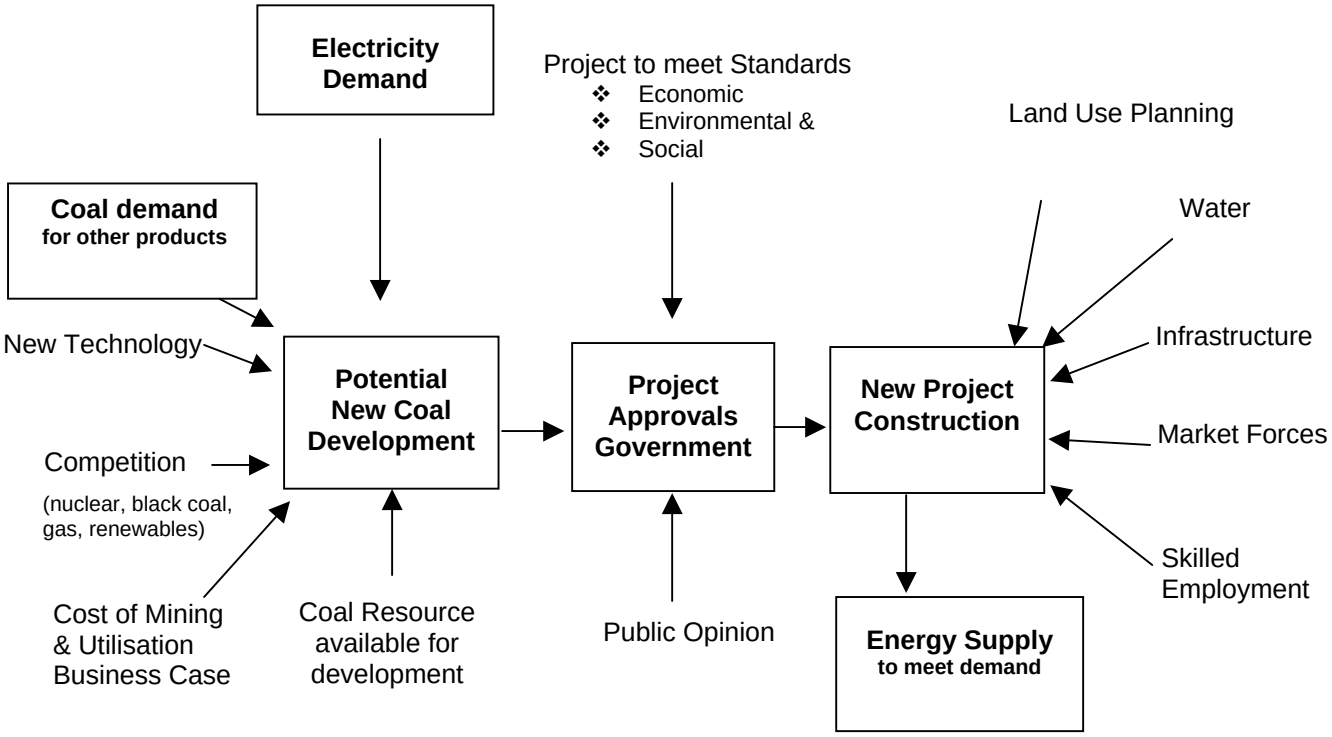
Finally, the utilisation of all fossil fuel based energy supply is under scrutiny from both cost and ultimate resource life perspectives. World oil, gas and coal supply/demand challenges are influencing availability of energy sources and their price. In this situation consideration of other energy options, including new conversion processes for large available energy resources, such as occur with brown coal, are inevitable.

Against this background it is to be expected that the role of brown coal will receive considerable scrutiny from the community, industry and governments. There is no doubt that the application of a range of different technologies, many of which are either mature or comparatively well understood, can lead to the production of electricity and a wide range of other products, such as gas or liquid fuels, from brown coal. However, brown coal is not the only option for many of these products. Renewable energy sources, natural gas and nuclear could all play a role to varying extents in the move towards a carbon constrained

energy future. The ultimate proportions of each will depend upon the relative costs, technical capability, community attitudes and government incentives.

However, the LV2100 Coal Project is not intended to evaluate or promote the continued use of brown coal. There are various commercial, government and joint initiatives which are targeted at evaluating, developing and implementing various aspects of future coal utilisation. Any proposal for a new coal based project arising from these initiatives will need to undertake a specific environmental impact assessment and government approval process before it can proceed.

The following model represents those factors that are likely to influence future coal use.



The LV2100 Coal Project aims to identify possible coal requirements to 2100 and to provide a strategy to guide land use planning in the Latrobe Valley. Coal predictions make the assumption that new technology for coal conversion will successfully meet community expectations especially regarding greenhouse gas emissions and that projects will be compatible with the principles of sustainable development. Planning for communities and infrastructure can then be made against the background of potential coal development, leaving future generations with the maximum flexibility in their decision-making.

Contents

Table Index

Figure Index

Appendices

1. Introduction and Background

1.1 Study overview

The Latrobe Valley region, 150 km to the east of Melbourne, is a growing and vibrant community with employment diversity in agriculture, services, industry and tourism.

Local brown coal resources provide the bulk of Victoria's electricity supply needs and forms a foundation of industry in the region. Coal mining exceeding 60 million tonnes per annum (Mtpa) at Yallourn, Hazelwood and Loy Yang mines make Latrobe Valley one of the premium energy regions in Australia. These coal-based projects have long life cycles, providing stability for the region, employment and opportunities for service industries. The vast scale and readily available coal resources in the Latrobe Valley also provide prospects for future growth. New projects will require construction and operational teams and the activity will enhance support industries. To gain approval, new projects will need to provide economic benefit as well as meeting social, environmental and infrastructure requirements, including reduced greenhouse gas (GHG) emissions and finding sustainable solutions for the whole community.

Brown coal resources in Victoria, and in particular the Latrobe Valley, are vast and sufficient to meet energy demands well into the future. To quote the recent Australian Government White Paper "other than nuclear power, coal offers the only real energy source for electrical power in Australia" – a solution to GHG emissions will be found. Similarly, the Victorian Government's Position Paper "The Greenhouse Challenge for Energy" states that "brown coal energy is likely to remain the most abundant and low cost primary energy source available to Victoria for some time" [Ref 26].

Future brown coal utilisation depends on advances in technology to improve efficiency and reduce greenhouse gasses. This study assumes this is achievable whilst maintaining coal-based generation competitiveness with other energy sources. Other imperatives include providing economic benefit and meeting environmental and community standards for sustainable development.

One outcome of this study is to provide advice to all levels of government on making provision for future coal development. Predicting coal demand for power generation for up to 100 years is a daunting task, when one considers the accelerating pace of technological change. Greenhouse gas and carbon trading issues will also have a major impact for future coal utilisation. Other sources of energy such as gas, water, wind and co-generation need to be considered. Brown coal is also a potential feedstock for oil, gas and hydrogen – likely to be the next energy source for transport. At a recent Exploration Licence Tender for available brown coal resources, there was considerable interest shown by private sector developers for exploration and development. At least three companies are actively working at developing coal projects for power generation or gas and diesel production. Some, of these projects could commence by 2015 with lifetimes in excess of 40 years. New coal technology demonstration projects are likely to start earlier.

1.2 Regional Minerals Program

The Latrobe Valley 2100 Coal Resource Project has been funded through the Australian Government's Regional Minerals Program, under a partnership arrangement between the Australian, State and Local Government's and industry. Similar studies have been conducted in other States and Territories under the auspices of the Regional Minerals Program.

The Regional Minerals Program was established by the Australian Government in 1996 as a key element of its strategy to encourage a coordinated approach by industry and governments to facilitating regional development of mining and processing activities (including oil and gas) and to promoting regional employment opportunities.

The program funds regional studies, carried out in partnership with industry and governments, to:

- Provide an overview of the mineral resources and processing potential of selected regions;
- Assess the infrastructure and government services of a region and develop proposals to overcome impediments to development; and
- Identify and explore wider policy issues that warrant further attention, such as specific research and development needs, land access and environmental issues

The Program funds studies to identify infrastructure requirements and options to remove regional impediments to the economic development of mineral industries. It particularly encourages enhanced levels of exploration, mining and processing activity. The studies make recommendations on ways to reduce costs to industry, encourage value-added processing and create employment in regional Australia. The program's objectives and outcomes are to:

- Enhance communication and consultation between the minerals industry and all levels of government;
- Help to clarify industry needs and priorities for infrastructure with significant gains to industry competitiveness;
- Improve the potential to expand existing operations;
- Bring forward projects earlier than might otherwise be the case; and
- Bolster regional employment opportunities.

2. Scope of Study

2.1 Scope of Study

The scope of the study addresses the challenge of encouraging economic development through the extraction of the coal resource without compromising the health or amenity of residents of the Latrobe Valley and being protective of environmental values such as native vegetation and water resources. The terms of reference for the study are presented below in Section 2.2

For the sake of clarity, except where specifically referred to as black coal, all references to “coal” in this report relate to brown coal (lignite).

2.2 Terms of Reference

The project considers the development of the Latrobe Valley coalfield over a nominal period through to the year 2100. This will therefore require an understanding of the likely mining developments through to that point in time.

In considering the strategic management of the brown coal deposits in the Latrobe Valley, overlain by urban centres, infrastructure, other industries such as agriculture, and features of the natural environment such as rivers and native vegetation, the project will, at a strategic level, examine, identify, evaluate and deliver on each of the following:

a. the likely sequence and extent of development of the brown coal resources through to the year 2100 including demand model, map(s), and, quantity and location of brown coal development,

b. infrastructure requirements for the optimum development of the brown coal resource (including downstream industries such as hydrocarbons, electricity generation and other industries), service industries and the community including details of land, transport, utilities, overburden and waste disposal, river diversion etc.,

c. likely infrastructure requirements for service industries and the community needed to keep pace with these developments, including transport, utilities, urban and green space etc.,

d. options, strategies, guidelines and recommendations within a planning framework that will optimise the placement of new and existing infrastructure,

e. research and tabulation of all aspects of surface- and sub-surface water resources on mine and downstream industry development including demand, supply, disposal, competition for water resources both during and after mining, and related environmental factors,

f. identify potential conflicts, constraints and barriers between the environment, infrastructure or land use in coal resource and associated development examined in a), b), c) and e) and outline options and/or strategies to mitigate these, and list the parties most suited to manage the outcomes,

g. review and tabulate current mine closure plans including mine rehabilitation strategies in a regional context, particularly in relation to water resources and the landscape, and comment on additional innovative options in the context of development to the year 2100,

h. review the existing principles of the Latrobe City and Wellington Shire planning schemes and recommend amendments in relation to brown coal mining and mining infrastructure in the context of the proposed development outlined above,

i. review and tabulate the likely impact of the above developments (mine, industry, urban growth, infrastructure) on the natural environment, particularly rare or threatened species and plant communities, and outline options and/or strategies to mitigate these, and list the parties most suited to manage the outcomes.

In addressing the above the consultant shall present strategies and recommendations to avoid, mitigate, manage and action any issues and/or impediments (constraints and barriers) that are identified in the project and not otherwise addressed in a) to i).

2.2.1 Greenhouse Gases

The matter of GHG as a potential constraint or influence on the development of the Latrobe Valley coal resources is subject to separate and extensive studies being undertaken by other parties. This project shall not consider the environmental constraints to coal field development due to GHG emissions. It may however consider the likely future infrastructure needs for effective GHG abatement measures ie. geosequestration.

2.3 Study Management

2.3.1 Project Sponsors

The project has been instigated by the Victorian Government Department of Primary Industries (DPI) and was founded on a grant from the Australian Government Department of Industry, Tourism & Resources (DITR) under its Regional Minerals Program with contributions from public and private sponsors. Project management was provided by Mr Guy Hamilton of DPI, assisted by a Project Management Committee (Mr Chris Fraser, Minerals Council of Australia – Victoria Division; Mr Nicholas Birch, DITR and Mr Charlie Speirs, Loy Yang Power Management). Mr Fraser chaired the principals (sponsors) reference committee.

GHD would like to acknowledge assistance provided by MAA for Energy Modelling and the sponsors and their representatives:

Mr Guy Hamilton	Department of Primary Industries (Vic)
Dr Roger Dawson	Department of Primary Industries (Vic)
Mr Nicholas Birch	Department of Industry, Tourism and Resources (Australian Government)
Mr Chris Fraser	Victorian Division of the Minerals Council of Australia
Mr Charlie Speirs	Loy Yang Power Management
Mr Richard Polmear	International Power - Hazelwood
Mr Ron Mether	TRUenergy (previously Yallourn Energy)
Mr Robert Gierer	VEMCO Australia
Mr David Lea	Monash Energy Ltd (previously APEL)
Ms Elaine Wood	Latrobe City
Mr Ted Mouritz	HRL Developments Pty Ltd
Mr Alan Freitag	Department of Sustainability and Environment (Vic)
Mr Graeme Jackson	West Gippsland Catchment Management Authority
Mr Roy White	Gippsland Water
Mr Terry Flynn	Southern Rural Water

2.3.2 Consultant Team

GHD Consulting was engaged to conduct the study. The team was led by Ken Tabart, Project Director and Ted Waghorne, Project Manager. Other key team members were:

Community Consultation	Amy Hubbard	
	Sophie Walker	
Predictive Energy Model	Dan Magasanik	(McLennan Magasanik & Associates)
Future Coal Mining Areas	Ted Waghorne	
	Paul Currie	
Land Planning	Campbell Watts	
Water	Russell Hawken	
Regional Environmental Issues	David Petch	
Infrastructure	Ken Tabart	
Mine Rehabilitation	Ted Waghorne	
	Paul Currie	

2.4 Overview of the Study Region

The Project will be limited geographically to that part of the Latrobe Valley bounded by the towns of Moe, Traralgon, Rosedale, Gormandale and Boolarra.

The Latrobe City is the third largest municipality outside metropolitan Melbourne and Geelong with over 71,000 residents. The western edge of Wellington Shire is also contained within the area of study. The Latrobe Valley region is resource rich with forest, brown coal and water resources and prime agricultural land. Major agricultural industries include dairy, beef cattle and forestry. Industry includes power generation, paper production and milk processing. There are a number of educational facilities including in the tertiary sector Monash University and the Central Gippsland Institute TAFE. Tourism is also a growing industry. There are a number of support industries government departments in the region such as the Australian Securities Commission's National Information Processing Centre. The region is the dominant source of Victoria's power generation.

The local towns are characterised by the larger regional centres of Moe, Morwell and Traralgon and also the smaller townships of Churchill, Yallourn North, Yinnar, Tyers, Rosedale, Boolarra and Gormandale. The resident population of the Latrobe region is projected to rise to 77,755 in 2021 and 79,406 in 2031. For the area of Latrobe Valley, population numbers in the 2001 Census were Moe (15,387), Morwell (13,527), Traralgon (19,614), Churchill (4,898), Rosedale (1,042) and Boolarra (478) [Ref 10].

Employment in the region is mainly in retail trade (17.05%), manufacturing (12.23%) and Health and Community Services (10.71%). The total labour force for the Latrobe Valley region was 29,074 people in 2001 with 3,541 people unemployed [Ref 10].

2.5 Glossary of Terms

Aquifer	An underground layer of rock or sediment which holds groundwater at pressure and allows water to percolate through
Brown Coal	Coal is a "fossil fuel" formed by the decomposition of land plants, that have accumulated in swampy or low-lying areas. Lignite or brown coal is younger and contains a higher moisture content than black coal. In the Latrobe Valley the brown coal is of Tertiary age.
Carbon Capture Sequestration	The capture and secure storage of carbon (generally in the form of carbon dioxide) that would otherwise be emitted to the atmosphere.
CCS	Carbon, Capture and Storage
CO_2	Carbon dioxide, a greenhouse gas that contributes to global warming.
Coal	All references to "coal" in this report relate to brown coal (lignite).
Coal Bed Methane	Gaseous hydrocarbons contained in, or extracted from, in-situ coal seams.
Coal Conversion	Conversion of coal into other hydrocarbon products, such as diesel, methanol, ammonia and hydrogen, as well as briquettes and char.
Coal Stripping Ratio	The quantity of coal relative to overburden and interseam, vertically at any point. Units [tonne (t):bank cubic metres (BCM)]

DITR	The Australian Government Department of Industry, Tourism and Resources is responsible for providing policy advice to its Ministers. www.industry.gov.au
DPI	The Department of Primary Industries is responsible for the sustainable development of Victoria's mineral, petroleum and extractive industries by: Providing strategic policy advice to the Minister for Energy Industries and Resources Regulating and promoting exploration and development Facilitation of new projects. www.dpi.vic.gov.au
EE Act	*Environment Effects Act 1978*; Victoria's comprehensive appraisal mechanism of the social, environmental and economic impacts of proposed works.
EES	Environment Effects Statement; is a document prepared under the *Environment Effects Act 1978*, which describes the likely social, environmental and economic effects associated with a proposed development. It is intended to ensure that impacts are carefully assessed before any decision is made on the proposed development.
EPA Act	*Environment Protection Act 1970*; provides legislation in Victoria for protection of the environment; promotes ecologically sustainable development, conservation of biodiversity and heritage; and fosters a cooperative approach to the management and protection of the environment.
Gasification	The process by which a solid carbon-based fuel is converted by partial combustion into carbon, hydrogen and other gas mixtures.
Geosequestration	A technology that puts carbon dioxide into deep, secure underground geological storage.
Gl/a	Gigalitre's per annum.
GJ/MWh	Specific Energy Consumption - Gigajoules per Megawatt hour.
Groundwater	Water held in the ground generally within aquifers.
GHD	GHD Pty Ltd is an international professional services company that provides leadership in management, engineering, the environment, planning and architecture. www.ghd.com.au
GHG	Greenhouse gases: those gases, such as water vapour, carbon dioxide, tropospheric ozone, methane and low level ozone that are transparent to solar radiation but opaque to long wave radiation and which contribute to the greenhouse affect.

Greenhouse Effect	The increasing mean global surface temperature of the earth caused by gases in the atmosphere (including carbon dioxide, methane, nitrous oxide, ozone, and chloroflurocarbon). The greenhouse effect allows solar radiation to penetrate but absorbs the infrared radiation returning to space.
Interburden	Non-carbonaceous material between coal seams and disposed into overburden dumps during mining.
in-situ	In the ground.
IPRH	International Power Hazelwood
JORC	The Joint Ore Reserves Committee; sponsored by the Australian Mining Industry (the AusIMM and the AIG), publishes a *Code for Reporting of Mineral Resources and Ore Reserves*.
kV	Kilovolt
Lignite	Refer Brown Coal
MCA	Minerals Council of Australia. The principal representative body of the mining industry. www.minerals.org.au
MMA	McLennan Magasanik Associates are Australian strategic consultants – with integrated energy, environmental, regulatory and process industry experience. www.mmassociates.com.au
MRD Act	The *Mineral Resources Development Act 1990*; provides a legislative framework for the development and regulation of the mineral exploration and mining industry in Victoria. The *MRD* Act applies to all minerals, including gold, coal, and mineral sands, addresses licensing and approvals, and other issues including compensation, rehabilitation and royalties for mineral exploration and development activities. The Act seeks to encourage an economically viable mining industry that makes the best use of mineral resources in a way that is compatible with the economic, social and environmental objectives of the State. A series of regulations and guidelines also apply to mineral exploration and development activities.
NEM	National Electricity Market.
NEMMCO	National Electricity Market Management Company.
Overburden	Non-carbonaceous material overlying coal seams, usually comprised of sands and clays, and placed in overburden dumps during mining.
PJ/yr	Petajoules per year
$PM_{2.5}$	Particulate Matter up to 2.5 micrometers in size, which includes toxic organic compounds and heavy metals.
PM_{10}	Particulate Matter up to 10 micrometers in size, which include smoke, dirt and dust, mold spores and pollen.

SECV	The State Electricity Commission of Victoria was a State Government instrumentality responsible for all coal winning, coal utilisation and power generation in the Latrobe Valley prior to the privatisation of assets in the 1990's.
Syngas	Synthetic gas (principally carbon monoxide and hydrogen) made by the gasification of organic matter.
t/m^3	Specific Density – tonnes per cubic metre.
VENCorp	A State Government entity within Victoria's privatised energy industries with system planning and operational and communications roles in emergency supply situations for both gas and electricity. www.vencorp.com.au
WWTP	Waste Water Treatment Plant.

3. Methodology

3.1 Methodology and Outputs

This study was carried out during 2004 and completed mid 2005. The activities and timeline for the project are shown on Figure A1 – Appendix A.

In the first stage of this study, GHD specialists examined coal resources, better coal development areas, water utilisation and land planning arrangements in the Latrobe Valley. Community consultation to assess attitudes to new coal developments was also carried out. Our sub-consultant MMA, predicted electrical power demand to 2050, within the Victorian part of the NEM using a well-proven model developed in-house.

An Electrical Demand Model was developed so that combinations of energy sources or different timing of projects can be introduced. A number of scenarios for the Victorian power sector were developed.

The project was carried out over three time periods: to 2030, 2050 and 2100. Likely coal developments to 2030 were predicted from current mine plans and projections from the holders of existing Exploration Licences. It is anticipated that new wind farms and peaking gas plants will be progressively introduced as Victoria's power demand grows in the next 10 or 15 years. A new large base load station was projected to be needed between 2015 and 2020. A number of coal conversion processes could also commence in this period. Beyond this timeframe, the Hazelwood, Yallourn and Loy Yang power stations are likely to be progressively retired requiring replacement power generation investment in new project infrastructure.

This study projects likely renewable, gas and coal power generation scenarios. Utilising new technology with higher efficiency and greatly reduced GHG emissions, brown coal is assumed to be utilised for both power generation and for conversion to other products. Whilst gas and renewable energy projects will be located across Victoria, the majority of coal projects will be within the Gippsland Region. A number of new coal mine development sites have been defined, and the need to review land Planning Schemes was examined. The impact of these coal developments on the local region, providing employment and growth but also affecting land utilisation, water resources and the environment were also assessed. Opportunities to improve mine rehabilitation practices, to use adjacent mines for overburden dumps rather than create new external dumps and to leave the land in a long-term sustainable situation was also examined. Regional aquifer management will also be a requirement of new projects needing the transfer of water extraction licences or recharge mechanisms to be put in place.

4. Stakeholder Consultation

"To inform, consult and assess community views on future coal development"

4.1 Initial Community Consultation

4.1.1 Aims and Objectives

In this phase of the study GHD aimed to have discussions that aided the formulation of future coal development options that are environmentally sensitive, financially viable and balance competing interests in the local communities. The Latrobe Valley region includes the towns of Traralgon, Morwell, Churchill, Moe, Rosedale, Gormandale and Boolarra but the Consultation Program and regional aspects where appropriate. The Consultation Program engaged a range of stakeholders with an interest in the potential impacts arising from continued mining in the Latrobe Valley. In addition to public consultation, key stakeholders from mining and power companies, water authorities; council and government representatives were engaged in Workshops.

The Stakeholder Consultation Program was aimed to inform and consult the Latrobe Valley communities and relevant agencies so that community ideas and opinions are considered in the development of the Strategy. The Consultation Program: -

- provided the Latrobe Valley communities with information about the Project in an open, accessible manner utilising a number of communication techniques and channels;
- provided the Latrobe Valley communities with an opportunity to identify key issues in relation to the Project and put forward ideas and opinions to the project team;
- documented all community responses and feedback in relation to the Project and its outcomes and ensure this information is disseminated regularly to the project team in an efficient and effective way; and
- encouraged information sharing and consultation during the project between key community stakeholders and to report back on the outcomes of the Consultation Program.

4.1.2 Key Community Stakeholders

An initial activity of the Consultation Program was the development of a contacts database utilising the Latrobe City Council's existing consultation mechanisms and other local sources to ensure all relevant stakeholders were included.

Community stakeholders for consultation activities are identified broadly as:

- Australian and state members of parliament/representatives of Shire Councils
- Current strategic or advisory committees
- Business and industry bodies
- Community groups
- Indigenous/owners of land
- Environment groups
- Rural and agricultural industry groups
- Local media.

4.1.3 Community Consultation Approach

The Consultation Program was conducted from July to November, 2004. Communication mechanisms were established prior to the public announcement of the project in preparation for enquiries, submissions and the upcoming workshops and focused interviews.

The Stakeholder Consultation Program encouraged participation by all relevant stakeholders at a number of stages during the development of the Project to enable open, effective and appropriate consultation. The following Activities Framework (Table 4.1) provides an outline of the activities implemented, integrating community consultation and communication tasks and techniques.

The Stakeholder Consultation Program drew on the outcomes of the Critical Issues Workshop, the Inception Report and a number of meetings of the principal sponsors.

Despite considerable effort, only limited numbers from the community attended public workshops. However, our assessment was that community is supportive but challenging towards continued development of the coal industry in the Latrobe Valley. Outcomes of the various consultation studies are summarised in this section. Appendix B details responses.

4.1.4 Activities Framework

A summary pf the activities carried out in the stakeholder consultation phase are outlined in Table 4.1.

4.2 Critical Issues Workshop

One of the recognised stakeholder groups comprise those agencies working within the Latrobe Valley. These include the Shires, water authorities, power and mining companies and are represented in this study as the principal stakeholders. This workshop held early in the study was aimed to consider the critical issues to address and help set the direction for the study. During the workshop a number of key issues were highlighted. These were: -

Table 4.1 Activities Framework

Activity	Purpose	Outcomes	Timing
Stakeholder Consultation Program	To develop a Consultation Program detailing consultation methods and communication protocols to be adopted for the project.	Consultation strategy presented and finalised.	April 2004
Project Information Desk	To establish the key communication mechanisms in order to manage and document community enquiries and stakeholder details. The information desk used a project 1800 number and a generic project email. All community enquiries were appropriately recorded and responded to. Stakeholder contact details were recorded in a database.	1800 number and project email address established. Stakeholder list developed in Access database.	April 2004
Project Announcement	To formally announce the project so that the community, stakeholders and agencies are aware of the project's commencement. The communication channels included a general mail-out and advertisements in the local media.	Mail-out of general introductory letters.	Early May 2004
Introductory Fact Sheet	To provide a clear and concise introduction to the project, relevant background material and its objectives. Double sided A4 fact sheet including diagrams and photographs.	Newsletter developed and distributed in electronic format to Principals / community (Appendix C).	May 2004
Critical Issues Workshop	Involving Principals, this Workshop aimed to test initial concepts and ideas on the future of coal developments in the Latrobe Valley and the impacts on communities, water and other environmental issues.	Pre-Workshop reading prepared and Workshop involving Principals conducted. Outcome report written.	June 2004
Visioning Survey	An online/paper survey to provide stakeholders and community with an opportunity to express how they see the Latrobe Valley in 2100.	Visioning survey posted online and distributed in hard copy format.	July 2004
Progress information sheet	Provide updates on the progress of the project with a similar format to the previous fact sheet.	Second Newsletter developed/distributed.	August 2004
Issues and Opportunities Workshops	To focus on 'Issues and Opportunities' associated with particular examples of coal developments. Four workshops were held with participants from community members. Workshops were held at strategic locations within the study area.	Four workshops held. Summary report prepared and distributed to project team and workshop participants.	September 2004
Focused Interviews	Held with representatives of key agencies or stakeholder groups unable to attend the series of workshops.	Focused interviews held.	October / November 2004

4.2.1 Planning

A number of planning related issues were raised. These included the need for more clarity on land zoning, the relevance of current land zoning and whether planning and communication structures responded to the changing needs of the region. Other issues of importance included the buffers, zones, land use planning and overlays, the major Morwell River Diversion and its implications for the municipal planning scheme and infrastructure coordination were also raised. It was suggested that the study should inform the project and provide the basis for changes to the planning framework and other strategic initiatives in the region.

4.2.2 Mine Rehabilitation

This issue was highlighted in regard to backfilling of mines, concerns about the use of water for rehabilitating mines by flooding and the lack of regional coordination and planning on the issue of mine closure. It was suggested that changes were required to encourage different environmentally sustainable site rehabilitation solutions.

4.2.3 Water

Water was recognised as a key natural resource, and was a recurring theme for the day. Specific issues related to best use, balancing competing demands, storage and treatment, water recycling and broader issues of ground and surface water quality. Questions were asked about whether current water management is appropriate and how waterways should best be managed into the future. The study is to take into account latest government directions, white papers etc.

4.2.4 Politics, Community And Triple Bottom Line Principles

There is a need to gain the support of the broader community on the future use of brown coal. The study is to reflect the values of the community. Suggestions on this issue included the need to articulate government policy on the importance of coal for future energy requirements and the importance of protecting these coal resources. Also need to include community benefits from coal development, and the need to consult the community in the project approval processes.

4.2.5 Technology, Infrastructure and Markets

Lastly, the stakeholders acknowledged a number of issues relating to infrastructure developments and the need to protect key coal resources, regardless of coal demand forecasts. It was made clear that the study must also take account of environmental and technologies and potential market changes. It was also suggested that a more strategic and holistic focus was required to find solutions to common Latrobe Valley/ regional infrastructure and environmental challenges, such as future CO_2 pipelines and river diversions.

It was resolved that the Principals would review progress through the study.

4.3 Visioning Survey Summary Report

As part of the community consultation process, a visioning survey (Appendix B) was distributed in June 2004 to 170 community organisations and community contacts currently on the project's Stakeholder Database. The survey was also distributed in the Latrobe City Council office and service centres. The survey could be completed online at http://www.ghd.com.au/survey/lvcoal or by using a reply paid service made available to encourage responses. The response was extended to a total of six weeks.

A major purpose of the survey was to obtain an indication of issues and concerns within the Latrobe Valley communities about the future development of the area and brown coal development in particular. Another purpose was to encourage respondents to describe their vision for the Latrobe Valley. The survey was filled out by 28 respondees. Although disappointing, the results were regarded as more of a barometer of issues ahead of the community workshops in September.

The majority of the respondents lived or worked in the Latrobe Valley. Respondents indicated benefits of the Latrobe Valley including its rural outlook, closeness to mountains, bush and sea. Respondents were concerned about the affects of industrial development; smell, dust and visual, but recognised the need for development for employment and economy. Respondents indicated that for coal to provide a strong economic future for the Latrobe Valley, solution of greenhouse gas emission issues were required. They also sought clarity on land use issues to avoid future competition between different land use demands.

4.4 Community Workshops Summary Report

As part of the consultation program for the Latrobe Valley 2100 Coal Resource Project, community workshops were organised in Traralgon, Churchill, Moe and Morwell. With two facilitators (Sophie Walker and Amy Hubbard), and an introductory presentation by Ken Tabart, it was intended that the two hour workshop involve a semi-structured format with a number of group exercises. However, given the attendance was low at all the workshops, the format changed to a roundtable discussion. Participants were encouraged to raise issues, comments and concerns around the key areas of the study – community values, environmental values, economic growth, water resource management, land use planning and governance and any other issues regarded as relevant. A large coal resource area map aided discussions.

The workshops allowed full discussion on a wide range of issues associated with coal developments in the Latrobe Valley. Discussion in each workshop focussed both on particular issues and regional development issues. Local issues included the alignment of the Traralgon bypass and the potential for Morwell to be surrounded by mines. Regional issues included concern about the role, location and use of buffer areas around towns, mine rehabilitation, water use, dust and the need to maintain satisfactory environmental emission levels. There was discussion about the need for better regional planning relating to coal use. Coal development was supported provided that community concerns are adequately addressed.

A full summary of each workshop is included in Appendix B.

5. Predictive Energy Model

"To structure scenarios for brown coal demand for electricity generation, taking into account various levels of generation from renewables and natural gas and the possible introduction of new technologies, providing higher efficiencies in thermal generation plants."

5.1 Model for structuring Victorian Electricity Generation Scenarios

In order to examine alternative scenarios, a spreadsheet model for the generation of electricity in Victoria has been developed. It is based upon:

- the assumption that brown coal based generation will continue to be competitive even if stringent greenhouse gas mitigation measures become mandatory
- a projection of electricity demand to 2050, by using the medium NEMMCO projection to 2012/13, and extrapolating to 2020. Beyond 2020 an electricity demand growth rates of 1.5% pa to 2030 and 1% to 2050 have been used.
- coal and gas conversion factors (GJ/MWh) for current power generation plant and
- for new plant assuming it uses new technology with higher efficiencies

The user of the spreadsheet may, or is required to, choose:

- the year of decommissioning of existing brown coal based plants
- the proportion of electrical energy consumption to be met by renewable energy sources over time
- as more capacity is required, gas or coal based generation technology and its efficiency
- a different energy demand scenario may be entered

The model does not provide for additional plants which may covert coal to liquid hydrocarbons or gaseous fuels.

Coal based generation plants are anticipated to be in the Latrobe Valley, gas based plants can be elsewhere. Renewable based generation is likely to be elsewhere.

Three potential coal use scenarios for the production of electricity in Victoria, on the basis described above, are presented below.

5.2 The Victorian Electrical Power Scene

Victoria is Australia's second most populated state with much of its economic activity based on competitively priced electrical energy for industry and communities alike. For more than 75 years, the State Electricity Commission (SECV) designed, built and operated mines, power generation plants, and transmission and electrical distribution facilities throughout the state. Following the introduction of microeconomic reforms by the Australian Government, a competitive electricity market – termed the National Electricity Market (NEM) governs the generation, sale and purchase of electricity in those parts of Queensland, NSW, Victoria and South Australia and (shortly) Tasmania which are interconnected by the high voltage electricity transmission system. An outline of the working of the NEM is provided in Appendix F. The Victorian Government privatised the power industry in this state.

The bulk of the electrical power generated in Victoria is sourced from brown coal. Brown coal deposits in the Latrobe Valley and at Bacchus Marsh, Anglesea and in South Gippsland are large enough, and extractable at sufficiently low cost, to sustain usage at current rates for many hundreds of years. Given the basis for model structuring, set out in the previous section, brown coal will maintain its competitiveness and continue to be used in large quantities for electricity generation. Gas is also expected to become a significant fuel for electricity generation in Victoria, particularly for intermediate and peak requirements. Victoria has a number of hydro-electricity generating facilities. The lack of suitable additional sites and limited water resources constrain growth potential. A number of wind farms have been recently completed or are under construction, with a Victorian Government objective to have 1000MW of wind generation installed by 2006 [Ref 26]. Current primary electricity generation energy sources are as follows:

Table 5.1 Victoria's Primary Source of Electricity Generation (2001)

Type of fuel/energy	Generation		Fuel Consumed	
	GWh	Proportion	PJ	Million Tonnes
Renewable	859	1.8%	Not Applicable	
Brown Coal	46557	97.0%	628.8	62
Natural Gas	585	1.2%	6.3	
Total	**48000**	**100.0%**	**635.0**	

Source NEMMCO, with adjustment by MMA [Ref 32]

It is uncertain what measures will be adopted to limit greenhouse gas (GHG) emissions. The existing brown coal-based generation plants emit considerably more CO_2 per unit of electricity then any other power generation plants in Australia. This is due to the nature of brown coal, primarily its high moisture content, and its direct use without prior processing, other than crushing.

Modifying existing plant either to substantially reduce CO_2 emissions or to capture it for purposes of sequestration would be expensive. New plants, however, are expected to be designed with lower levels of emissions. This may be via increased efficiencies, coal drying, gasification, CO_2 capture and sequestration. Reduction of the water content of brown coal before burning it to raise steam is a possible early development that may lend itself to improvements in existing generating plants as well as in new

ones. Appendix G provides an overview of Advanced Fuel Technologies being considered for future coal utilisation, provided by Mr David Lea of David Lea Consulting Pty Ltd. Australia's Mining Monthly in December 2004 [Ref 33] also outlines major research and development programs underway to ensure economic growth is not hamstrung by an energy supply shortfall. The Latrobe Valley has the potential to be one of the foremost global sites for the application of these new technologies. The combination of an abundant low cost, high quality (ash, sulphur) energy source adjacent to a large sink for carbon dioxide (the depleted oil & gas fields and deep saline aquifers in the offshore Gippsland Basin) create this potential. A number of companies are currently working on detailed studies to bring this potential to reality. The same emerging technologies which will be required around the globe to reduce carbon dioxide emissions can be applied in the Latrobe Valley to create wealth and employment in an environmentally acceptable way.

As stated above, the basis for this study is that the use of brown coal will remain viable. A corollary is that the technologies required for this to apply will be developed and commercialised in a timely manner and it is recommended that the development and commercialisation of these technologies should be supported by industry and the Victorian Government

Coal can also be used for a variety of other purposes. For more than 50 years, dried and briquetted coal has been produced for solid fuel home heating and industrial boilers. This market has declined in recent years and is unlikely to expand in the future. Brown coal can also be converted to syngas, liquids and hydrogen, for industrial purposes. This may well become economically viable during the period covered by this study. Coal could also become a source of hydrogen for the transportation sector.

5.3 Sources of Energy for the Victorian Power Sector

In this study, our objective is to develop scenarios for the use of coal over the remainder of this century. We have structured three scenarios on the basis presented in Section 5.1.

Firstly, MMA has modelled the National Electricity Market (NEM) on a business as usual basis to estimate Victorian generation to 2020. This is based on the assumption that no new GHG emission mitigation measures, beyond the New South Wales and Queensland schemes, are put in place but that both of these continue until 2020.

Table 5.2 presents a summary of the generation projection used. Up to 2020, the results take into account imports and exports of electricity. Beyond 2020 Victorian electricity generation has been extrapolated as shown in Table 5.2. As stated previously, the spreadsheet model allows the user to enter any desired projection.

Table 5.2 Projected Power Generation in Victoria

Year	2005	2020	2030	2050
Generation (TWh)	49	57	66	80
Compound Growth	2005 - 2020	1.0%		
		2020 – 2030	1.5%	
			2030 – 2050	1%

New investment in electricity generation will be required:

- to meet any growth in electricity consumption
- and to replace any generation capacity that may be shut down.

It is likely that new base load capacity will not be required for about ten years. New intermediate and peaking capacity will probably be added earlier. It is possible, however, that there will be earlier addition of new base load capacity as well. Even more than demand growth, the closure of existing large baseload power stations, beyond 2025, will require substantial investment in new generation plants.

Note on Generation and Demand

It is the NEM-wide demand/supply balance that provides opportunities for new generation. Depending upon:

- transmission costs and constraints between Victoria and other NEM regions
- generation costs in Victoria relative to those in other NEM regions

the new investment in generation will be distributed among the regions in various ways. For the purposes of this report, the approach adopted to projecting Victorian generation requirements is sufficiently accurate.

Three scenarios have been structured to assess likely coal requirements for generation during this century.

Scenario 1: In this scenario the existing coal power stations are phased out earlier than currently planned and the majority of new generation is based on renewables and gas. For this scenario, it is assumed that 20% of generation is contributed by renewables, mainly wind generation, by 2050. It was also assumed that natural gas-based generation consumes up to 200 petajoules per year (PJ/yr) for power generation. This scenario would result in about 30% of the electricity demand supplied from gas in 2050. The use of gas in Victoria would increase, from about 250 PJ/yr (currently with less than 10 PJ/yr for electrical power generation) to about 600 PJ/yr in 2050. This would likely require the import of gas from other states or Papua New Guinea. In this scenario it is assumed that improved technology would be available for new coal based power generation and even though no coal demand has been assumed for conversion to other hydrocarbon products, coal usage does not decline below about 30 Mtpa.

Scenario 2: In this scenario existing coal fired plant is phased out 5 years later than in Scenario 1, and there would be greater use of coal for the production of electricity. It is assumed that new technology, applied to new plants, will improve coal conversion efficiency and reduce greenhouse gas emissions. New generation is also assumed to utilise gas, limited to about 100 PJ/yr. This would increase total gas demand in Victoria from 250 to about 500 PJ/yr. As in Scenario 1, this is expected to require the import of gas. Renewables are assumed to meet 15% of power demand by 2050. Coal demand of approximately 40 Mtpa is required to meet the remaining electricity generation requirement and it is assumed that a further 15 Mtpa is converted to other products.

Scenario 3: In this scenario, existing brown coal generating plants are assumed to remain in base load service to a plant life of about 60 years or to the limit of coal reserves. It is assumed that new coal-fired power generation plant will utilise higher conversion efficiency technologies. Gas use for generation is expected to increase to about 60 PJ/yr. Renewables are assumed to expand to about 10% by 2050. Coal demand of approximately 50 Mtpa is required to meet the remaining electricity generation requirement. Some 40 Mtpa coal is assumed to be used to produce other hydrocarbon products in this scenario and total coal demand is expected to exceed 90 Mtpa.

Note on Electricity Generation Costs

Consideration of electricity generation costs is beyond the scope of this study, as is the forecasting of electricity prices. Costs and prices would be governed by a variety of factors, including the specifics of any GHG mitigation measures that might be implemented. We have not made any assumptions as to such measures, nor have we made any other ***explicit*** assumptions, except for those set out in Section 5.1. There is an ***implicit*** assumption, for any given scenario, that the addition of any given plant at any given time represents the lowest cost for meeting growth in electricity demand. In the absence of further inputs/assumptions there is no way of making even a qualitative comparison of future costs and prices under the various scenarios.

In modelling these scenarios, gas-based capacity is assumed to be added in 500 MW increments and brown coal-based capacity in 1000 MW increments. When each of the power generation plants is introduced, this leads to some short-term excess capacity of generation over demand - of little consequence for this level of planning. The heat rate for energy conversion used in Modelling is shown in Table 5.3 for each primary energy source and for current and new technology developments. Another variable in the modelling is the predicted life of current brown coal power generation projects. Assumptions made are shown on Table 5.4.

5.4 Summary

One basis of this study has been that new technology can be utilised to enable brown coal to remain competitive with other fuels whilst attaining utilisation efficiency and greenhouse gas targets.

Outputs from the modelling include the timing of new power generation projects and the proportion of natural gas, coal and renewables used for generation. Table 5.5 shows the proportion of power generation to 2050 utilising natural gas, coal and renewables for each scenario. This is graphically represented for scenarios 1, 2 and 3 in Figure 5.1, and Figure 5.2 shows the brown coal demand for power generation. This model is available for future use to include changes as they occur.

Each scenario shows a reducing dependency on brown coal for electricity generation in Victoria, with greater use of natural gas and renewables. However, brown coal will still be required to meet a significant portion of the electricity demand by 2050. Table 5.6 indicates the range of outcomes, which should be considered by planners.

For statutory land planning purposes in the Latrobe Valley it is recommended that Scenario 3 be used and that the energy model, through which the scenarios were developed, be provided to appropriate organisations to facilitate planning. Scenario 3 is a 'not unreasonably high' projection of coal utilisation to use as the basis for planning. This includes brown coal for power generation and for coal conversion (Figure 5.3). Securing sufficient coal for this scenario provides flexibility for future decision makers to source brown coal for power generation or the production of hydrocarbons.

Table 5.3 Modelling assumptions for generating efficiencies

Primary Energy	Technology Used	2010	2020	2030	2040	2050
		"Heat Rate for Energy Conversion (GJ/MWh)"				
Natural Gas	Evolution of Current Technology	6.8	6	5.7	5.5	5.5
	New Technology 1		5.0	4.5	4.5	4.5
	New Technology 2					4.5
Brown Coal	Evolution of Current Technology	11	9.5	9.5	9.5	9.5
	New Technology 1	8	7.5	6.8	6.4	6.0
	New Technology 2				5.4	5.2
Black Coal	Evolution of Current Technology	9	8.5	8.5	8.5	8.5
	New Technology 1		7	6	6	6
	New Technology 2				5	4.9
Cogeneration	Evolution of Current Technology	10.6	10.2	10	10	10

Table 5.4 Assumed Shutdown Dates for Existing Power Stations

	Scenario 1	Scenario 2	Scenario 3
Morwell	2012	2012	2012
Hazelwood	2020	2025	2030
Yallourn	2020	2025	2030
Loy Yang A	2035	2040	2045
Loy Yang B	2040	2045	2050

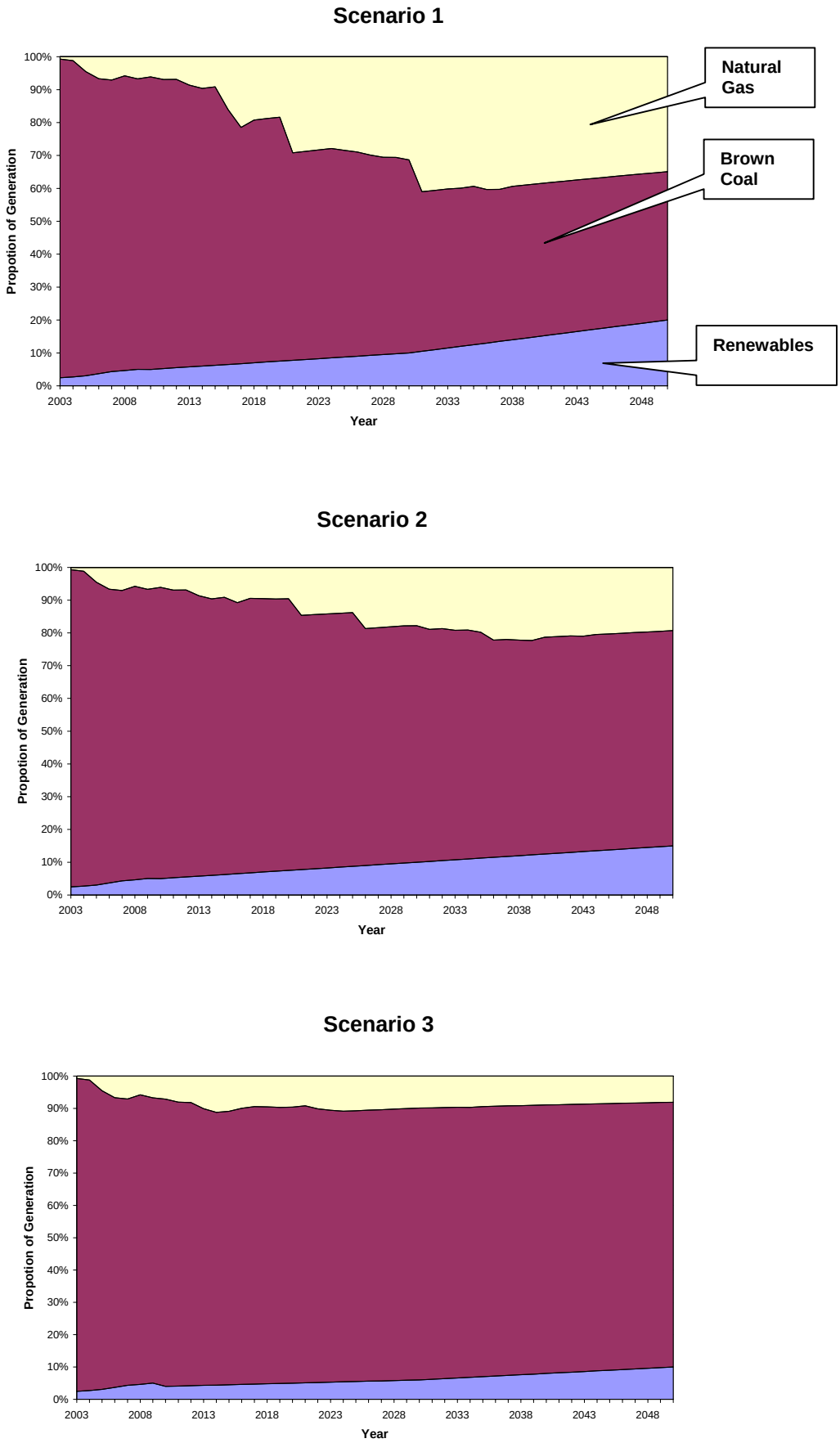


Figure 5.1 Proportion of Power Generation from Natural Gas, Coal and Renewables

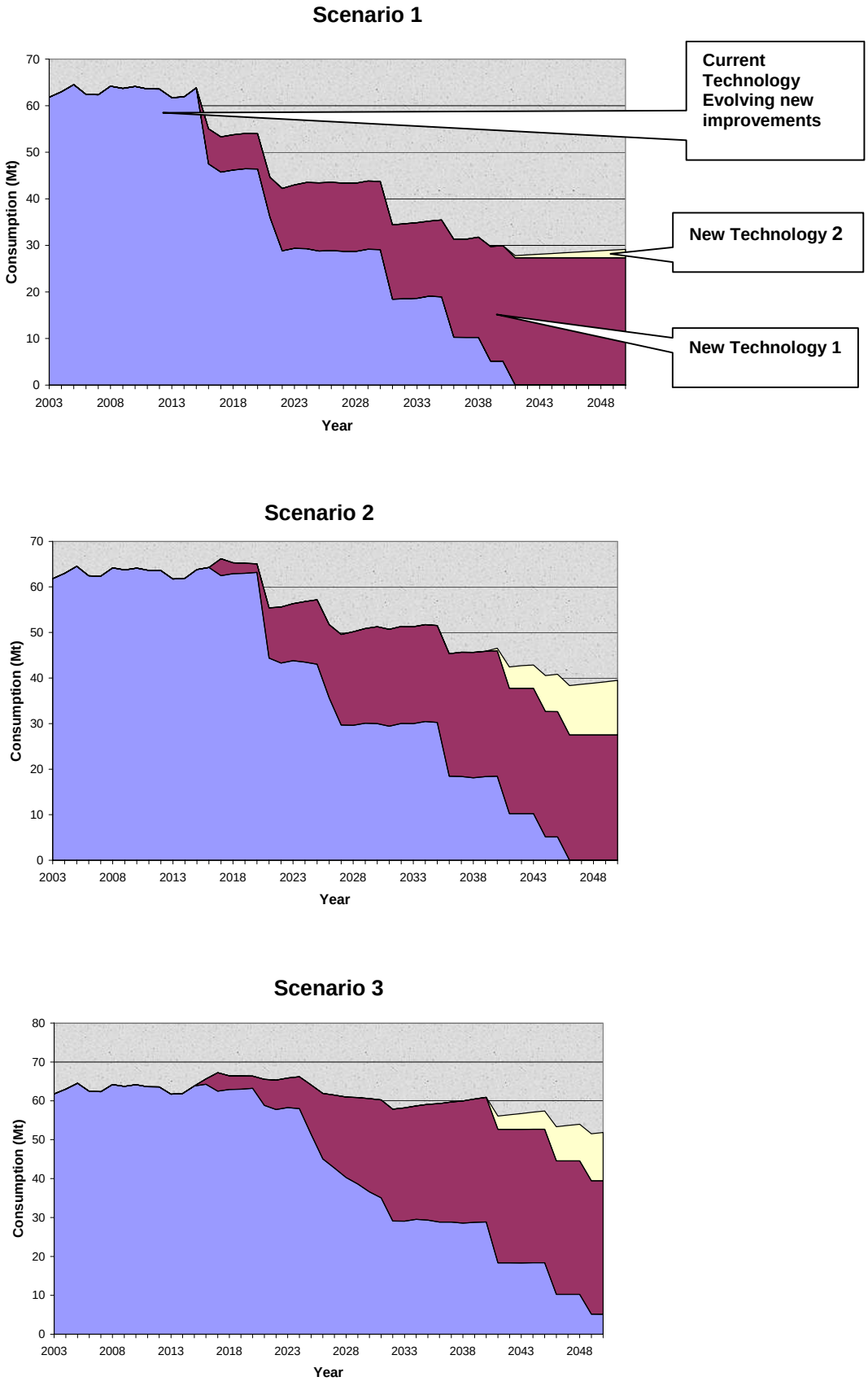


Figure 5.2 Predicted Brown Coal Demand for Power (Mtpa)

Table 5.5 Proportion of Power Generation Sourced from Natural Gas, Coal and Renewables

Scenario	Energy	2010	2020	2030	2040	2050
1	Natural Gas	6.1	18.4	31.3	38.6	34.9
	Brown Coal	88.9	74.1	58.7	46.4	45.1
	Renewables	5.0	7.5	10.0	15.0	20.0
2	Natural Gas	6.1	9.6	17.8	21.3	19.3
	Brown Coal	88.9	82.9	72.2	66.2	65.7
	Renewables	5.0	7.5	10	12.5	15.0
3	Natural Gas	7.1	9.6	9.9	8.9	8.1
	Brown Coal	88.9	85.4	84.1	83.1	81.9
	Renewables	4.0	5.0	6.0	8.0	10.0

Table 5.6 Predicted Coal Consumption at 2050

Scenario	Brown Coal Demand Mtpa		Total Coal Demand Mtpa
	Power Generation	Coal Conversion	
1	30	0	30
2	40	15	55
3	50	40	90

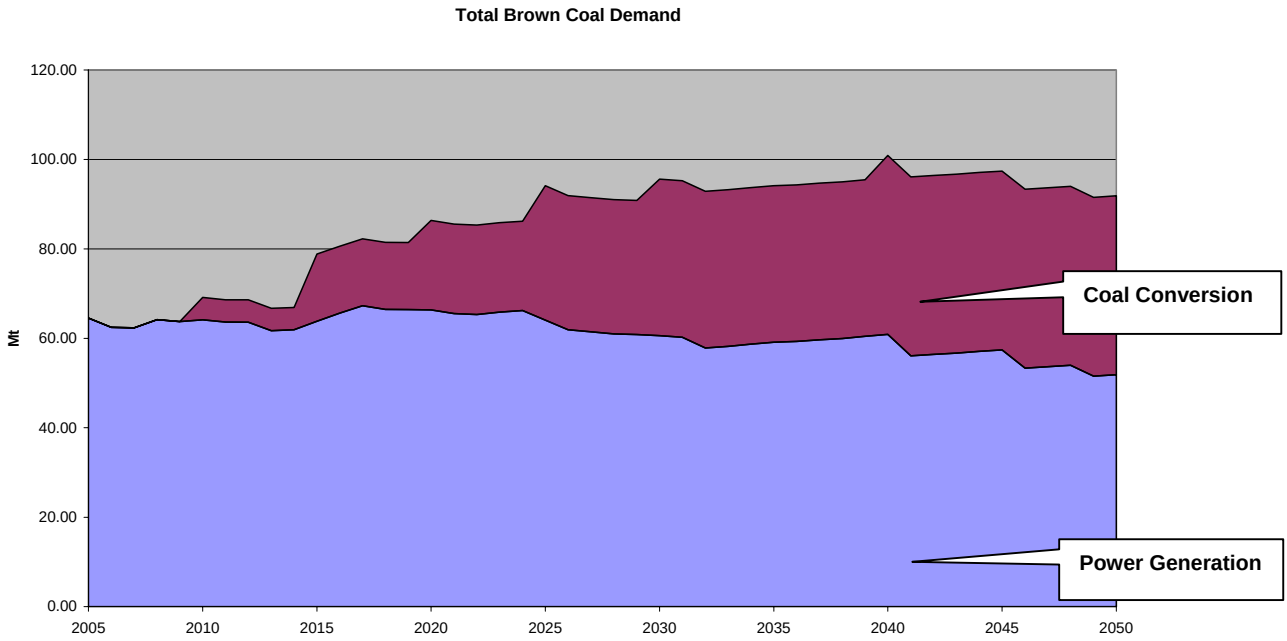


Figure 5.3 Annual Coal Consumption in Scenario 3

6. Future Coal Mining Areas

"To outline the brown coal resources in the Latrobe Valley and to assess their likely utilisation within the remainder of the century, considering community expectations and the demands for coal for electricity and other products."

6.1 Coal Resources in the Latrobe Valley

The Latrobe Valley 2100 Coal Resources project aims to develop a strategy to guide planning and sustainable mine development practices for brown coal in the Latrobe Valley. Firstly it is useful to consider background information on the coal resources in the Latrobe Valley, the current mining operations and base information for assessing potential future mining areas and their issues. This information will be utilised to help identify the best coal resource areas and an indicative order of resource development.

Within the Gippsland Basin, the Latrobe Valley contains vast quantities of brown coal resources (53,000 Mt of 'economic' coal reserves. The region annually produces about 65 Mt of coal for generation of electrical power and conversion to briquettes and char. Within a privatised industry these long life industries form a cornerstone to the economics of the Latrobe Valley. Agriculture, horticulture, forestry and paper production, tourism and service industries add to the diversity of this region. The brown coal contains low ash and sulphur, is readily mined and can be used as a feedstock for power generation or to produce solid, liquid or gas fuels. Carbons, fertiliser, agricultural products and other by-products are also possible. Basic and applied research is being carried out to develop more efficient and environmentally friendly methods of using the coal. Beyond the current mining areas, vast coal resources remain available for use. New coal projects are expected to result in economic growth for the region, provide opportunities for the local population whilst meeting all environmental standards.

The coal resources within the Latrobe Valley are well defined. Coal drilling, organised by the SECV in the 1950's – 1980's, was generally carried out on a 400 metre grid. The density of boreholes drilled in the Latrobe Valley region is shown in Figure 6.1. Areas where the coal seams are under deep cover and/or contain thin coal seams have been less well drilled. A number of selected boreholes have been drilled through the coal measures into basement. During 2002, GHD were commissioned by the Department of Natural Resources and Environment to convert existing borehole data into a 3 Dimensional (3D) Geological Model of the Latrobe Valley [Ref 11] and this model was released in May 2003 by DPI. A long section through the Latrobe Valley is provided in Figure 6.2, showing defined coal seams from Moe on the left to the south of Rosedale to the right.

The 3D model of the Latrobe Valley coal resources identified 53,000 Mt of 'economic' coal. Considering less than 5,000 Mt has been mined in the last 80 years this represents a massive resource to meet Victoria's energy needs into the future. This 3D model has been used for evaluation of the coal resources in selected areas for this LV2100 Coal Project.

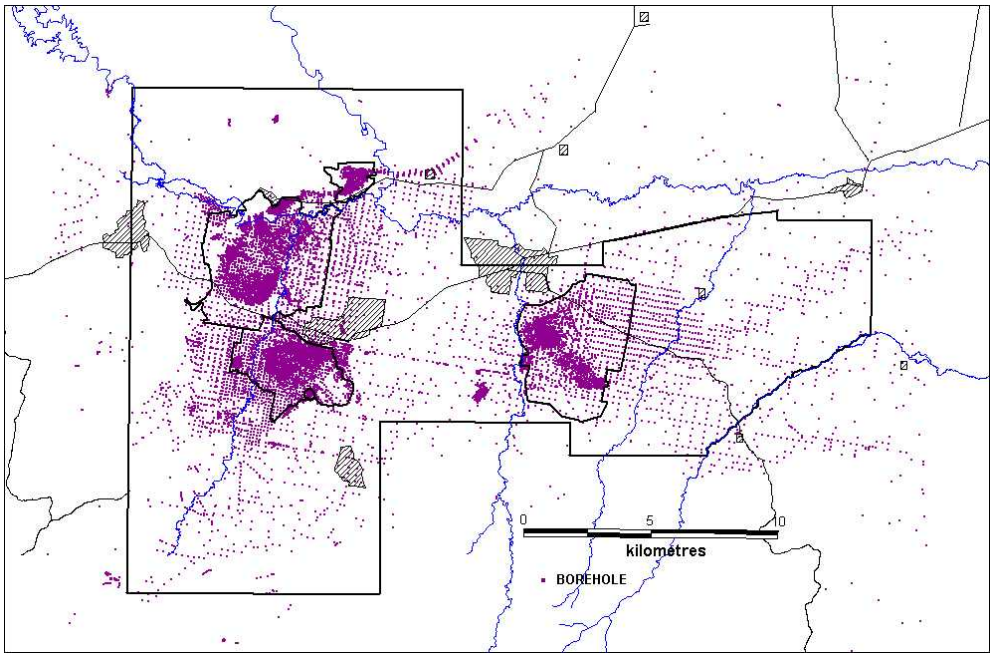


Figure 6.1: Borehole Locality Plan

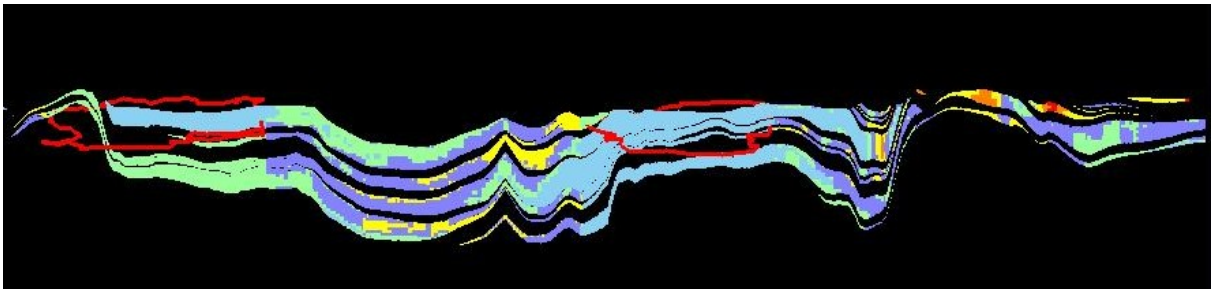
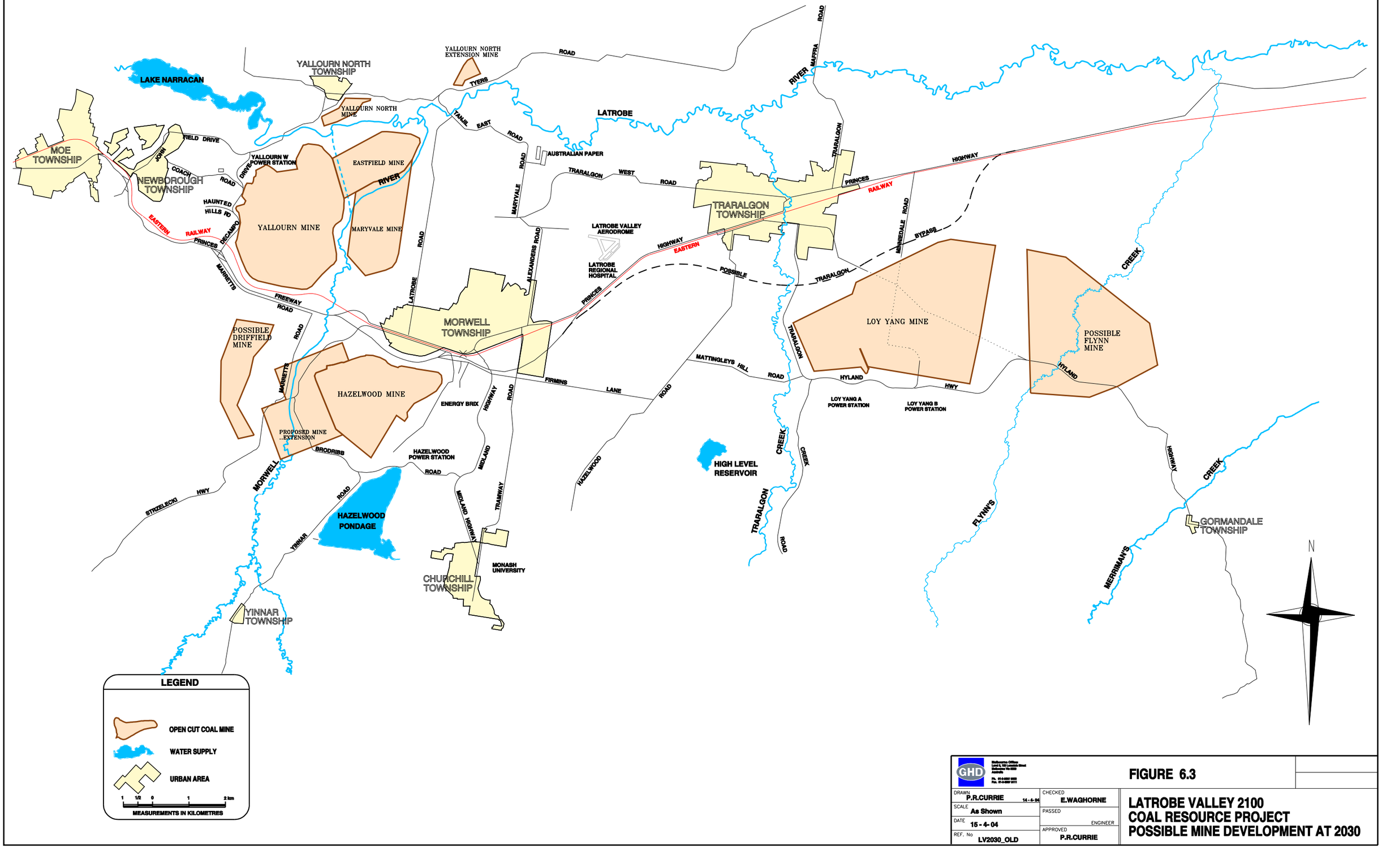


Figure 6.2 W-E oblique long-section of the Latrobe Valley.

(In red are the Yallourn, Hazelwood and Loy Yang mine boundaries)

6.2 Projection of likely Coal Mining to 2030

To provide an initial point for coal development planning, an estimate of the extent of the Latrobe Valley coal mining projects to the year 2030 was undertaken (Figure 6.3). As the mining operations have some flexibility of development within their mining licence areas the positions shown in this figure are indicative and do not constitute any commitment. Included are the existing mines at Yallourn, Hazelwood and Loy Yang, together with the potential mining operations at Flynn and Driffield. Whilst these latter two projects are currently being considered for development, neither have yet finalised mine plans nor received government approval. The mining operations of Yallourn and Hazelwood are forecast to be nearing completion around 2030. Although should Hazelwood not receive project approval for its West Field development, it could cease operation by 2010. The Loy Yang mining operation is required to meet the requirements of the Loy Yang A & B Power Stations until around the middle of the century.



GHD

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Ph. 03-8687 8000
Fax. 03-8687 8111

FIGURE 6.3

DRAWN	P.R.CURRIE 14-4-04	CHECKED	E.WAGHORNE
SCALE	As Shown	PASSED	ENGINEER
DATE	15-4-04	APPROVED	P.R.CURRIE
REF. No	LV2030_OLD		

LATROBE VALLEY 2100 COAL RESOURCE PROJECT POSSIBLE MINE DEVELOPMENT AT 2030

LAKE NARRACAN
YALLOURN NORTH TOWNSHIP
YALLOURN NORTH EXTENSION MINE
YALLOURN NORTH MINE
TYERS
ROAD
MOE TOWNSHIP
NEWBOROUGH TOWNSHIP
JOHN
FIELD DRIVE
COACH
ROAD
DRIVE
YALLOURN W POWER STATION
EASTFIELD MINE
RIVER
HAUNTED
HILLS RD
DECAMPO
YALLOURN MINE
MARYVALE MINE
EASTERN
RAILWAY
PRINCES
MARRETTS
FREEWAY
ROAD
LATROBE
TAKLE
EAST
ROAD
AUSTRALIAN PAPER
LATROBE
RIVER
MAFFRA
ROAD
TRARALGON
HIGHWAY
TRARALGON
WEST
ROAD
MARYVALE
ROAD
ALEXANDERS ROAD
LATROBE VALLEY AERODROME
LATROBE REGIONAL HOSPITAL
HIGHWAY
EASTERN
PRINCES
POSSIBLE
TRARALGON
BYPASS
KINNEDALE
ROAD
TRARALGON TOWNSHIP
PRINCES
RAILWAY
HIGHWAY
MORWELL TOWNSHIP
LOY YANG MINE
TRARALGON
CREEK
MARRETTS
ROAD
HAZELWOOD MINE
PROPOSED MINE EXTENSION
BRODRIBB
ENERGY BRIX
HIGHWAY
ROAD
FIRMINS
LANE
ROAD
MATTINGLEYS
HILL
ROAD
HYLAND
HWY
HYLAND
LOY YANG A POWER STATION
LOY YANG B POWER STATION
HAZELWOOD POWER STATION
ROAD
MORWELL
ROAD
HAZELWOOD PONDAGE
MIDLAND
HIGHWAY
TRAMWAY
MIDLAND HIGHWAY
HAZELWOOD
HIGH LEVEL RESERVOIR
CREEK
CREEK
TRARALGON
ROAD
STRZELECKI
HWY
YINNAR
CHURCHILL TOWNSHIP
MONASH UNIVERSITY
YINNAR TOWNSHIP
FLYNN'S
MERRIMAN'S
HIGHWAY
CREEK
GORMANDALE TOWNSHIP

N

LEGEND

- COAL AREAS
- OPEN CUT COAL MINE
- WATER SUPPLY
- URBAN AREA

1 1/2 0 1 2 km
MEASUREMENTS IN KILOMETRES

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FIGURE 6.4

DRAWN	P.R.CURRIE 14-6-04	CHECKED	E.WAGHORNE
SCALE	As Shown	PASSED	ENGINEER
DATE	15-6-04	APPROVED	P.R.CURRIE
REF. No	LV2100A		

LATROBE VALLEY 2100 COAL RESOURCE PROJECT COAL AREAS

6.3 Mining Options Beyond 2030

6.3.1 Economic Coal Resources in the Latrobe Valley

The brown coal seams of the Gippsland Basin underlie most of the Latrobe Valley and even extend eastward at great depth into Bass Strait. Within the Latrobe Valley, all land areas containing significant coal seams are shaded in green on Figure 6.4. As discussed previously the Latrobe Valley contains 53,000 Mt of 'economic' coal resources, more than 10 times production over the last 80 years. Based on the current rates of consumption, 500 years of coal production appears feasible. One aim of this project is to highlight the best coal within these resources which are likely to be required by 2100 and ensure that they are protected for future use.

To assess the better coal resource areas for future mine development, many criteria need to be considered. Of primary importance to project economies is the coal stripping ratio, as this determines how many tonnes of coal can be won for every cubic metre of overburden removed. Reducing this ratio rapidly increases coal mining costs. Figure 6.5 indicates the vertical stripping ratio of coal deposits within the Latrobe Valley based on the 3D Geological Model. This initial assessment included all known coal resources without depth or thickness constraint and ignoring any coal quality variations. In Latrobe Valley mines vertical stripping ratios (coal : overburden) of more than 4:1 have been mined but in the future, coal winning to 2:1 is likely to be necessary. The 2:1 strip ratio contour has been used to define the better coal areas. These areas have been outlined on Figure 6.6, shaded in green hatching. These better coal resource areas are assumed at this stage to be potential mining zones recognising that other mining or planning constraints such as current land planning, community assets, environmental impacts and other land uses need also to be considered.

Each of the better coal resource areas have been broken into likely mining areas. These represent areas that may be considered for single or combined mining operations after due consideration of all relevant issues and constraints. Figure 6.7 shows a layout of the Latrobe Valley with these possible future mining areas hatched in red. Each mining area has a coded identifier. In-situ coal quantities (not to JORC) within these areas have been estimated and detailed on the figure. Before finalising the strip ratio assessment and estimating contained coal resources; deep or thin coal seams at the bottom of the sequence that have an incremental stripping ratio worse than 2:1 were ignored. In-situ coal estimates make no allowance for use or ownership of land, mining licences, possible mining losses, coal left in batters, depth limitations, coal quality etc. However, the estimates provide an indication of the maximum coal extraction that could be possible in each area.

A number of small potential new Mining Areas have been identified. These are named from A to N (not in any order). Areas O, P & Q are within exploration licence areas where there is no firm mine development planned, but options for further development and coal usage are being considered. Areas X, Y, and Z are areas where there may be potential to mine deep coal seams located under operating mines. These areas may have internal overburden waste dumps requiring removal.

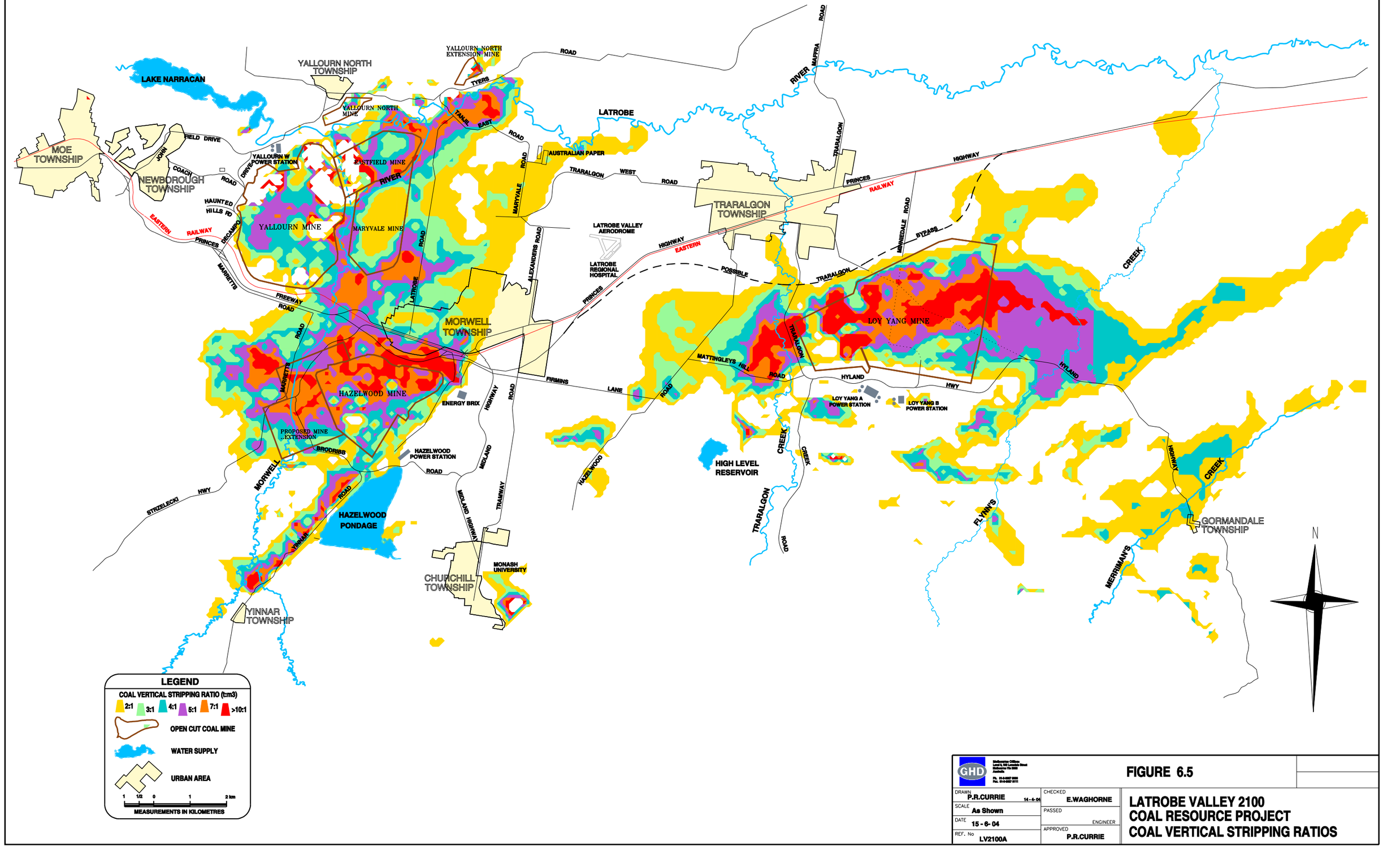

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FIGURE 6.5

DRAWN P.R.CURRIE 14-6-04	CHECKED E.WAGHORNE	**LATROBE VALLEY 2100 COAL RESOURCE PROJECT COAL VERTICAL STRIPPING RATIOS**
SCALE As Shown	PASSED ENGINEER	
DATE 15-6-04	APPROVED P.R.CURRIE	
REF. No LV2100A		

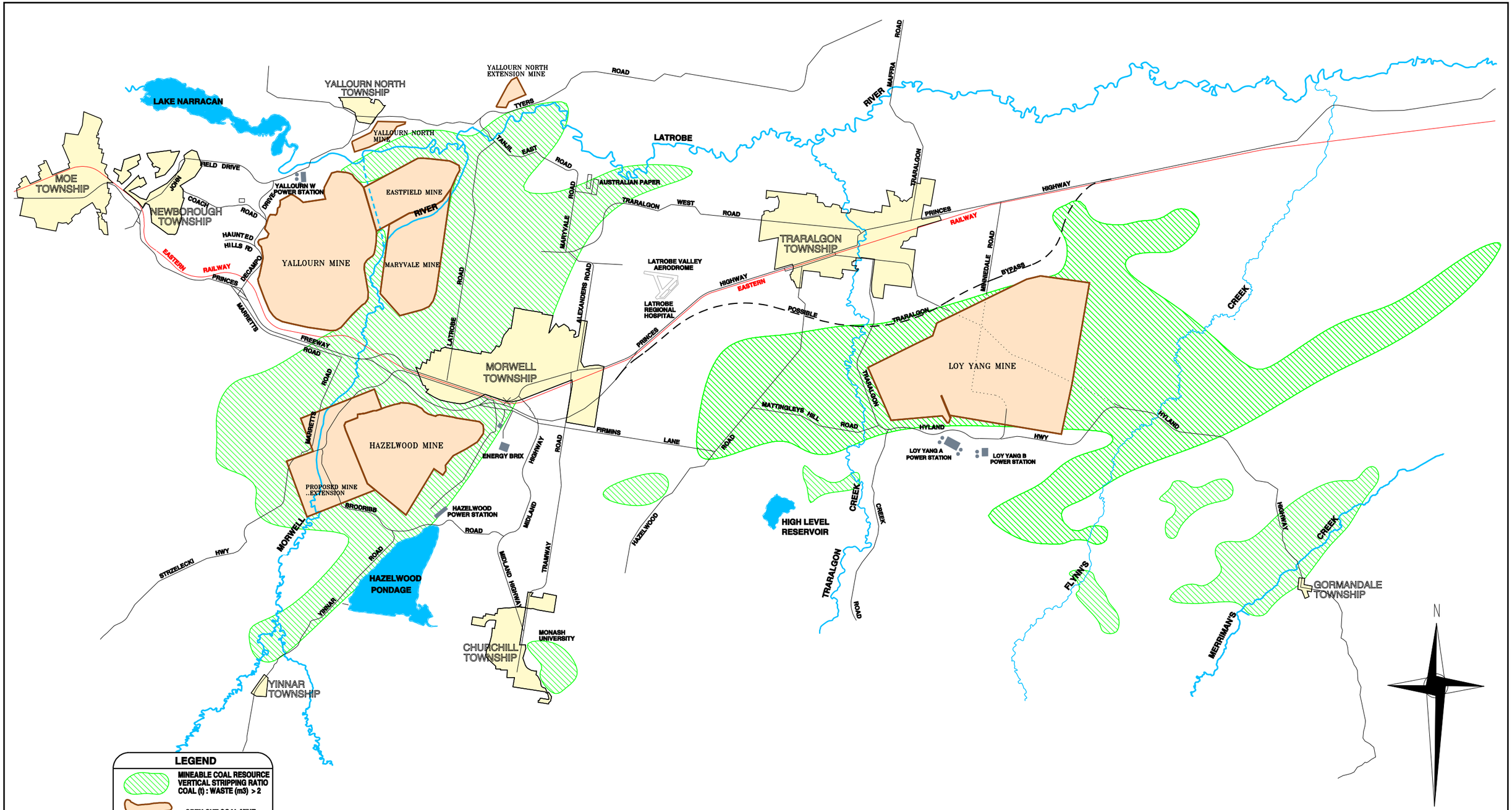

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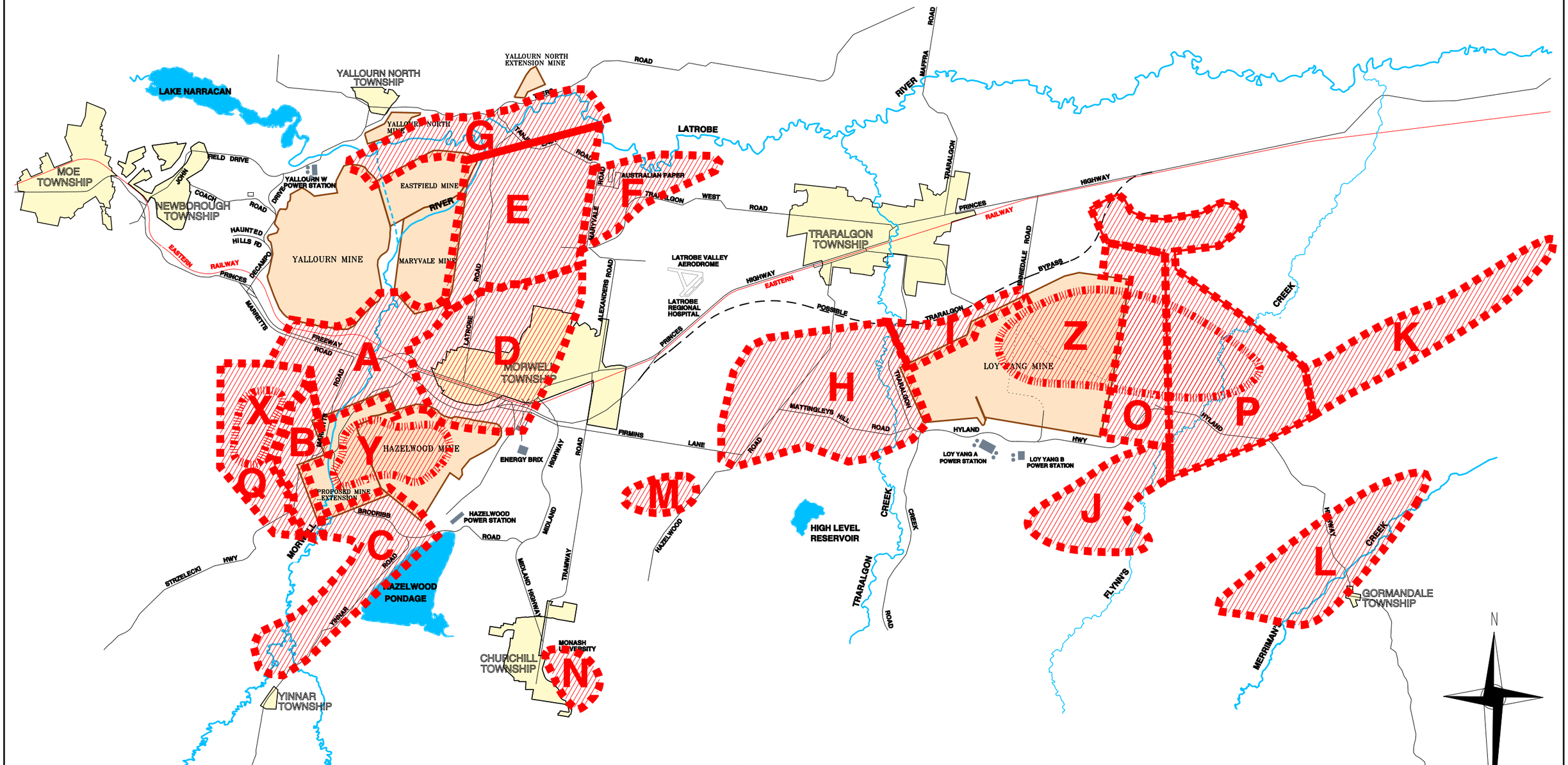
FIGURE 6.6

DRAWN P.R.CURRIE 14-6-04	CHECKED E.WAGHORNE	**LATROBE VALLEY 2100 COAL RESOURCE PROJECT BETTER COAL RESOURCE AREAS**
SCALE As Shown	PASSED ENGINEER	
DATE 15-6-04	APPROVED P.R.CURRIE	
REF. No LV2100A		



LEGEND

- POSSIBLE MINEABLE RESOURCE AREAS
- OPEN CUT COAL MINE
- NEW AREAS
- WATER SUPPLY
- DEEP COAL AREAS UNDER PREVIOUSLY MINED OPERATIONS
- URBAN AREA

1 1/2 0 1 2 km

MEASUREMENTS IN KILOMETRES

MAGNITUDE OF POSSIBLE RESOURCE AREAS

AREA	COAL (Bt)	AREA	COAL (Bt)
A	2.2	K	1.8
B	0.4	L	1.1
C	1.0	M	0.1
D	4.4	N	0.1
E	4.7	O	2.5
F	1.3	P	4.5
G	0.5	Q	0.5
H	5.3	X	0.02
I	0.9	Y	0.2
J	1.5	Z	0.5

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FIGURE 6.7

DRAWN P.R.CURRIE 14 - 4 - 04	CHECKED	
SCALE As Shown	PASSED P.R.CURRIE ENGINEER	
DATE 15 - 4 - 04	APPROVED	
REF. No LV2100B		

LATROBE VALLEY 2100 COAL RESOURCE PROJECT POSSIBLE FUTURE MINING AREAS

6.3.2 Selection of the Probable Order of Development

The Latrobe Valley is endowed with one of the largest brown coal (lignite) resource areas in the world. In the last 80 years coal use focussed on power generation, town gas and briquettes. Future uses are likely to be different. New technology will change mining and coal conversion practices and products are likely to include electrical power, hard coal products, syngas, liquids and hydrogen. Development and deployment of geosequestration, coal pre-drying/dewatering and improving the efficiency of coal utilisation is likely to be essential in attaining Government approvals for the future use of the coal.

These new technologies will have to meet community expectations as well as allowing competition with other energy suppliers. Market forces will continue to play and risks to future coal development include the costs of meeting new environmental standards, community expectations, carbon pricing etc.

In addition to the need for new conversion or environmental control technology the cost of mining can have a major impact on the viability of a new project. New technology is continuing to lower mining costs allowing deeper mines to become viable. Even so the strip ratio, depth and coal resource size remain critical in the evaluation of potential mining sites. Coal quality can also affect project viability with variations in moisture, ash and ash constituents having impacts on process economics.

The first step facing a new developer is to get an Exploration Licence containing adequate economic coal resources. Approvals are a Victorian Government responsibility. Coal economics will also be affected by roads, rivers, towns, industry, forests or farming of land over or adjacent to coal deposits. Land use within the Latrobe and Wellington Planning Schemes is also controlled by zones and overlays. These controls provide direction for future and current land users. Special Use Zones and coal overlays protect the highest value coal resources and related infrastructure from other incompatible land uses. Judiciously placed, these zones and overlays can assist access to future coal developments. Current zoning, based on the projection of future coal development predicted by the SECV in the 1980's may need reviewing to protect likely coal development areas needed for the rest of this century.

The Victorian Government require developers to demonstrate that the new project will meet appropriate community and environmental standards. Approval processes for projects of State significance include the Environment Effects Statement (EES) process from the *Environment Effects Act* (EE Act) as well as the requirements of the *Mineral Resources Development Act* (MRD) and the *Environment Protection Act* (EPA) Act. A key factor in approving new development is the minimisation of the impacts on the local community and the environment. The Victorian Government has indicated that new projects will need to minimise GHG emissions, meet prevailing noise and dust emission standards whilst protecting water quality and biodiversity. Native title and heritage issues also need to be considered. Large scale projects in the nature of a brown coal mine will most likely be required to carry out a comprehensive assessment via an Environment Effects Statement of the potential impacts (both positive and negative) of the proposed development – environmentally, socially and economically – the triple bottom line.

6.3.3 Coal Area Ranking

It is not possible in this study to examine each area in sufficient detail nor to predict all of the changing circumstances that will occur over the next 100 years to specifically detail an order of development. However, our team has considered each potential coal winning area against broad criteria to reach a qualitative view on those projects more likely to proceed. Projects have been ranked as follows:

A. Ranking 1 Most likely to proceed – few issues to overcome
B. Ranking 2 Likely to proceed – some issues to overcome
C. Ranking 3 Could proceed – coal mining overlaying project is in progress
D. Ranking 4 Might Proceed – many community issues to overcome
E. Ranking 5 Unlikely to proceed – major issues to overcome before 2100.

The scoring system allocated up to 5 points for each major criteria (geology, environment, community and economics) and were added to attain a total score for comparison. Based on this scoring system, projects were ranked from 1 to 5. The outcomes of this assessment have been summarised in Table 6.1 and detailed individual sheets included in Appendix E.

F. As can be seen on Table 6.1, scores >16 were ranked 1, >13 ranked 2 and so forth. This Ranking provides an insight into a possible order of development of the coal fields. It has been used as a basis of reviewing the required protection of future coal development areas to maintain opportunities into the future. However, prudent long term planning should ensure protection is offered to as many of these coal areas as possible to ensure flexibility for future coal development. Figure 6.8 shows the Ranking 1 and Ranking 2 Areas.

6.3.4 Coal Area Ranking Criteria

G. The qualitative ranking has been based on a simple scoring system following an examination of each potential future coal resource area against the following criteria:

- **Geology** - strip ratio, resource size, geological knowledge.

Each site has its own distinctive geological setting.

For open cut mining, the strip ratio (coal : waste ratio) is most important. The lower the ratio the more waste needs to be moved and the higher the cost of coal. Material movement is the highest cost element in the mining operation. A score of 2 was given for a strip ratio limit of 3:1 and 1 for 2:1.

Another important element in the evaluation of a site is the total in-situ coal resources. The greater the in-situ coal resource the more opportunity exists for long term viable mining and in securing finance. For this study, the estimated in-situ coal resources of 3000 Mt in a defined area resulted in a score of 3, 1500 Mt a score of 2 and 500 Mt a score of 1.

Other factors such as geological certainty, coal quality, seam thickness etc., were considered to be of secondary importance especially when considering the large amount of exploration already completed in the Latrobe Valley and the apparent flexibility of new technologies to handle variable coal quality.

- **Environment** - issues of regional importance.

Issues of regional significance have been considered in this study. These include river diversions, cooling ponds, proximity to townships and groundwater issues. In this study issues have been scored 1 (major issues), 3 (issues can be overcome) or 5 (few apparent environmental issues).

Each project will have specific environmental issues that are difficult to appreciate, let alone to compare to other projects, without full environmental investigations. The environmental effects from the coal conversion process was not considered. It has been assumed that each project meets all environmental standards for emissions, including GHG emissions, flora, fauna; and any environmental impacts are managed.

- **Community** - impacting on the community.

The comparison of different projects from a community perspective has been based on regional issues such as major road and rail relocations, mining close to communities, impact on current industries etc. It is assumed the projects meet environmental standards and communities are not faced with pollution. Scoring: 1 where there are major issues, 3 where issues can be overcome to 5 where there are few apparent community issues.

- **Economics** - costs associated with mining or regional infrastructure.

H. This study did not look at individual project economics. The comparisons between coal areas has been carried out by considering major mining, infrastructure, environment and community costs that became apparent during the evaluation of each area.

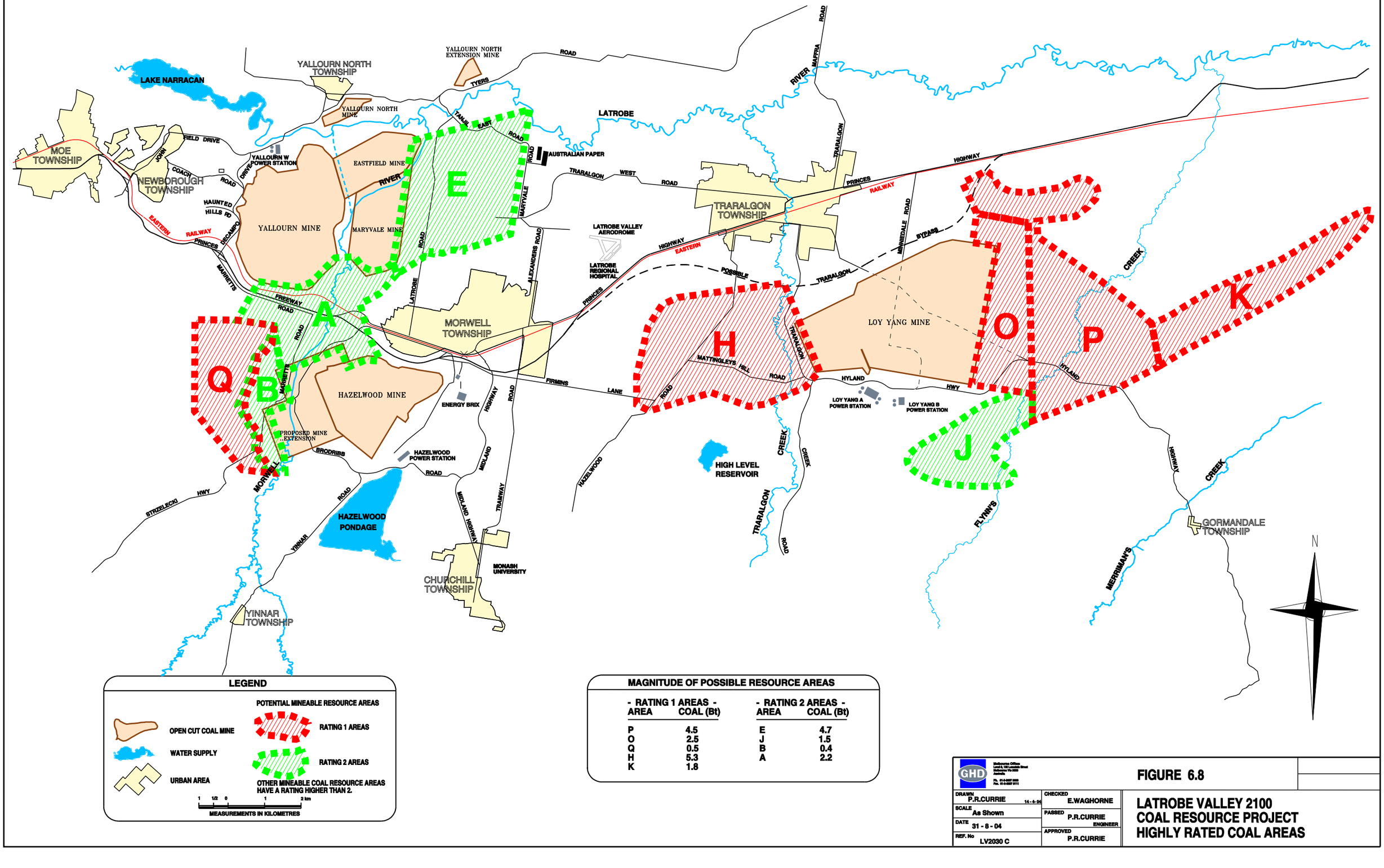
I. Mining costs are of greatest influence on new projects. For project areas with apparent high mining costs, these were scored 1, those with low mining costs scored 2. Low costs in the other categories scored 1 each.

J.

Table 6.1 Coal Prospects – Summary in Order of Ranking

Coal Resource Area	Location	Results of Evaluation Review						Comments on Rating
		Geology	Environment	Community	Economics	TOTAL SCORE	RANK	
P	Flynn Field (Monash Energy have been granted an EL)	5	4.5	5	4	18.5	1	A large well defined resource, with few perceived community issues and the potential for low cost mining. Only environmental issue appears to be the partial relocation of the intermittent Flynn Creek.
O	Coal between current Loy Yang Mining Licence Area and the Monash Energy EL (Loy Yang have an EL application pending)	4	4.5	5	4.5	18	1	It is assumed that this coal resource area would be mined following completion of either the Loy Yang or Flynn Mines. Rating would be a little lower for a new mine - considering mining costs and the loss of resources due to mine batters.
Q	Driffield (HRL have been granted an EL)	3	5	4	5	17	1	Medium sized, well defined coal resource with few perceived issues.
H	West of Loy Yang mine & Traralgon Creek	4.5	4	4.5	4	17	1	Very large, reasonably well defined coal resource; with great potential to find very economic mining areas. There seem to be few perceived issues for its development. Land zoning needs to be examined and Traralgon By-Pass alignment needs to avoid coal deposit.
K	North of the Rosedale Monocline and east to Rosedale	3	5	5	4	17	1	This coal resource sub-crops at the Rosedale Monocline. There is some geological uncertainty. Mining would be in a narrow width. The strip ratio worsens significantly to increase coal reserves.
E	East of Maryvale Field and north of Morwell township	3.5	4	4	4	15.5	2	There are good coal resources extending east from planned Yallourn Maryvale development. It could readily be mined as a further extension of the Yallourn mine. There are some community issues relating to rural living and its proximity to the north of Morwell township and to APM.
J	Fernbank Field - south-east of Loy Yang	3	3	5	4	15	2	This moderately sized coal resource; requires relocation of Flynn's Creek and could be mined in association with Loy Yang Flynn Field or separately.
B	Area between the Hazelwood Mine and potential Driffield Mine.	3	3	5	3.5	14.5	2	Rating assumes mining follows completion of the Driffield or Hazelwood Mines; However the expected need to further relocate the Morwell river reduces its viability.
A	Corridor Field west of Morwell	4.5	3	3	3	13.5	2	Well drilled resource extending beneath the road and rail transport corridor and Morwell river. Scored down to account for necessary relocations. Smaller developments may rate higher

Coal Resource Area	Location	Results of Evaluation Review						Comments on Rating
		Geology	Environment	Community	Economics	TOTAL SCORE	RANK	
M	South west of area H	1.5	5	4.5	2	13.0	3	Small resource, Only consider with area H
Y	Deep coal beneath planned Hazelwood mine	1.5	3.5	4	3.5	12.5	3	The well defined M2 coal resources beneath the current Hazelwood mine could be economic if it is possible to manage coal winning and mine backdumping to lesson risk of settlement in Morwell M2. Coal winning could extend beyond the bounds of the current Hazelwood mine into areas A, B and Q.
Z	Deep coal beneath planned Loy Yang mine	1.5	3.5	4	3.5	12.5	3	This is a logical extension of Loy Yang mine, although mining costs will rise and the need to incorporate internal dumping for rehabilitation and to reduce groundwater depressurisation makes it a difficult development
C	Western side of the Hazelwood Cooling Pond and down to Yinnar	4	3	3	2	12	3	With limited exploration, potential for a narrow mine with some community issues to be solved. Need to move cooling pond.
F	Beneath Maryvale Paper Mill	4	5	1	1.5	11.5	4	Good coal resources here but the major issue to its use is the need to relocate the massive wood and paper facilities. The owners have an agreement to use the site until at least 2030.
X	Deep coal beneath a possible Driffield mine	0	3	5	3	11	4	Unlikely there is sufficient coal to warrant mining - could be included in a deep Hazelwood development (Area Y).
L	Adjacent to Gormandale	3	3	3	2	11	4	Major issues associated with the Merriman Creek and Gormandale make this a difficult resource to utilise
G	Under the Latrobe River	3	0	4	2	9	4	Relocating the Latrobe River is a major environmental and economic issue
I	Between Loy Yang mine and Traralgon	3	3	1	1	8	5	Impacts on the Traralgon buffer area and proposed Princess Highway by-pass route make utilisation of this resource difficult.
N	Adjacent to Churchill	2	2	1	1	6	5	Small coal resources and envisaged impacts on the town of Churchill and to the University precinct affect rating.
D	Under Morwell Township	5	1	0	0	6	5	In spite of large coal resources, moving the Morwell township of >10,000 residents greatly affects rating.



LEGEND

- OPEN CUT COAL MINE
- WATER SUPPLY
- URBAN AREA
- POTENTIAL MINEABLE RESOURCE AREAS
- RATING 1 AREAS
- RATING 2 AREAS
- OTHER MINEABLE COAL RESOURCE AREAS HAVE A RATING HIGHER THAN 2.

1 1/2 0 1 2 km

MEASUREMENTS IN KILOMETRES

MAGNITUDE OF POSSIBLE RESOURCE AREAS

- RATING 1 AREAS - AREA	COAL (Bt)	- RATING 2 AREAS - AREA	COAL (Bt)
P	4.5	E	4.7
O	2.5	J	1.5
Q	0.5	B	0.4
H	5.3	A	2.2
K	1.8		

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FIGURE 6.8

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SCALE	As Shown	PASSED	P.R.CURRIE ENGINEER
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REF. No	LV2030 C		

LATROBE VALLEY 2100 COAL RESOURCE PROJECT HIGHLY RATED COAL AREAS

6.4 Number of Coal Projects Prior to 2100

As discussed in Section 5, there is a range of expected coal demands to meet electricity generation requirements and coal to oil projects. These have been analysed under Scenarios 1, 2 and 3. For each scenario, coal demands will need to be met from current mines, extensions of current mines or by opening new mines. New mines could have a range of outputs. For this study current mines are assumed to continue at current rates to projected shut down times. New mines are assumed to be developed in 10, 25 or 50 Mtpa production "projects" with a 40 year life. An estimate of the number of mine projects that will need to be commenced in this manner to meet the demand estimate has been made. This rationale is developed on Table 6.2: -

Table 6.2 Approximate Coal Demand and New Mine Projects

Coal Demand	Scenario 1	Scenario 2	Scenario 3
2050 for generation of electricity (Mtpa)	30	40	50
2050 for coal to oil (Mtpa)	-	15	40
Coal Demand at 2050 (Mtpa)	30	55	90
Coal Demand 2005 - 2050 (Mt)	2100	3000	3800
Coal Demand 2050 - 2100 (Mt)	1500	2750	4500
Total Estimated Coal Demand (Mt)	3600	5750	8300
Predicted Coal from current mines (Mt)	1050	1500	1850
Coal required from new mines (Mt)	2450	4250	6450
Likely new mine projects with: -			
◗ 10 Mtpa, 40 year life	1	1	1
◗ 25 Mtpa, 40 year life	2	2	3
◗ 50 Mtpa, 40 year life	1	2	3
Total New Mine Projects	**4**	**5**	**7**

6.5 Summary

Beyond the life of the current projects new coal developments would be required to meet either of the three scenarios examined in this study. 9 high ranking areas have been identified. To meet Scenario 3 most of the Ranking 1 and 2 projects would be commenced by the end of this century. Scenario 2 would involve 5 new projects to 2100 and Scenario 1, 4 new projects. It is recommended that all Ranking 1 and 2 projects are given maximum protection in land zoning to facilitate their future development.

A conceptual view of how mining could be prior to the end of the century is given on Figure 6.9.

LAKE NARRACAN
MOE TOWNSHIP
NEWBOROUGH TOWNSHIP
YALLOURN NORTH TOWNSHIP
YALLOURN NORTH EXTENSION MINE
YALLOURN NORTH MINE
YALLOURN W POWER STATION
REHABILITATED MINE
OPERATING MINE
AUSTRALIAN PAPER
LATROBE
LATROBE VALLEY AERODROME
LATROBE REGIONAL HOSPITAL
TRARALGON TOWNSHIP
MORWELL TOWNSHIP
ENERGY BRIX
HAZELWOOD POWER STATION
HAZELWOOD PONDAGE
CHURCHILL TOWNSHIP
MONASH UNIVERSITY
YINNAR TOWNSHIP
HAZELWOOD
HIGH LEVEL RESERVOIR
LOY YANG A POWER STATION
LOY YANG B POWER STATION
GORMANDALE TOWNSHIP
FLYNN'S
MERRIMAN'S
TYERS
TANJIL EAST ROAD
JOHN FIELD DRIVE
COACH ROAD
HAUNTED HILLS RD
DRIVE
DECAMPO
EASTERN RAILWAY
PRINCES
MARRETTS FREEWAY ROAD
MARRETTS ROAD
BRODRIBB ROAD
STRZELECKI HWY
YINNAR ROAD
MORWELL ROAD
LATROBE ROAD
MARYVALE ROAD
ALEXANDERS ROAD
TRARALGON WEST ROAD
HIGHWAY EASTERN
POSSIBLE TRARALGON BYPASS
MINNIEDALE ROAD
RAILWAY PRINCES HIGHWAY
TRARALGON CREEK
MATTINGLEYS HILL ROAD
HYLAND HWY
HYLAND
FIRMINS LANE
MIDLAND HIGHWAY
MIDLAND TRAMWAY
HAZELWOOD ROAD
TRARALGON CREEK ROAD
HIGHWAY CREEK
RIVER MARFRA ROAD
RIVER

LEGEND

- MINEABLE COAL RESOURCE VERTICAL STRIPPING RATIO COAL (t) : WASTE (m3) > 2
- REHABILTATED MINE
- WATER SUPPLY
- URBAN AREA
- OPERATING MINE

1 1/2 0 1 2 km

MEASUREMENTS IN KILOMETRES

N

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FIGURE 6.9

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LATROBE VALLEY COAL RESOURCE PROJECT CONCEPTUAL MINING OPERATIONS IN 2080

7. Land Planning

"To review the Latrobe City and Wellington Shires Strategic and Statutory Planning Framework relative to coal, land over coal, surrounding land uses and buffers, and identify gaps where likely coal developments are not accommodated or where current coal related provisions are not required in the future."

7.1 State Policies & Strategies

7.1.1 Framework for the Future

This framework was prepared in 1987 in order to establish land use guidelines for the protection and sequential development of brown coal in the Latrobe Valley region. It was intended to provide a long-term land planning structure that protected Victoria's coal resources as well as giving certainty to residents and business within the region. It builds upon work commenced in the 1940s for protection and delineation of coalfields, which was steadily reviewed through the 1970s and 1980s.

The three main goals of the framework were:

- *To protect Victoria's coal resources and maximise the efficiency of development of the coal resource for the benefit of all Victorians;*
- *To improve the quality of life for the region's population by promoting better planning in the region; providing greater security of tenure for residents; and compensating those affected by coal development in the next 30 years;*
- *To maximise the retention of land throughout the region in productive use.*

The framework intended to set out a response to community concerns, finalise coal boundaries and identify ways that coal would be protected. It has become the basis of local planning.

The framework for the Future was based on predicted coal use by the SECV at that time.

- Category A used within 30 years
- Category B used within 60 years
- Category C beyond 60 year timeframe

7.1.2 Land Over Coal and Buffer Study

Following the completion of the Framework for the Future in 1988, a further study was carried out to clarify the acceptable uses of 'land-over coal' and to define buffers between towns and potential open pit mines [Ref 20]. These buffer areas were defined to be 1 km wide from potential mine crests with a 250 m operational zone defined on the mine side. The objective of the buffer areas was to protect communities from mining and to protect future mining from encroaching town boundaries.

7.1.3 Strategic Environmental Resource Framework

A Strategic Environmental Resource Framework [Ref 25], released in November 2004, was developed in part as a result of further modelling undertaken by the Department of Primary Industries in regard to coal resources within the Latrobe Valley.

The environmental resources framework foreshadowed the likelihood of the Government issuing further exploration licences to private industry and provides an overview of the current issues relating to the mining and use of brown coal. The intent was to provide a structure for enabling informative decisions at all stages of new coalfield development through:

- *Highlighting policies related to environmental and social issues*
- *Serving as a resource document for assessing any future coal tenders*
- *Serving as a resource document for assessing regional impacts of future coal developments*
- *Guiding other major infrastructure and development projects, to minimise potential conflicts with coal developments*
- *Serving as a resource document for developers preparing tenders, Environment Effects Statements (EES) and Environmental Management Plans (EMP's)*

7.2 State Planning Policy Framework

A planning scheme is a statutory document that sets out objectives, policies and provisions that relate to the use, development, protection and conservation of land to an area to which it applies. A planning scheme is derived from the Victorian Planning Provisions (VPPs), which are a Statewide reference document.

A key characteristic of the Victorian Planning Provision model planning schemes is that land use planning is driven by a strategy. This strategy has been incorporated into planning schemes through the inclusion of the State Planning Policy Framework and a Local Planning Policy Framework.

The State Planning Policy Framework (SPPF) located within all Planning Schemes sets out specific policies expressing relevant economic, social and environmental considerations in relation to land use planning. The section of the SPPF most relevant is Clause 17.08 – Mineral Resources.

The Clause has the following objective:

> *To protect identified mineral resources, to encourage mineral exploration and mining in accordance with acceptable environmental standards and to provide a consistent planning approval process.*

Clause 17.08-3 – Geographic strategies states: -

> *"Planning and responsible authorities in Central Gippsland must act to protect the brown coal resource and should ensure that:*
>
> *Changes in use and development of land overlying coal resources, as generally defined in Framework for the Future (Minister for Industry, Technology and Resources and Minister for Planning and Environment, 1987) and the Land Over Coal and Buffer Area Study (Ministry for Planning and Environment, 1988), do not compromise the winning or processing of coal. Coal-related development is adequately separated from residential or other sensitive uses and main*

transport corridors by buffer areas to minimise adverse effects such as noise, dust, fire, earth subsidence, and visual intrusion.

Uses and development within the buffer areas are compatible with uses and development adjacent to these areas."

Other policies relevant include elements of *Clause 15 – Environment,* such as water quality, air quality, soil contamination, conservation of native flora and fauna and renewable energy. These issues sit along side any future framework prepared for the Latrobe Valley Coalfields.

7.3 Latrobe and Wellington Planning Schemes

The Local Planning Policy Framework is comprised of the Municipal Strategic Statement (MSS) – Clause 21 and Local Policies – Clause 22. It provides direction for the determination of land use development applications and for overall land use planning.

Clause 21: Brown Coal Objective

Both Latrobe City and Wellington Shire have local policies and strategies located within the MSS related to the operation and influence of the Coalfields within each region that are fundamentally based on the *Framework for the Future 1987.* As such both municipalities have generally consistent objectives, which are located in Clause 21.04-11 of the La Trobe Planning Scheme and Clause 21.10 of the Wellington Planning Scheme. These are:

- *To facilitate orderly coal development so that the resource is utilised in a way which is integrated with State and local strategic planning.*
- *To ensure the use and development of land overlying the coal resource having regard to the need to conserve and utilise the coal resource in the context of overall resources having regard to social, environmental, physical and economic considerations in order to ensure a high quality of life of residents.*
- *To provide a clear understanding within the regional community of the implications of designating land for future coal resource development or for buffer areas in the future use of land.*

Other clauses within each MSS reference the importance of energy and coal but details the specific policy objectives within Clause 22 – Local Policies.

Clause 22: Coal Resource and Coal Buffers Policy

Both Latrobe City and Wellington Shire have fundamentally the same policies for Coal Resources and Coal Buffers with only a small difference within the Coal Resources Policy relating to the use of the Special Use Zone – Schedule 1 within the Latrobe City. Nevertheless the intent is ultimately the same.

The policies are located at Clause 22.01 and 22.02 in the La Trobe Planning Scheme and Clause 22.08 and 22.09 in the Wellington Planning Scheme. These are detailed as follows:

7.3.1 Coal Resources Policy

The policy basis notes:

- *The coal resource is an asset of National and State importance for energy purposes.*
- *The boundaries of the coal resource are shown on the Coal Resources Policy map as follows:*
  - *Special Use Brown Coal (SUZ1)*
    - *Category A coalfields - development possible within 10-30 years.*
  - *Other coal areas (SRO1):*
    - *Category B coalfields - development possible within 30-60 years.*
    - *Category C coalfields - development more than 60 years off.*
- The industry is a significant land use activity in and a key component to the economy of the municipality.

The objectives are:

- *To ensure that the use and development of land overlying the coal resources recognises the need to conserve and utilise the coal resource in the context of overall resources, having regard to social, environmental, physical and economic considerations in order to ensure a high quality of life for residents.*
- *To facilitate orderly coal development so that the resource is utilised in a way which is integrated with the State and Local Planning Policy Frameworks.*

An important element of the policy relates to the primacy that land use for coal resource use has over all other land uses. Planning authorities, in preparing amendments to the Scheme, and responsible authorities, in deciding applications, must take into account this primacy. In particular where there are land use or policy conflict encountered, the coal resource and areas required to utilise the resource must be protected from other land uses and adjacent land uses that may create compatibility issues.

7.3.2 Coal Buffers Policy

The policy basis detailed in the Clause identifies that:

The coal industry is of national and State importance due to its use as the primary energy source for the electricity generating industry in Victoria. The impact on the environment is radical. Buffers protect those elements of the policy area such as urban settlements from the impact of the radical change to the environment from the coal industry.

The urban buffer distance has been established on the basis of the known impacts of earth subsidence, noise, dust, fire hazard and visual intrusion. Buffer areas extend for a distance of 750 metres from any urban settlement boundary to the perimeter of a 250 metre wide coal operational area. The total separation area between an urban settlement boundary and the crest of any future open cut development should not be less than 1 kilometre in width.

As well as protecting urban areas, coal buffers also prevent urbanisation of land areas adjacent to high value coal resources which might prevent their future utilisation. Specific buffers also have been identified as part of the La Trobe Planning Scheme related to transport corridors and the Australian Paper Mill site at Maryvale.

The same objectives for buffers in both Municipalities are detailed in the policy:

- *To ensure that the use, development and management of land in the coal resource areas mutually protect urban amenity and coal resource development as well as the continued social and economic productive use of land.*
- *To minimise the land use conflict between the coal resource development and other development and use in the municipality.*
- *To ensure that adequate spatial separation is provided between existing and proposed urban and industrial uses and existing or proposed coal development so as to reduce the likely effects of earth subsidence, the emission of noise, dust, fire hazard and visual intrusion.*
- *To provide for uses and developments which are compatible to coal development and ancillary services within the buffer area.*
- *To maximise the protection of the coal resource to ensure resource security in the future.*

These policies are designed to ensure that there is ongoing protection of coal as a national resource, but to understand that its use and development should have regard to the broader social, environmental, physical and economic considerations in the surrounding areas.

7.3.3 Other Objectives

Key influences pursuant to Clause 21.02 of the La Trobe Planning Scheme and 21.03 of the Wellington Planning Scheme include (inter alia):

- Environment;
- Economic diversity and development;
- Natural resources;
- Population; and
- Electricity generation & international industries.

These issues must be considered in determining how the future protection and development of coal within the Latrobe Valley is undertaken.

7.4 Zoning and Overlays

A description of the zones and overlays within the La Trobe and Wellington Planning Schemes are given in (Tables 7.1, 7.2). As noted, each Municipality utilises planning tools available within the Victorian Planning Provisions to designate areas of identified brown coal within the region and to provide appropriate buffers. The main difference is that the coal areas identified by the SECV as Category A (development within the next 10-30 years from 1987) only occur within the La Trobe Planning Scheme. The Wellington Planning Scheme designates areas based on the boundaries of Categories B and C.

Special Use Zone – Schedule 1 (Brown Coal) – La Trobe Planning Scheme

The purposes as set out are:

- *To provide for brown coal mining and associated uses*
- *To provide for electricity generation and associated uses*
- *To provide for interim and non-urban uses which protect brown coal resources and to discourage the use or development of land incompatible with future brown coal mining and industry*

Special Use Zone (Morwell River Diversion) – La Trobe Planning Scheme

Within the Latrobe Shire Planning Scheme this zone ensures that adequate spatial separation is provided for a potential future river diversion to the east of Morwell.

State Resource Overlay (Brown Coal) – La Trobe and Wellington Planning Schemes

For other identified coal areas (Categories B – development within 30-60 years and C – development more than 60 years off) the State Resource Overlay (SRO) – Schedule 1 (Gippsland Brown Coalfields) is applied. It has the following specific statement of significance and management objective:

- *1.0 Statement of resource significance*

The Gippsland Coalfields provide a secure long term energy source for base load power generation in Victoria, as well as providing a unique opportunity for other related significant developments.

- *2.0 Management objective*

In order to ensure the medium to long term extraction and use of the coal resource for power generation, building, works and subdivision of land over the resource should be of a type that will not inhibit, by way of community significance or cost of removal, the eventual productive use of that resource.

The Schedule to this overlay is applicable to both Latrobe City and Wellington.

Environmental Significance Overlay – La Trobe and Wellington Planning Schemes

For areas that are designated as buffers, the Environmental Significance Overlay – Schedule 1 (Urban Buffers) or Schedule 3 (Urban and Construction Buffer) has been applied. Whilst the statement of significance and objectives in both Planning Schemes is similar (Table 7.1, 7.2) La Trobe's is quoted.

- *1.0 Statement of environmental significance*

The coal industry is of national and State importance due to its use as the primary energy source for the electricity generating industry in Victoria. The impact on the environment is radical. Buffers protect those elements of the Coal Buffers Policy Area such as urban settlements from the impact of the radical change to the environment from the coal industry.

- *2.0 Environmental objective to be achieved*

To ensure that development in the Gippsland Coalfields Policy Area provides mutual protection of urban amenity and coal resource development and the continued social and economic productive use of land. To provide for development which is compatible within a buffer area including reservations and for services ancillary to a Brown Coal Open Cut outside the buffer area.

Table 7.1 La Trobe Planning Scheme – Zones and Overlays Relevant to the Coal Resource

	La Trobe Planning Scheme	**Purpose/Objective**
Zone	Special Use Zone – Schedule 1 (Brown Coal) (**SUZ1**)	Zone Purpose: To implement the State Planning Policy Framework and the Local Planning Policy Framework, including the Municipal Strategic Statement and local planning policies. To recognise or provide for the use and development of land for specific purposes as identified in a schedule in this zone. Schedule 1 Purpose: To provide for brown coal mining and associated uses. To provide for electricity generation and associated uses. To provide for interim and non-urban uses which protect brown coal resources and to discourage the use or development of land incompatible with future brown coal mining and industry.
	Special Use Zone – Schedule 5 (Morwell River Diversion) (**SUZ5**)	Zone Purpose: To implement the State Planning Policy Framework and the Local Planning Policy Framework, including the Municipal Strategic Statement and local planning policies. To recognise or provide for the use and development of land for specific purposes as identified in a schedule in this zone. Schedule 5 Purpose: To ensure that adequate spatial separation is provided between works associated with the proposed river diversion and associated works and any existing or proposed use and development, so as to reduce the likely effects of the emission of noise, visual intrusion, waste discharge, movement of earth and dust.
Overlay	State Resource Overlay – Schedule 1 (Gippsland Brown Coalfields) (**SRO1**)	Overlay Purpose: To implement the State Planning Policy Framework and the Local Planning Policy Framework, including the Municipal Strategic Statement and local planning policies. To protect areas of mineral, stone and other resources, which have been identified as being of State significance, from development that would prejudice the current or future productive use of the resource. Schedule 1 Management Objective: In order to ensure the medium to long term extraction and use of the coal resource for power generation, building, works and subdivision of land over the resource should be of a type that will not inhibit, by way of community significance or cost of removal, the eventual productive use of that resource.

	Environmental Significance Overlay – Schedule 1 (Urban Buffer) (**ESO1**)	Overlay Purpose: To implement the State Planning Policy Framework and the Local Planning Policy Framework, including the Municipal Strategic Statement and local planning policies. To identify areas where the development of land may be affected by environmental constraints. To ensure that development is compatible with identified environmental values. Schedule 1 Environment Objective: To ensure that development in the Gippsland Coalfields Policy Area provides mutual protection of urban amenity and coal resource development and the continued social and economic productive use of land. To provide for development which is compatible within a buffer area including reservations and for services ancillary to a Brown Coal Open Cut outside the buffer area.

(NB: For up to date Planning Scheme Provisions (Map and Ordinance provisions) refer to: www.dse.vic.gov.au/planningschemes)

Table 7.2 Wellington Planning Scheme – Zones and Overlays Relevant to the Coal Resource

	Wellington Planning Scheme	**Purpose/Objective**
Zone	No relevant Zone(s)	N/A
Overlay	State Resource Overlay – Schedule 1 (Gippsland Brown Coalfields) (**SRO1**)	Overlay Purpose: To implement the State Planning Policy Framework and the Local Planning Policy Framework, including the Municipal Strategic Statement and local planning policies. To protect areas of mineral, stone and other resources, which have been identified as being of State significance, from development that would prejudice the current or future productive use of the resource. Schedule 1 Management Objective: In order to ensure the medium to long term extraction and use of the coal resource for power generation, building, works, and subdivision of land over the resource should be of a type that will not inhibit, by way of community significance or cost of removal, the eventual productive use of that resource.
	Environmental Significance Overlay – Schedule 3 (Urban and Construction Buffer) (**ESO3**)	Overlay Purpose: To implement the State Planning Policy Framework and the Local Planning Policy Framework, including the Municipal Strategic Statement and local planning policies. To identify areas where the development of land may be affected by environmental constraints. To ensure that development is compatible with identified environmental values. Schedule 3 Environment Objective: To ensure that development and land management in the Gippsland Coalfields provides mutual protection of urban amenity and coal resource development and the continued social and economic productive use of land. To provide for development which is compatible within a buffer area and for services ancillary to coal open cut operations. To reduce impacts associated with coal mining such as earth subsidence, emission of noise, dust, fire hazard and visual intrusion, waste discharge, movement of earth, and dust.

(NB: For up to date Planning Scheme Provisions (Map and Ordinance provisions)) refer to: www.dse.vic.gov.au/planningschemes

7.5 Protection of Future Coalfields within Latrobe Valley

The LV2100 Coal Resources Project has reviewed the coal areas in the Latrobe Valley. An assessment carried out on a regional basis has provided an indication of the most likely coal areas which will be developed by 2100. A number of changes are recommended to the State and Local Planning Policy Frameworks, Special Use Zones, Buffers and Overlays.

7.5.1 State Planning Policy Framework

The general intent of the relevant clauses in the SPPF is sufficient to emphasise the need to protect mineral resources, and more specifically the coal resources of the Gippsland Region. There is, however, at the very least a need to update reference to the changes recommended by the LV2100 Coal Project. It is recommended Clause 17.08-3 be modified to read as follows:

K. *Planning and responsible authorities in Central Gippsland must act to protect the brown coal resource and should ensure that:*

L. *changes in use and development of land overlying and in proximity to coal resources, as generally, as generally defined in Framework for the Future (Minister for Industry, Technology and Resources and Minister for Planning and Environment, 1987), the Land Over Coal and Buffer Area Study (Ministry for Planning and Environment, 1988) and the Latrobe Valley 2100 Coal Resource Project (Department of Primary Industries, 2004), do not compromise the winning or processing of coal,*

M. *coal related development is adequately separated from residential or other sensitive uses and main transport corridors by buffer areas to minimize adverse effects such as noise, dust, fire, earth subsidence, and visual intrusion, and*

N. *uses and development within the buffer areas are compatible with uses and development adjacent to these areas.*

7.5.2 Local Planning Policy Framework – Latrobe City and Wellington Shire

The LPPF provisions for both local governments are almost identical and are derived from Framework for the Future and Land Over Coal and Buffer Area Study. There are two distinct policy areas: Coal Resources and Coal Buffers.

Coal Resources

Reference in Policy Basis to the boundaries of the Coal Resources Policy Map should be modified to read:

- *Special Use Brown Coal (SUZ1) – Ranking 1 and 2 areas – development for resource extraction and associated uses possible within 100 years.*
- *Other Coal Areas (SRO1) – Other coalfields and areas for associated uses more than 100 years off.*

The policy map should be modified to reflect the recommended changes to the boundaries of these areas.

The remaining policy provisions are considered adequate.

Coal Buffers

The provisions of the policy framework relating to buffer requirements are based on assumptions made in *Framework for the Future* and *Land Over Coal and Buffer Area Study*. This LV 2100 study has not uncovered any additional information that suggests these policy provisions should be modified.

However, it should be noted that during community consultation questions were raised about the need to clarify acceptable uses of land within buffer areas. This issue has not been further examined.

There has also been community debate about the location of the Traralgon Bypass and potential urban expansion within the Traralgon coal buffer [Ref 28]. The need for a coal buffer immediately adjacent to the east of Newborough has also been queried.

7.5.3 Zones and Overlays – Latrobe City and Wellington Shire

Scheme Provisions

The Special Use (Brown Coal) Zone 1 is only used in the La Trobe Planning Scheme, while the State Resource Overlay, and Environmental Significance (Urban Buffers) overlays are used in both the La Trobe and Wellington Planning Schemes. It is recommended that the Special Use (Brown Coal) Zone is included in the planning scheme of the Wellington Shire. All three planning scheme tools are considered adequate for managing land use and development to protect the coal resource. The scheme provisions are generally adequate to protect the resource, although there may be a need to reconsider the developments requiring permits.

The Environmental Significance (Urban Buffers) overlay requires a permit for a wide range of buildings and works, and this allows for the potential impact of uses and development on the use of the coal resource. The Special Use (Brown Coal) 1 zone and State Resource overlay, however, do not require permits to be issued for dwellings (provided they meet the minimum requirements relating to impacts on the use of the coal resource). This is considered a gap in the scheme provisions, because dwellings could be constructed with no input from the planning or referral authorities.

7.5.4 Coal Resource Areas and Planning Scheme Implications

Each identified coal resource area assessed suitable for future use has been reviewed against current land zones and overlays in the two Planning Schemes (refer Figure 7.1).

Whilst it might be desirable to zone all identified coal areas with the special use zone (SUZ1), which provides the greatest protection for coal resources, this does not recognise the likely delay in commencing the development of some of the coal resources. When the current planning schemes were being established, “Framework for the Future” was used as a basis for establishing the Special Use Zone (SUZ1) areas for coal projects likely to commence within a 30 year time frame. A State Resource Overlay was applied to coal developments likely to be developed beyond the 30 year timeframe. This arrangement for zoning high ranked coal areas and applying overlays for developments with secondary ranking is a reasonable approach and is recommended in this current review. However, the timeframe for areas to be zoned SUZ1 is recommended to include all coal areas likely to be needed by 2100.

In the scenarios examined, between 4 and 7 mining projects are expected to be commenced prior to 2100. New projects could commence in the next five or ten years and a number are expected to be

needed to replace existing mine and power operations in the 2030's and 2050's. The qualitative rating process has identified 9 coal resource areas with a Ranking 1 and 2, from which these coal demands are expected to be sourced. It is difficult to determine the exact order of development or timing of these coal resource areas. The three most highly scored, Ranking 1 areas are currently being considered for development. It is recommended that all coal projects with Ranking 1 or 2 should be protected by SUZ1 zoning even though some of these coal areas may not be commenced for 50 or 60 years. Table 7.3 details a recommended zoning standard for coal resource areas. Table 7.4 outlines the coal resource areas and associated rankings and observations regarding the existing level of protection in the planning schemes.

Table 7.3 Recommended Zoning Standard

Ranking of Coal Area	Zone Requirement	Overlay Requirement
1	SUZ1	Not required
2	SUZ1	Not required
3	Either SUZ1 Zone or State Resource Overlay	
4	Not Required	State Resource Overlay

The LV2100 Coal Resource project has not examined the total area covered by a coal resource overlay, and is not recommending changes to this situation.

This study has not firmly defined the boundaries of new or modified coal areas. This involves further study of the coal resources, likely mining areas and the need for associated infrastructure. When "Frameworks for the Future" was carried out, the protected areas included an allowance for power station sites, external overburden dumps, ash ponds and any associated infrastructure. It is recommended these issues need further review and discussion with key stakeholders before the precise areas requiring rezoning are defined.

Whilst reviewing coal resource areas and assessing gaps in current land controls a number of other areas appear to have zones not still required for future coal related developments.

These include the Anderson Creek future overburden dump area, land to the west of De Campo Drive in Newborough, land to the south-west of Driffield, land near Yinnar and the major Morwell River diversion to the east of Morwell. Table 7.5 suggest a number of areas which may no longer be required. Anderson Creek and the major Morwell river diversion are discussed in Section 7.5.5 and 7.5.6.

7.5.5 Anderson Creek Overburden Dump Area

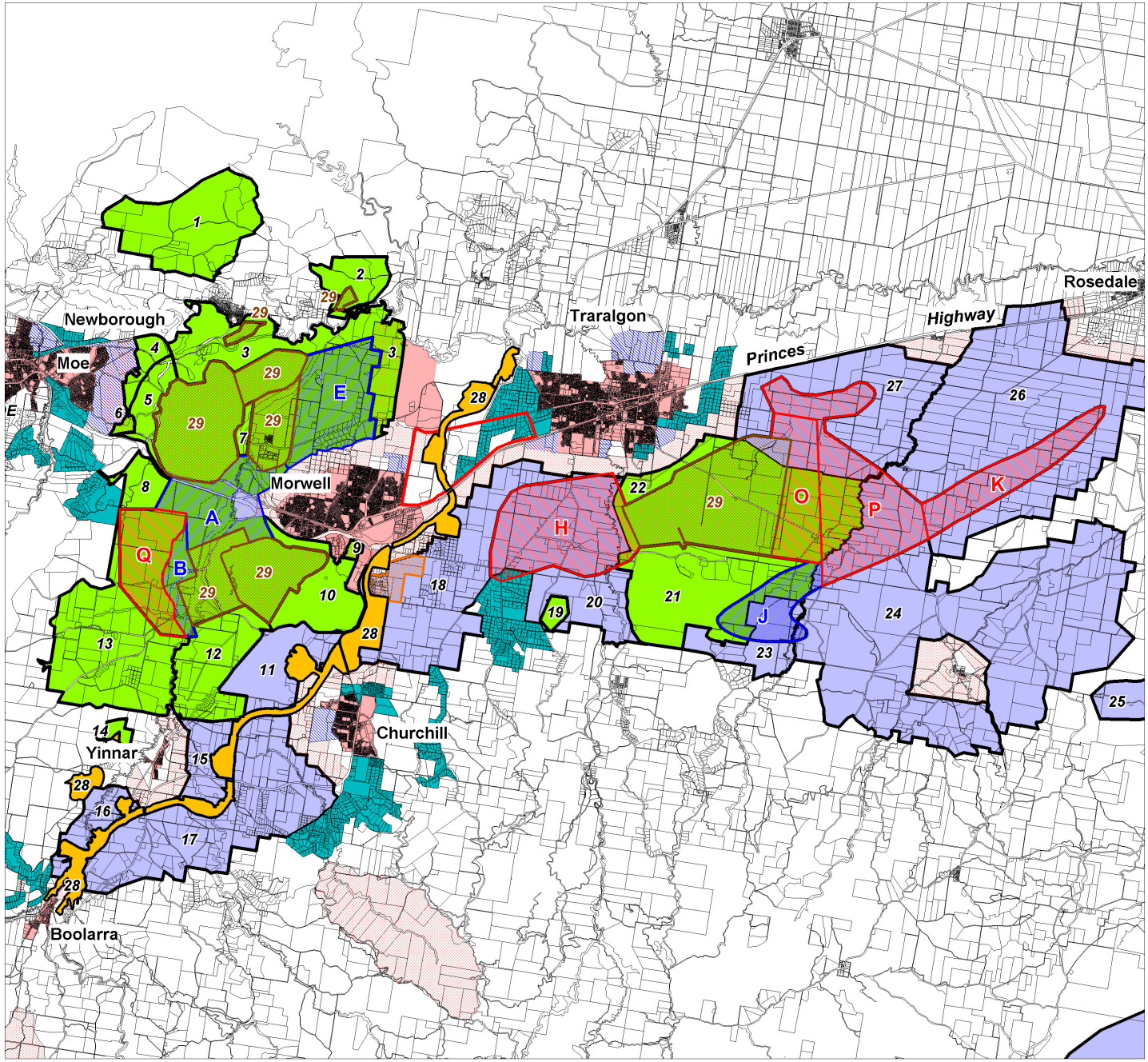
In the 1980's a number of studies relating to the future use of coal were carried out by the SECV or other government bodies. The summary document [Ref 13] "Long Term Development of Coal Resources" in April 1982 recommended a Preferred Development Plan. Within this plan the growth in power generation and coal utilisation required the construction of a number of new mines and power stations. The strategy

was considered for development in the ‘Western and Eastern’ Coalfield areas. In this reference the Western Coalfield referred to the area west of the Morwell monocline evidenced by the ‘Ridge’ through Morwell township. The Western Coalfield includes Hazelwood, Yallourn and Driffield coal areas. For the Western Coalfield development it was recognized that in some circumstances there would be insufficient room in existing mines to store overburden material. A SECV report in 1983 “Western Coalfield Overburden Disposal” [Ref 14 & 15] discusses the problem. The adopted strategy assumed the Yallourn mine would be completely backfilled and that waste dumping in Driffield and Hazelwood mines needed to wait until the Morwell M2 coal seam (coal seam below the Hazelwood mine) had been excavated. An area to the north-west of Yallourn covering Anderson Creek was designated for future overburden dumping and was re-zoned accordingly.

The Anderson Creek overburden dump was required to meet short term scheduling difficulties for excess overburden dumping from the new mines in the western part of the Latrobe Valley even though over the longer term there is insufficient overburden to backfill mined out areas because of the high coal:overburden strip ratio.

Power demand and consequently power station and mine development has been much slower than predicted in the mid 1980’s studies and there is currently large spare dumping capacity in both the Yallourn and Hazelwood mines. Should a Driffield mine proceed, there would be sufficient space available in either mine for overburden from the initial mine opening without impacting a future Morwell M2 coal seam development. Other mines may proceed in the western end of the Latrobe Valley and these should be able to be designed to utilise dumping room within current mines, even for the higher coal usage in Scenario 3.

Arrangements may need to be brokered by the Victorian Government to enable one mining operation to cost effectively dump overburden into a neighbouring mine that may be managed by a competitor. If this can be satisfactorily achieved there should be no reason to retain the Anderson Creek overburden dumping area and it is recommended that planning controls be reviewed and, where appropriate, deleted.



G:31/15100/Mapinfo_Files/ Brown Coal.WOR

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Kilometres

Scale: 1:175,000 @ A3

LEGEND

COAL ZONES AND OVERLAYS

- SPECIAL USE 1 ZONE: Brown Coal
- 28 — SPECIAL USE 5 ZONE: Morwell River Diversion
- STATE RESOURCE OVERLAY
- ENVIRONMENTAL SIGNIFICANCE OVERLAY - URBAN BUFFER

OTHER LAND USES, ZONES AND OVERLAYS

- EXISTING URBAN AND INDUSTRIAL AREAS
- POTENTIAL URBAN EXPANSION AREAS (Subject to Further Investigation)
- EXISTING RURAL LIVING
- EXISTING INDUSTRIAL AREAS WITH STATE RESOURCE OVERLAY
- MORWELL - TRARALGON CORRIDOR ACTIVITY PRECINCT

POTENTIAL MINEABLE RESOURCE AREAS

- H — RATING 1 AREAS
- A — RATING 2 AREAS
- 29 — OPEN CUT COAL MINE

ZONE AND OVERLAY AREAS OUTSIDE RESOURCE AREAS

- 2

Figure 7.1
COAL RESOURCE AREAS AND PLANNING SCHEME IMPLICATIONS

Latrobe Valley 2100 Coal Project
Ref. No. 31/15100 - December 2004

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Ranking
1
2
3
4
5

Table 7.4 Identified Coal Resource Areas in order of Ranking

Coal Resource Area	Location	Rank	Comments on Rating	Resource Size (BillionT)	Land Zoning	Overlay	Are the coal resources adequately protected (by the use of SUZ1 zoning)	Comment on Adequacy of Zoning
P	Flynn Field (Monash Energy have been granted an EL)	1	A large well defined resource, with few perceived community issues and the potential for low cost mining. Only environmental issue appears to be the partial relocation of the intermittent Flynn Creek.	4.5	approximately 30% SUZ1;	remaining 70% SRO1	No	High priority to protect this coal resource by increasing SUZ1 zoning
O	Coal between current Loy Yang Mining Licence Area and the Monash Energy EL (Loy Yang have an EL application pending)	1	It is assumed that this coal resource area would be mined following completion of either the Loy Yang or Flynn Mines. Rating would be a little lower for a new mine - considering mining costs and the loss of resources due to mine batters.	2.5	mostly SUZ1	remainder SRO1	No	High priority to protect this coal resource by increasing SUZ1 zoning
Q	Driffield (HRL have been granted an EL)	1	Medium sized, well defined coal resource with few perceived issues.	0.5	SUZ1		Yes	
H	West of Loy Yang mine & Traralgon Creek	1	Very large, reasonably well defined coal resource; with great potential to find very economic mining areas. There seem to be few perceived issues for its development	5.3	Nil	SRO1	No	High priority to protect this coal resource by increasing SUZ1 zoning
K	North of the Rosedale Monocline and east to Rosedale	1	This coal resource is where the coal seams sub crop to the Rosedale Monocline. There is some uncertainty of geology in this area. Mining would be in a narrow band and the strip ratio worsens to increase coal reserves.	1.8	nil	SRO1	No	High priority to protect this coal resource by increasing SUZ1 zoning
E	East of Maryvale Field and north of Morwell township	2	There are good coal resources extending east from planned Yallourn Maryvale development. It could readily be mined as a further extension of the Yallourn mine. There are some community issues relating to rural living and its proximity to the north of Morwell township.	4.7	SUZ1		Yes	
J	Fernbank Field - south-east of Loy Yang	2	This moderately sized coal resource; requires relocation of Flynn's Creek.	1.5	about 50% SUZ1	remainder SRO1	No	Suggest rezone to SUZ1
B	Area between the Hazelwood Mine and potential Driffield Mine.	2	Rating assumes mining follows completion of the Driffield or Hazelwood Mines; However the expected need to further relocate the Morwell river reduces its viability.	0.4	SUZ1		Yes	

Coal Resource Area	Location	Rank	Comments on Rating	Resource Size (BillionT)	Land Zoning	Overlay	Are the coal resources adequately protected (by the use of SUZ1 zoning)	Comment on Adequacy of Zoning
A	Corridor Field west of Morwell	2	Well drilled resource extending beneath the transport corridor and Morwell river. Scored down to account for necessary relocations. Smaller developments may rate higher	2.2	SUZ1		Yes	
M	South west of area H	3	Small resource, Only consider with area H	0.1	Rural & Rural Living	SRO1	Uncertain	Viability of this site needs further study. May be possible to incorporate into H.
Y	Deep coal beneath planned Hazelwood mine	3	The well defined M2 coal resources beneath the current Hazelwood mine could be economic if it is possible to manage coal winning and mine backdumping to lesson risk of settlement in Morwell. M2 coal winning could extend beyond the bounds of the current Hazelwood mine into areas A and B.	0.2	SUZ1		Yes	
Z	Deep coal beneath planned Loy Yang mine	3	This is a logical extension of Loy Yang mine, although mining costs will rise and the need to incorporate internal dumping to reduce groundwater depressurisation makes it a difficult development	0.5	SUZ1		Yes	
C	Western side of the Hazelwood Cooling Pond and down to Yinnar	4	With limited exploration, potential for a narrow mine with some community issues to be solved	1	mostly SUZ1	remainder SRO1	Uncertain	Needs more consideration of the viability of this site
F	Beneath Maryvale Paper Mill	4	Good coal resources here but the major issue to its use is the need to relocate the massive wood and paper facilities	1.3	ID2Z	nil	Yes	Low likelihood of mining due to value of APM so rezoning of low priority at this time
X	Deep coal beneath a possible Driffield mine	4	Unlikely there is sufficient coal to warrant mining - could be included in a deep Hazelwood development.	0.02	SUZ1		Yes	
L	Adjacent to Gormandale	4	Major issues associated with the Merriman Creek and Gormandale make this a difficult resource to utilise	1.1	RUZ1	SRO1	Yes	Low likelihood of mining so rezoning of low priority
G	Under the Latrobe River	4	Relocating the Latrobe River is a major environmental and economic issue	0.5	mainly SUZ1		Yes	unlikely to be mined
I	Between Loy Yang mine and Traralgon	5	impacts on the Traralgon buffer area and proposed by-pass route make utilisation of this resource difficult	0.9	SUZ1		Yes	unlikely to be mined in period
N	adjacent to Churchill	5	Small coal resources and envisaged impacts on the town of Churchill and to the University precinct affect rating.	0.1	various zones	Nil	Yes	Very Low likelihood of mining so rezoning of low priority
D	Under Morwell Township	5	In spite of high coal resource, moving the Morwell township of >10,000 residents greatly affects rating	4.4	Nil	Nil	Yes	Very Low likelihood of mining whilst other coal areas available and more favourable so rezoning of low priority

7.5.6 Morwell River Diversion

The long term development study of the Latrobe Valley in 1982 [Ref 13] discussed the difficulty posed by the Morwell River, which passes through the middle of the Western Coal development area. When considering mining in Hazelwood, Yallourn, Driffield and the Corridor Field (the coal resources beneath the Princes Highway and Melbourne rail link), these studies recognised the need to regularly relocate the Morwell River if the coal resources were to be fully utilised. Mining at Morwell, Yallourn East and Maryvale Fields has already required diversions of the Morwell River and a further diversion is currently proposed for Hazelwood West Field.

In 1983 a Natural Resources and Environment Committee of Enquiry (NREC) examined for the Parliament of Victoria the proposed major Morwell River diversion [Ref 16]. A supplementary study by the SECV [Ref 17] outlined the design work carried out to deviate the Morwell River to the east of Morwell. The proposed diversion involved flood regulation on the Wilderness, Stocks and Stony Creeks and at Boolarra and Yinnar; some 30 km of open channel; 35 million cubic metres of spoil; a number of spoil dumps; as well as a highway crossing and drop structures into the Latrobe River. This was to be a major undertaking.

Detailed below are the conclusions of the NREC findings: -

"8.1 The Committee recommends that:

a) The option of diverting the Morwell River to the east of Morwell to provide full access to the Western Coal Fields should be retained. The need for and timing of the diversion should be reviewed as part of the future inquiries into major power station projects;

b) In order to minimise future "planning blight", protect existing landholders and reduce general uncertainty, the route of the diversion and the location of associated works should be defined now and not subjected to further detailed evaluation until a decision is made that the diversion is actually required;

c) Any future diversion of the river should be designed and constructed to achieve as close an approximation to a naturally formed watercourse as technically feasible;

d) the most probable route for any future diversion and the most probable location of spoil dumps and flood regulating storages is defined in figures 11 to 20. The land which is directly affected, as defined in the above drawings, should be declared a Proposed Public Purpose Reservation (River Diversion);

e) Land which would be affected by additional infrequent flooding if the flood regulating storages are constructed and land abutting the possible future diversion channel and spoil areas which would be indirectly affected by construction works, as defined in figures 11 to 20, should be zoned in the appropriate planning schemes as a Special Policy Area (Land Subject to Inundation) and as a Special Policy Area (Construction Buffer);

f) The Special Policy Areas should be overlying zones complementing the existing planning controls. Development proposals by landholders within the Special Policy Area should be referred to the State Electricity Commission for comment before any decision is made on these development proposals by the responsible authority; and

Table 7.5 Zoned areas which may not be required for future coal protection

Area	Location	Land Zoning	Comments on Previous reason for zoning	Comment on the current need for this Zoning
Anderson Creek	Approximately 10km to the north-west of Yallourn	SUZ1	A large area was set aside for external overburden dumping which was considered necessary for some of the mine development scenarios postulated by the SECV in the 1980's for the 'western coalfield'	There has been a much slower development of mines in the 'western coalfield' than postulated by the SECV. Now, current mines at Yallourn and Hazelwood would appear to offer much closer sites for external dumping if needed for new mines. However, arrangements need to be implemented to allow over burden dumping in neighbouring mines to avoid need to retain Andersons Creek dump site.
De Campo Drive	Haunted Hills immediately to the west of Yallourn Mine	SUZ 1	Area previously used for road realignment and rural fire prevention. Was considered subject to earth-movement due to vicinity of Yallourn Mine.	Mining in the Yallourn Mine has moved to Eastfield and this area is now stable and unlikely to be required further by Yallourn Energy from say to the west of De Campo Drive.
South-West Driffield	Off coal to the south-west of potential Driffield Mine	SUZ1	Previously this area was sought for new power stations, ash ponds and overburden dumps.	Such a large area may not be required for Driffield power stations and associated works.
Major Morwell River Diversion	From Yinnar through to the east of Morwell	SUZ5	The SECV reasoned that the most effective way to access all of the coal on the 'western coalfields' was to divert the river to the east of Morwell. Whilst this was to be of high cost it would avoid the need for smaller Morwell river diversions.	This river diversion involves the construction of a number of dams and a considerable length of new river alignment. With the privatisation of the coal mining industry each company only 'owns' a small portion of the coal resource and is unlikely to be able to find the massive cost required to carry out this major diversion.

g) *If a decision is eventually made that a diversion is required as part of a major power station project, then the detailed technical and environmental aspects of the diversion should be thoroughly reviewed before the construction of the diversion is approved. This review should include consideration of the long term ownership and use of land affected by the diversion and the appropriate planning controls flowing completion of the diversion works."*

The Morwell River, which has been relocated a number of times, still crosses the Western Coal Resources and is likely to need moving a number of more times to allow coal to be won from this region. In the last 20 years, with the privatisation of the industry and the transfer of responsibility for regional development passing from SECV hands, short and specific Morwell river relocations around individual mining areas has been preferred to the major relocation to the east of the City of Morwell. This approach minimises the short term cost and the impact on the ecology, on communities and on land use along the river.

The cost of the major relocation has not been estimated in detail but is likely to be between $1 - 2 billion and impacts a large number of land holders, roads and the commercial area to the east of Morwell as well as losing significant lengths of natural river. This option is unlikely to be funded by the size of projects being defined for development and in the future 'short' diversions are more likely to be utilised to access coal resources. Assuming the current planned diversion of the Morwell River to allow expansion of the Hazelwood mine proceeds, only two or at maximum three more diversions of the Morwell River are likely to be needed (to recover coal between the Hazelwood Mine and the Driffield area and to mine the Corridor Field). Three short diversions are likely to be much cheaper than a single major river diversion.

The outcome of this study is that there is little economic imperative to carry out the major Morwell River diversion and minor diversions have much smaller impacts on the ecology and the community. Whilst land use zoning makes provision for the major river diversion, this study questions the likelihood of it ever being progressed and recommends government, in consultation with local government and industry, review the need for the diversion prior to releasing the land for other uses.

7.5.7 Summary of Zone and Overlay Changes

From this LV2100 Coal Resource Project Study the following implications for the current boundaries of the zones and overlays are:

- A number of high priority coal resource areas are considered to have inadequate protection against inappropriate land uses. It is recommended that these areas have greater protection by use of SUZ1 Zoning. All Rank 1 and 2 areas should be zoned Special Use (Brown Coal) Zone 1 to allow for both the extraction of the coal resource and other associated uses, with several minor exceptions where road and other public use related zones can remain within the ranked areas.
- Several existing Special Use (Brown Coal) Zones 1 are no longer required and should be rezoned for alternative land uses.

The potential changes to zones and overlays have implications for Latrobe City's initiatives to accommodate residential land supply requirements. Morwell continues to be constrained by coal buffers to the north, west and south. Traralgon is constrained to the south by the coal buffer will be constrained by the Princess Freeway by-pass. The coal zones and overlay boundaries in this area are subject to agreement on a final bypass alignment. The need to protect Coal Area H, to the south-west of Traralgon, should be factored into the bypass alignment as well as any consideration about proposals to allow urban expansion south of the current Princes Highway. The proposed Morwell – Traralgon Corridor Concept Plan [Ref 28], for activity precincts particularly south of the Princes Highway, could clash with coal Area H utilisation. It is recommended that the Environmental Significance (Urban Buffer) overlay adjacent to Newborough be shifted further east, allowing potential additional urban expansion of east Newborough.

Detailed recommendations regarding the changes to zones and overlays are contained in Table 7.6. These need to be confirmed by local councils and State Government following appropriate community consultation. The boundaries of zoning and overlay changes also need to be more accurately determined prior to amendments to the planning schemes as outlined in the Planning Scheme Amendment Process.

It is recommended that DSE, Latrobe City and Wellington Shire implement a process to act on the key outcomes of this study to protect coal resources, provide certainty to communities and release land zoning not now required.

Table 7.6 Planning Scheme Recommendations

Coal Resource or Precinct	Local Government	Framework for the Future Recommendation (1987)	Current Zoning	Current Overlays	LV 2100 Assessment	Recommendations
A	Latrobe City.	Existing category A coalfield.	Special Use 1 (Brown Coal). Public Use. Road (Category 1).	Land Subject to Inundation (part).	Ranking 2 area.	Retain existing zones and overlays.
B	Latrobe City.	Existing category A coalfield.	Special Use 1 (Brown Coal). Road (Category 2).	Land Subject to Inundation (part).	Ranking 2 area.	Retain existing zones and overlays.
E	Latrobe City.	Existing & possible future development of category A coalfield.	Special Use 1 (Brown Coal).	Land Subject to Inundation (part).	Ranking 2 area.	Retain existing zones and overlays.
J	Latrobe City. Wellington Shire.	Possible future development of category A coalfields (part). Existing other associated areas.	Rural. Special Use 1 (Brown Coal) (part). Public Conservation and Resource (part).	State Resource. Land Subject to Inundation (part).	Ranking 2 area.	Resolve boundaries with precincts 21, 23 and 24. Rezone to Special Use 1 (Brown Coal).

Coal Resource or Precinct	Local Government	Framework for the Future Recommendation (1987)	Current Zoning	Current Overlays	LV 2100 Assessment	Recommendations
H	Latrobe City.	Land over coal	Rural. Special Use 1 (Brown Coal) (part). Rural Living (part)	State Resource. Land Subject to Inundation (part).	Ranking 1 area.	Rezone to Special Use 1 (Brown Coal). Resolve conflict with Rural Living zone and boundary with precincts 18 and 20. Remove State Resource Overlays.
K	Wellington Shire.	Land over coal	Rural.	State Resource.	Ranking 1 area.	Rezone to Special Use 1 (Brown Coal). Remove overlay.
O	Latrobe City	Possible future development of category A coalfields (part).	Rural. Special Use 1 (Brown Coal) (part).	State Resource. Land Subject to Inundation (part).	Ranking 1 area.	Rezone to Special Use 1 (Brown Coal). Remove State Resource overlay.
P	Latrobe City. Wellington Shire.	Possible future development of category A coalfields (part).	Rural. Special Use 1 (Brown Coal) (part). Public Conservation and Resource (part).	State Resource (part). Land Subject to Inundation (part).	Ranking 1 area.	Rezone to Special Use 1 (Brown Coal). Remove State Resource overlay.

Coal Resource or Precinct	Local Government	Framework for the Future Recommendation (1987)	Current Zoning	Current Overlays	LV 2100 Assessment	Recommendations
Q	Latrobe City	Rural. Special Use 1 (Brown Coal)	Land subject to flooding (part)	Possible future development of Category A coalfields.	Ranking 1 area	Retain existing zone and overlay.
1	Latrobe City.	Possible future development of other associated areas.	Special Use 1 (Brown Coal).	Nil.	Anderson Creek overburden area. No longer required.	Rezone to Rural.
2	Latrobe City.	Existing category A coalfields. Existing other associated areas.	Special Use 1 (Brown Coal).	Nil.	Current mining license area at Yallourn Nth Extension mine. Retain for associated coal industry use.	Retain existing zone.

Coal Resource or Precinct	Local Government	Framework for the Future Recommendation (1987)	Current Zoning	Current Overlays	LV 2100 Assessment	Recommendations
3	Latrobe City.	Existing and possible future development of category A coalfields. Existing other associated areas.	Special Use 1 (Brown Coal).	Nil.	Area east of E: Approx 1 km buffer, "subject to negotiations between SECV and APM" Area north of E: Latrobe river flood plain. Area north of Yallourn mine: Latrobe river flood plain. Yallourn north mine site: Power stations and associated infrastructure. Retain for associated coal industry use.	Retain existing zone.
4	Latrobe City.	Existing and possible future development of associated coal industry areas.	Special Use 1 (Brown Coal).	Nil.	Unlikely to be required.	Rezone to Rural, subject to investigating the feasibility of urban development as an extension to Newborough.
5	Latrobe City.	Existing category A coalfields. Existing associated coal industry areas.	Special Use 1 (Brown Coal).	Nil	Unlikely to be required. Located adjacent to the existing Yallourn open cut mine.	Resolve boundary with Yallourn mine and 4. Rezone to Rural. Introduce the Environmental Significance (Urban Buffer) overlay.

Coal Resource or Precinct	Local Government	Framework for the Future Recommendation (1987)	Current Zoning	Current Overlays	LV 2100 Assessment	Recommendations
6	Latrobe City.	Existing category A coalfields. Existing associated coal industry areas.	Special Use 1 (Brown Coal).	Environmental Significance (Urban Buffer)	Unlikely to be required within the 100 year timeframe. Located partly adjacent to the Yallourn open cut mine.	Remove the Special Use 1 (Brown Coal) zone and the Environmental Significance (Urban Buffer) overlay from the western half of the precinct. Rezone subject to investigating the feasibility of urban development as an extension to Newborough.
7	Latrobe City.	Existing category A coalfields.	Special Use 1 (Brown Coal).	Nil.	Unlikely to be required within the 100 year timeframe. Contains Morwell, river surrounded by the Yallourn mine.	Retain existing zone.
8	Latrobe City.	Existing and possible future development of category A coalfields.	Special Use 1 (Brown Coal).	Nil.	Contains fire service reservoir. Retain for associated coal industry use.	Retain existing zone.
9	Latrobe City	Existing associated coal industry areas.	Special Use 1 (Brown Coal).	Environmental Significance (Urban Buffer).	Contains 'The Ridge', Powerworks and offices. Adjacent to existing Industrial 1 Zone	Rezone to Industrial 1 or Commercial. Retain overlay.

Coal Resource or Precinct	Local Government	Framework for the Future Recommendation (1987)	Current Zoning	Current Overlays	LV 2100 Assessment	Recommendations
10	Latrobe City.	Existing and possible future development of category A coalfields.	Special Use 1 (Brown Coal).	Nil.	Area contains overburden dump, ash ponds. Retain for associated coal industry use.	Retain existing zone.
11	Latrobe City.	Existing other associated areas.	Public Use 1. Rural. Public Park and Recreation.	State Resource.	Retain for existing cooling pondage and other associated coal industry uses.	Retain existing zones and overlay.
12	Latrobe City.	Possible future development of category A coalfields. Possible future development of associated coal industry areas and other.	Special Use 1 (Brown Coal).	Land Subject to Inundation (part).	Ranking 3 coal area. Retain for associated coal industry use.	Retain existing zone and overlay.
13	Latrobe City.	Possible future development of associated coal industry areas and other.	Special Use 1 (Brown Coal).	Land Subject to Inundation (part).	Partly retain for associated coal industry use.	Retain existing zone in the north of the precinct. Rezone to rural in the south of the precinct. Boundary to be defined following further evaluation.

Coal Resource or Precinct	Local Government	Framework for the Future Recommendation (1987)	Current Zoning	Current Overlays	LV 2100 Assessment	Recommendations
14	Latrobe City.	Possible future development of other associated areas.	Special Use 1 (Brown Coal).	Nil.	Unlikely to be required within the 100 year timeframe.	Rezone to Rural.
15	Latrobe City.	Land over coal.	Rural. Public Conservation and Resource.	State Resource.	Unlikely to be required within the 100 year timeframe.	Retain existing zones and existing State Resource Overlay.
16	Latrobe City.	Land over coal	Rural. Public Conservation and Resource.	State Resource. Land Subject to Inundation (part).	Unlikely to be required within the 100 year timeframe.	Retain existing zones and existing State Resource Overlay. Retain Land Subject to Inundation overlay.
17	Latrobe City	Land over coal.	Rural. Public Conservation and Resource.	State Resource.	Unlikely to be required within the 100 year timeframe.	Retain existing zones and existing State Resource Overlay.
18	Latrobe City.	Existing associated coal industry area (part). Land over coal.	Rural. Industry.	State Resource.	Area contains a number of industrial and commercial premises.	Retain existing zones and State Resource Overlay. Resolve boundary with H.
19	Latrobe City.	Existing other associated area.	Special Use 1 (Brown Coal).	Nil.	Contains the low quality water dam.	Retain existing zone.

Coal Resource or Precinct	Local Government	Framework for the Future Recommendation (1987)	Current Zoning	Current Overlays	LV 2100 Assessment	Recommendations
20	Latrobe City.	Land over coal.	Rural.	State Resource. Land Subject to Inundation (part).	Partly retain for associated coal industry use.	Retain State Resource overlay. Change zone at the northern side to SUZ1 in association with H. Boundary to be defined following further evaluation. Retain Land Subject to Inundation overlay.
21	Latrobe City.	Existing associated coal industry and other associated areas. Land over coal.	Special Use 1 (Brown Coal).	Nil.	Power station and overburden dump located in this precinct. Retain for associated coal industry use.	Retain existing zone.
22	Latrobe City.	Existing category A coalfields.	Special Use 1 (Brown Coal).	Nil.	Partly retain for associated coal industry use. Traralgon Bypass potentially located within or adjacent to the precinct.	Retain existing zone, but with modified northern boundary, when the bypass location has been confirmed.
23	Latrobe City.	Land over coal.	Rural.	State Resource.	Located adjacent to a Ranking 2 Area J.	Boundary with J to be resolved. Retain existing zone and overlay in remaining area.
24	Wellington Shire.	Land over coal.	Rural. Public Conservation and Resource.	State Resource.	Unlikely to be required within the 100 year timeframe.	Boundaries with P and J to be resolved. Retain existing zones and overlay.

Coal Resource or Precinct	Local Government	Framework for the Future Recommendation (1987)	Current Zoning	Current Overlays	LV 2100 Assessment	Recommendations
25	Wellington Shire.	Land over coal.	Rural.	State Resource.	Unlikely to be required within the 100 year timeframe.	Retain existing zone and overlay.
26	Wellington Shire.	Land over coal.	Rural.	State Resource.	Unlikely to be required within the 100 year timeframe.	Retain Rural zone. Retain existing State Resource overlay Boundary with K to be resolved.
27	Latrobe City.	Land over coal.	Rural.	State Resource.	Unlikely to be required within the 100 year timeframe.	Retain existing zone and overlay.
28	Latrobe City	Possible future development of other associated uses.	Special Use 5 (Morwell River Diversion)	Environmental Significance (Urban Buffer) (part). Airport Environs. Land Subject to Inundation (part).	This precinct has previously been set aside for the major Morwell River diversion, which is no longer considered viable.	Rezone to match adjacent zones and overlays, subject to government agreement not to retain this river alignment option.
29	Latrobe City.	Existing and possible future development of category A coalfields.	Special Use 1 (Brown Coal). Rural.	State Resource (overlay).	Identified as existing open cut coalmines.	Rezone all to Special Use 1 (Brown Coal).

8. Water

"As water is a key resource for future coal use and power generation, this study has reviewed the regional water resources, current and future water use and estimated a water balance for the Latrobe Valley."

8.1 Introduction

The primary objective of this section is to review, in broad terms, the current status of water resource use (surface and groundwater) for the power industry and other competing demands within the Latrobe Valley Region and to predict water resource availability. Other aspects for consideration include environmental, economic and social issues related to power industry growth as well as potential conflicts and opportunities arising from water resource issues.

Although the water resources (surface and groundwater) within the Latrobe River basin[1] are of primary importance to power generation, the resources of adjoining river basins are also of relevance from an overall regional water resource perspective. The relevance of adjoining river basins from a surface water perspective includes the fact that water can be transferred between basins; and from a groundwater perspective that aquifers do not have the same boundaries as surface water catchments. Potential (recycled) water from the locally proposed Gippsland Water Factory or from Melbourne's Eastern Water Recycling Proposal and the relationship between surface and groundwater are also included as key factors in the water resource equation.

8.2 Regional Water Resource Status and Current Use

Water reforms in recent years have focused on sustainable yields as being the "best" indicator of the amount of water that can be diverted from the waterways without impacting on the water environment. Table 8.1 provides a broad indication of surface water resources for the Latrobe River basin. The information provided in the table is based on the most recent analysis undertaken across the region.

Table 8.1 Current and Potential Available Surface Water Resources in Latrobe River Basin

Basin	Sustainable Yield (GL/a)	Developed Yield (GL/a)	Potential Increase in Developed Yield (GL/a)	Water Entitlements (GL/a)	Water Use (GL/a)
Latrobe	**262**	**262**	**0**	**252**	**160**

Reference (23): RM 1 Water Resources & Allocation, Stage 1 Gippsland Water for Growth Committee, 2002 and State Water Report 2003-2004 – A Statement of Victorian Water Resources

[1] River basins are defined by surface water catchment areas.

Definitions:

- 'Sustainable Yield' is the estimated maximum volume of water that can be diverted after taking account of in-stream environmental water requirements;
- 'Developed Yield' refers to the annual volume of water that is currently available for diversion at a defined level of reliability, taking account of environmental water requirements; and
- 'Water Use' volume used is the total volume of surface water resources diverted for use both within the Basin and for export to other Basins.

The total Surface Water Entitlements within the Latrobe Basin equate to around 252 GL/a[2] compared to the current use of around 160 GL/a and compared to the estimated developed yield within the Basin of around 262 GL/a. This indicates that it is possible to meet future increases in demand within existing entitlements.

However, the Sustainable Yield and Developed Yield estimates were undertaken several years ago. They do not incorporate the recent prolonged drought period, potential impacts due to climate change, and are based on previously pre-determined environmental water requirements. These estimates require review and hence estimates of water availability may change in time as more information is collected and further studies conducted.

Additionally, it is generally accepted by various stakeholders that the Latrobe Basin water resource is over utilised as is evident from declining groundwater levels, unhealthy river habitat and poor condition of the Gippsland Lakes. DSE has reviewed water availability across Victoria through the Sustainable Diversion Limits (SDL) Project. The SDL represents the upper limit of winterfill diversions, beyond which there is an unacceptable risk that additional extraction may degrade the environment. Table 8.2 provides details of the estimated SDL for the Latrobe Basin. These figures assist to quantify the extent of overuse during the winterfill period, this being an estimated 101 GL/a.

Table 8.2 Current Water Availability based on Sustainable Diversion Limits

Latrobe Basin Sustainable Division Limit (GL)	Estimated Total Use (GL)	Available Water (GL)
49	150	(101)

Reference DSE 2004 Sustainable Diversion Limits Project

Provision of environmental flows is also a key element of improving / maintaining river health. The Victorian Government's White Paper outlines a policy aimed at improving the health of Victorian rivers by 2010 and the Latrobe River is currently the subject of an environmental flow study by the West Gippsland CMA as part of the stressed rivers program. Additionally, the Victorian River Health Strategy does not permit further allocation of annual entitlement.

[2] State Water Report 2003-2004 – A Statement of Victorian Water Resources

Access to alternative water resources such as from recycled water projects or water trading for industrial growth would be subject to extensive environmental, social and economic assessment. In this regard the government will be developing a Sustainable Water Strategy for the Central Region of Victoria with a planning period of 15 years and beyond (Victorian Government White Paper). The strategy will address key issues such as improving the efficiency of water management across the region, protection and improvements to river health, providing reliable water entitlements for water authorities and users, improving accountability, allocating new water entitlements to maximise the community benefits and provide the capacity to manage risks to the water resources.

In summary, water use in the Latrobe Basin is below current entitlement levels and therefore it is possible to meet future increases in demand within existing entitlements, possibly facilitated by water trading.

However it is generally recognised that the Basin's water resource is currently over allocated and future increases in water usage may further increase environmental impacts. Alternative opportunities for Latrobe Valley mining companies to meet future water requirement are available and include new allocations from adjoining basins, obtaining unallocated water in Blue Rock Reservoir or through the previously mentioned opportunities from recycled water projects. These opportunities are assessed in Section 8.5.

8.2.1 Groundwater Resources

Sustainability of water resource development is government policy, as outlined in the Victorian Government White Paper "Securing Our Water Future Together" (2004) [Ref: 24]. Consequently the sustainable use of water resource policy is expected to become even stronger in relation to water management in the future.

Significant groundwater resources occur within the Gippsland Basin and beneath future coalfields. These groundwater resources are generally of good quality (< 1000mg/l total dissolved solids), represent a low grade source of geothermal energy (Temperatures < 70^{O}C) and occur in a number of regional aquifer systems ranging in depth below the surface from less than 20m to in excess of 1000m.

Groundwater within the Gippsland Basin is currently being extracted for use in the power industry, industrial supply, irrigation and agriculture, potable water supply and possibly as a by product of off-shore oil and gas extraction. Current groundwater extraction exceeds the estimated rate of natural recharge and this is demonstrated by falling water levels in some of the aquifers. Part of this over-extraction of water results from offshore oil production which, subject to the possibility of new discoveries, will continue to reduce to a likely closure around 2030. The cessation of pumping water for petroleum production may represent an opportunity for Government to reallocate both surface water (indirectly) and groundwater resources to alternative uses, depending on the type of water licence scheme in existence at that time. There is currently a need for more investigation to confirm and quantify the resource in some areas [Ref: 23] and it is recommended that government and industry work together to quantify the availability of water resources in accordance with the White Paper review.

The Gippsland Basin – Tertiary sediments contain the major aquifer in the Latrobe region, and extends over the Latrobe Valley, South Gippsland and East Gippsland Basins, with an estimated average annual recharge of about 150 GL. Based on the estimated recharge this aquifer is over-committed by about 30 GL/a. Investigations are currently underway to quantify the overall groundwater resource and evaluate the impacts of current extraction rates and their long-term sustainability.

The Moe Basin Tertiary Sediments with an annual groundwater extraction allocation of 8 GL/a (based on the current PAV) has a further 5 GL/a available for allocation.

Groundwater use in the Latrobe, Thomson and South Gippsland basins totals about 140 GL/a, (including offshore extraction) which is just over 20% of the total water allocation (i.e. surface water and groundwater).

Current groundwater allocation/usage and sustainable yields based on Hydrogeological Provinces are broadly summarised in Table 8.3 below.

Table 8.3 Current Groundwater Allocation/Usage and Sustainable Yields

Hydrogeological Province	Available Resource (annual recharge) (GL/a)	Current Allocation (GL/a)	Resource Surplus (GL/a)	Location
Gippsland Basin – Tertiary Sediments	150	181	-31	Latrobe Valley, South/East Gippsland
Moe Basin – Tertiary Sediments	8	3	5	Moe
Woorayl Basin – Tertiary Sediments	11	1 8	9	Leongatha
Mesozoic Highlands	Not Determined	Minor	-	Strzelecki Ranges
Palaeozoic Highlands	Not Determined	Minor	-	Great Dividing Range
Quaternary Sediments	50	59	-9	Various, across study area

Groundwater Entitlement is managed within Permissible Annual Volumes (PAV). This is an annual cap based on an estimate of the volume which can be sustainably extracted from a defined management area, which may be within an aquifer or include multiple aquifers.

Groundwater resources in the Latrobe Basin are over allocated compared to PAVs. Table 8.4 shows the over allocation of water resources in the relevant Groundwater Management Areas (GMAs). No more entitlements can be issued within Stratford GMA until further investigation.

Table 8.4 Current Water Availability in Groundwater Management Areas

Groundwater Management Area	Permissible Annual Volume (GL)	Allocation (GL)	Water Available (GL)
Rosedale	9	21	(12)
Stratford	Not Determined	26	0
Sale	13	23	(10)
Moe	8	4	4

Reference Southern Rural Water 2005

8.3 Latrobe Valley Area Water Balance

Current extractive water use within the Latrobe Valley area is summarised in Table 8.5 below. The figures have been rounded off to depict relative quantities.

Table 8.5 Current Extractive Water Use within the Latrobe Valley Area

Water Use	Volume Used (GL/a)
Power Industry (Surface and Groundwater)	120*
Other Major Industry (eg. Paper)	25*
Urban and minor Industry	10
Total	155

* Of the 120 GL/a used by the power industry, around 30 GL/a is returned to the river system. Also, around 10 GL/a is returned to the river system from major industry. Approximately 10 GL/a of highly concentrated saline wastewater is disposed of to the ocean and remaining domestic and industrial wastewater streams are currently treated at Dutson Downs for disposal to the ocean. New coal technology plants are expected to result in reduced water demand per MW.

8.4 River Water Quality

River water quality in the Latrobe system varies significantly from top to bottom of the catchment. In the headwaters the water quality is high. Water quality deteriorates as would be expected further down the catchment. One example is where the power station extractions and returns take place. In the lower Latrobe system irrigation returns from the Macalister Irrigation District drains reduce the quality of the water further in terms of both salinity and nutrient levels. Additional environmental flows are a possible outcome to improve the health of the Latrobe River system as a result of the Natural Resources Report Card [Ref 31]. As noted previously an environmental flow study is currently underway for the Latrobe River system.

8.5 Latrobe Valley Water Use and Supply to Year 2030 and Beyond

In future, the impact of environmental water requirements in rivers and sustainable groundwater use will put additional pressure on the need to be more efficient and to recycle water. A key feature will be a move towards matching sources to uses in terms of water quality requirements. While water treatment now and in the future will rely on improved technology, costs will become a significant factor. The ability to match high quality water sources to high quality uses and low quality water sources to meet low quality uses, will be one of the driving objectives in the future. Water supply options will need to more than ever take into account minimum energy principles.

Currently, untapped sources of water that should become available within the Latrobe Valley over the next 30 years and beyond, based on current investigations and initiatives include:

- Blue Rock Dam Unallocated resource equivalent to 40 GL/a. Likely uses would include urban, power, industrial, environment and agriculture;
- Gippsland Water's Water Factory, providing at least 20 GL/a of treated industrial and urban wastewater, predominately for industry;
- Treated wastewater from Melbourne's Eastern Water Recycling Proposal, predominately for industrial and agricultural use. Likely quantities are initially 40 GL/a (represents around 30% of resource reuse) and eventually around 100 GL/a (representing around 80% of resource reuse);
- Dewatering of coal, which could provide around 20 GL/a of water predominantly for industrial use; and
- Current mines reducing depressurisation requirements due to internal dump development and options for future mines where aquifer depressurisation may be lower than at present.

Taking into account the above assumptions, a relatively conservative scenario of future demand and water resource availability for the Latrobe Valley area is demonstrated in Table 8.6 below. The table demonstrates the relative balance between water demand and availability. The figures presented in the table are rounded off for relative comparison purposes and other factors relevant to the scenario include:

- Power industry demand growth requires an increase of water demand to year 2030 for new power plants and while existing power stations remain in operation. As new power plants come into operation, the demand for water is expected to reduce per unit of electricity produced;
- Urban and other industry demand growth within the Latrobe Valley area allows for expansion in lieu of other available information;
- No allowance is made for efficiency gains in water use (such as demand management);
- Coal mine fire/dust suppression water is assumed to be obtained from existing "recycled" sources.
- No allowance is made for further development of surface or groundwater resources;
- No specific allowance has been made for substantial increases in environmental allocations;
- Significant increases in agricultural water demand are not anticipated within the Latrobe Valley;
- Community acceptance of recycled water for predominately industrial and agricultural purposes;
- Existing water demand sources and proportional returns to the river system remain unchanged;

- The source of Gippsland Water's Water Factory is major industry, the power industry and urban wastewater sources; and
- Sources of water to satisfy various demands may change over time.

Table 8.6 Future demand and water resource availability estimates for the Latrobe Valley

Water User	Current Demand (GL/a)	2030 Demand (GL/a)	2050+ Demand (GL/a)
Power Industry[3]	120	135	85[4]
Coal Process Industry	-	5	25
Other Major Industry	25	30	40
Urban & Minor Industry	10	15	20
Total	155	185	170
Incremental Demand		30	15
Potential Incremental Water Supply		2030 Incremental Supply (GL/a)	2050+ Incremental Supply (GL/a)
Blue Rock Dam		40	40[5]
Water Factory		20	20[6]
Melbourne Eastern Water Recycling		40	100[7]
Coal Dewatering			20[8]
Mine Stability		10[9]	20[9]
Potential Total Additional Incremental Supply		110	200

Table 8.6 identifies that by 2030 incremental water demand from current use could be around 30 GL/a and at 2050 and beyond, incremental demand could decrease to 15 GL/a greater than current demand (due to improved efficiencies in the power industry).

[3] Assumes Scenario 3 development. No allowance made for pit flooding.

[4] Assumes new coal plant use, 30% water reduction per MW.

[5] Assume normal weather conditions.

[6] Gippsland Water plans show stage 2 at 55 GL/a.

[7] Gippsland Water plans show 135 GL/a capacity.

[8] Coal dewatering could be as large as 50 GL/a if the drying process recovers 80% of water content at 100Mtpa.

[9] If future mines are deeper, greater aquifer pumping may be required.

In comparison, the table also identifies that by 2030 potential incremental water supply sources could be around 110 GL/a and at 2050 and beyond, incremental supply sources could increase to 200 GL/a (all water sources may not be available in combination). The potential incremental water supply sources in Table 8.6 are a combination of existing unallocated water and recycled and reallocated water (from mining).

Hence, there appears to be sufficient opportunities for water supply from current and new sources to meet projected demands from coal use growth.

In Section 8.2 above, it was highlighted that total surface water use within the Latrobe Basin (around 160 GL/a) is substantially less than existing entitlements (252 GL/a). Thus the predicted future water demands within the Latrobe Valley area could be met by use of existing entitlements, trading of entitlements and incremental water sources as shown in Table 8.6, or a combination of the above.

8.6 Issues to be addressed

There are a number of issues associated with future power production development and associated brown coal mining that need to be addressed. As current groundwater extraction exceeds natural recharge, any further extraction of groundwater for new projects might modify the balance between the groundwater and surface water systems and contribute to the following regional issues.

- Declining groundwater levels;
- Regional land settlement and subsidence;
- Reduction in groundwater temperature;
- Reduction in groundwater discharge to surface water bodies; and
- Impact on groundwater dependent ecosystems.

In addition to the regional impacts due to groundwater use, the development of new mines normally occurs where coal seams are close to the surface. These same areas may also represent potential groundwater recharge or discharge areas and their loss could result in the following:

- Reduction in groundwater recharge / discharge rates;
- Impacts on groundwater quality;
- Alteration of local groundwater flows with the establishment of local groundwater “sinks”;
- Oxidation of sediments (through falling water levels); and
- Reduction in groundwater resource available to adjacent land owners and contribution to the regional impacts of declining groundwater levels subsidence and changing water quality.

A review of the region’s water resources and water balance is critical to gain a sound appreciation of the current status of water availability and future trends, in comparison with current and future demand scenarios. Significant impacts such as prolonged drought, climate change potential and changing demand patterns are examples of factors that lead to declining confidence in the water resource knowledge base. The proposed Sustainable Water Strategy for the Central Region of Victoria is timely.

River diversions and the alteration of river courses for mine development have significant impacts on the local and regional environment, including stream flows and aquatic and terrestrial flora and fauna. Existing environmental values and potential impacts need to be assessed, along with Net Gain requirements, as part of the potential development equation.

There is increasing pressure nationally and statewide to reduce or eliminate ocean outfall discharges. The issue of disposal of saline wastes will need to be factored into strategies such as the National Ocean Outfall Strategy being developed by the Australian Government.

Competing demands for water, such as environmental, industrial, agricultural and urban (eg. Melbourne) need to be balanced against availability to achieve and maintain a sustainability equation.

Effective management of water resources requires effective coordination between the managing authorities, including resource assessment, allocation, monitoring/measuring and review. Pricing of water to reflect true cost is also a key factor to sustainable management.

8.7 Potential Conflicts

Potential conflicts for water resource management related to future power production development and associated mining include:

- Increases in environmental water allocations;
- Competition for water from other major industrial development;
- Potential diversions to Melbourne (eg. Blue Rock / Thomson);
- Risk of the Water Factory or Melbourne Eastern Water Recycling Proposal not proceeding; and
- Deep coal mining requiring additional groundwater pumping.

8.8 Opportunities

There are numerous opportunities associated with future power production development and associated mining. Some include:

- Trading of water entitlements to satisfy future requirements;
- Groundwater stored in the aquifers in the Gippsland region is significant. With sufficient planning and knowledge, the impacts of extractions exceeding natural recharge could be minimised or overcome in the long term. The current groundwater system could be further utilised during the relative short duration of the mining projects with low impact on the long term sustainability of the regional groundwater resource;
- Technical developments associated with water management include:
  - Reduction in the demand for cooling water;
  - Economically viable treatment of wastewater for industrial, domestic and agricultural recycling (eg. from Gippsland Water Factory and Eastern Water Recycling Proposal), towards a “closed” system;
  - Coal drying technologies current under development by a number of parties. If commercially viable, these will produce consistently large volumes of water. The quality of this water will need to be carefully managed.
  - Improved water efficiency gains within existing industrial development and future development;
  - Aquifer recharge to minimise depletion and ground settlement;

- Reallocation of “fresh” water to the environment through recycling to satisfy demand.

- There is potential for growth of other supportive industries and other unrelated industries within the region, on the back of a growing power industry;
- Strategies and initiatives to drive improvements in water management, provide significant opportunities for improved environmental outcomes, together with improved social and economic outcomes; and
- Development of new initiatives and strategies provides an opportunity for improved engagement of the broader community in the water management debate; and including aspects such as ensuring the community influence the most appropriate use of water and influence appropriate pricing for water.

8.9 Summary

Water is a key resource for the environment, community and industry. It is sourced from surface runoff, dams, rivers, recycling and groundwater. Groundwater has to be extracted to maintain mine stability. The availability of water could be critical in the continuing use of coal in the Latrobe Valley. Water is used in the steam cycle, in plant cooling and in general purpose use for mining and power generation. However, due to different coal conversion processes being used, new technology is expected to require lower volumes of water for their efficient operation. Assessment of the overall balance of water available from surface, groundwater and recycling options indicate that there should be sufficient water to satisfy the projected demand for consumptive users.

However, sustainable water use is subject to conjecture with some government authorities casting doubt that the current practices are sustainable or justifiable in the longer term. Following reviews of the health of the Latrobe River system, it is possible that higher river flows may be necessary.

In the case of the use of large volumes of water for mine rehabilitation it is recommended that the Victorian Government and existing mine companies examine alternative mine closure options for the open coal mines. The preferential use of in-pit overburden dumping will reduce the need for water as ballast for long-term batter stability however, it is unlikely to completely preclude it.

There are opportunities to trade water entitlements and reduce demand growth, increase the amount of available water for use by diverting water into the Latrobe Valley, treating industrial wastewater and use of coal drying technologies. The diminishing extraction of water associated with Bass Strait petroleum production may also have an indirect beneficial impact.

Competing uses for water was a key issue raised during the consultation activities in terms of industry and agriculture use as well as community interest in recycling and new technology opportunities. Current practices for the allocation of water in Victoria operate on a free-market basis, essentially providing for water to the highest bidder subject to capture in the same catchment. Any increased competition in water supply will provide further pressure in the market to reallocate water to higher-value uses. Proposals to treat industrial and urban waste in the proposed Gippsland Water Factory or to divert recycled water from Melbourne are to be commended and the evidence provided shows that a lot of the flexibility in future water allocations is reliant on these projects proceeding.

The recent White Paper – “Securing out Water Future” [Ref 24] on sustainable practices in water resources concluded that regional groundwater resources are over-allocated on current analysis. Regional solutions are required to improve the health of aquifer systems by protecting recharge zones,

maximising internal mine dumps to reduce depressurisation requirements and to consider the potential for recharging aquifers down-gradient of mining operations. Reallocating some of the current groundwater extraction allocations to new mines and greater use of internal dumps provide opportunities for new mine development.

There currently is a Regional Groundwater Committee examining the aquifers in the Latrobe Valley area immediately surrounding the coal mines. The area of examination does not include the complete basin or involve all groundwater users, however this is appropriate for the management of brown coal mining licences. It is recommended that new mine owners are invited to join this committee as their projects develop. This forum should be utilised to address future groundwater issues and solutions in addition to appreciating the impact of depressurising aquifers for mine stability, recharge zones, new mining licences and arrangements for water trading rights. This could be achieved by broadening the Committee's terms of reference. It is also recommended that DPI attend this committee to foster discussion on finding solutions to future groundwater extraction issues.

It is important for the long-term water management of Latrobe Valley to expedite development of the proposed Sustainable Water Strategy for the Central Region of Victoria. Outcomes from the Strategy will provide a greater level of confidence in water resource availability and a more definite basis to determine sustainable development for economic, environmental and social benefits.

9. Regional Environmental Issues

"To consider the Regional Environment and assess likely impacts from continued brown coal developments"

There are a number of regional environmental issues in addition to water, land, coal, economy and infrastructure issues for the continued use of brown coal in the Latrobe Valley, addressed elsewhere in this report. This chapter reviews the natural environment, the Latrobe Valley air shed and other environmental issues. In fostering new projects there is a need to coordinate industry developments through government facilitation, whilst at the same time having appreciation of the commercial, environmental and other requirements.

9.1 The Natural Environment

9.1.1 Status of the natural environment in the Latrobe Valley

Parts of the Latrobe Valley are recognised for their natural environment, particularly the bushland and forested vegetation communities which are associated with the Strzelecki and Baw Baw mountain ranges bounding the valley. However the regions diverse range of land uses including agriculture, forestry and mining have led to extensive clearance of native vegetation from many areas, predominantly along the valley floor around the townships of Moe, Morwell, Traralgon and Churchill. Remnant pockets of more than ten different vegetation communities have been recorded in the more widely utilised parts of the valley but these are scattered and range from being relatively intact with few weeds, to stands of trees with a completely exotic understorey.

The Latrobe Valley has several significant watercourses including the Latrobe River and it's tributary the Morwell River which arises in the Strzelecki Ranges. The Latrobe Valley region faces a number of water quality issues within its catchments, which have implications for the health and condition of the waterways. Water quality issues include elevated nutrient levels and turbidity which are primarily attributable to runoff from intensively farmed areas and erosion.

The Latrobe Valley region contains three of Victoria's terrestrial bioregions, the Strzelecki Ranges, the Gippsland Plains and the Highlands Southern Fall bioregions. Victorian bioregions have been developed to reflect the patterns and ecological characteristics of the landscape and have been designed as broad scale mapping units for biodiversity planning in Victoria. The retention of biodiversity in the Latrobe Valley region is recognised by various authorities as an essential component of maintaining the natural environment. While there have been impacts to the natural environment within all bioregions in Latrobe Valley, the Gippsland Plains bioregion, which extends east from Melbourne to Lakes Entrance and comprises much of the area around the existing and proposed Latrobe Valley mining operations, has been the most heavily impacted, with significant vegetation clearance largely due to agricultural activities.

Within each of the bioregions, various Ecological Vegetation Classes (EVCs), which may comprise one or a number of floristic communities, have been identified through vegetation mapping. Department of

Sustainability and Environment (DSE) EVC mapping indicates the potential presence of over thirty EVC's within the entire Latrobe Valley region, with flora species of state and national conservation significance known to occur. In addition to being significant in their own right, these vegetation communities form valuable habitat for native fauna including species of regional, state and potentially national conservation significance. The landforms of the Latrobe Valley have been developed on sedimentary and volcanic materials with soils generally being fine grained and clay rich. Acid sulphate soils are also present as sub soils in some areas of the Latrobe Valley. These soils contain elevated levels of metal sulphides, which when exposed to oxygen through drainage and excavation can generate sulphuric acid, leading to the acidification of the surroundings.

9.1.2 Maximising the Coal Resource

Currently, existing brown coal mines are operated as discrete pits within isolated mining licences. Similarly, rehabilitation of these mines is subject to individual Rehabilitation Plans approved by DPI under the MRD Act. In the days of state ownership of the coal industry long-term mine planning was under the control of a single entity, the SECV. The regional perspective of mine planning decisions was effectively dismantled as a result of privatisation.

In 2001, the State Government's Brown Coal Tender resulted in the granting of new exploration licences contiguous with existing mining licences held by other companies. Assuming that each licence can develop an economic project and gain approval by Government, it is expected that these exploration licences would, at some point, be converted to mining licences, and subject to normal Government environmental impact assessment and approval, mining would proceed. Significantly, it is the Government's aspiration that, if mining were to proceed in the future, full extraction of the coal across the licence boundary should occur. Implicit in this is cooperation between companies that are likely to be competitors in the NEM.

The reason for the Government's approach is stated in the purpose of the MRD Act itself:

"…to encourage an economically viable mining industry which makes the best use of mineral resources in a way that is compatible with the economic, social and environmental objectives of the Sate."

Without extraction across the licence boundary, every contiguous pair of licences would have a perimeter of potentially hundreds of millions of tonnes of coal effectively sterilised from mining due to the need for batters, pit-edge infrastructure and the like. The long-term implications on the rehabilitation of the Latrobe Valley would be similarly disadvantaged- the capacity to deliver on a reasonably homogenous and attractive landform is lessened by such an outcome of mining.

From the industry perspective, full extraction across the licence boundary is economically attractive. There are several advantages:

- the potential resource is maximised, resulting in enhanced financial returns for the company;
- the coal will come with little overburden removal lowering operating costs;
- capital costs for the new licensee are reduced if the coal can be provided by an adjoining mine; and
- operating costs for the existing licencee are reduced by way of dispersing fixed costs against a larger production base.

A further reason is suggestive that this scenario will eventuate. The current mines have been established in the areas of the most favourable stripping ratios. Figures 6.5 and 6.6 clearly demonstrate that the most attractive, unmined coal is contiguous in many cases with existing mining licences. The implications for the Latrobe Valley is that the future is likely to consist of the expansion of existing pits rather than multiple, new pits. Or where they commence as two pits they are likely to be joined.

Two of the successful tenderers in 2001, HRL Development and Monash Energy, are already in discussion with the adjoining mining license holders with a view to, amongst other things, examining the opportunities for coal supply and cross-boundary extraction.

If, as seems possible, commercial arrangements eventuate, a number of challenges to Government, industry and the community could result. The challenges are:

- meeting greenhouse gas emissions targets
- determining appropriate mine rehabilitation strategies
- achieving lowered groundwater pressure to maintain a stable mine
- accessing sufficient water for process plant needs.

9.1.3 Meeting Greenhouse Gas Targets

The Victorian Government have outlined GHG reduction strategies which will require new technology to be used for future coal utilisation. This report assumes future projects will meet those target levels.

9.1.4 Rehabilitation of Worked Out Mines

As discussed in greater detail in Section 11, new mines or enlarged current mines will need to have effective rehabilitation strategies in place for the long term use of mine areas. The approved rehabilitation plans for current pits involves using water to fill mines to river levels, however as discussed elsewhere in this report, it is unlikely there will be sufficient water for this rehabilitation option. Mining companies are examining alternative rehabilitation strategies. In the 2004 EES for West Field, International Power Hazelwood (IPRH) proposed a reduced level of flooding, limited to that necessary to provide the additional weight not achievable through in-pit overburden dumping.

To illustrate the impracticality for filling mines with water at current rates of coal production (65 Mtpa), even if we are to assume only one half of this volume is to be taken up by water in the closed pit, for every year that coal mining continues approximately, 28 Gl of new water is required:

$$\frac{\text{(65 million tonnes x 50\%)}}{\text{coal density (1.15t/m}^3\text{) x equivalent volume of water (@1t/m}^3\text{)}}$$

$$= 28 \text{ Gl/a}$$

As has been demonstrated earlier, there is real concern amongst the water authorities that such water is available, or indeed, if it is available whether it is desirable to put it to such an end-use.

9.1.5 Groundwater Aquifer Pressure Reduction

In order to safely mine the coal within the Latrobe Valley, it is normally necessary to replace the pressure of groundwater aquifers on the mine site. Without this being done, the base of the mine is likely to heave and inflows of water could be expected. Dewatering of the Morwell and Traralgon interseams, in particular, have a regional impact on aquifer pressures and cause gradual settlement of surrounding land. Pumping activities in mines interact in the highly permeable aquifers.

Progressive backfilling of the mines using overburden and other waste material provides weight on the mine floor to minimise aquifer pumping. Ultimately when the mining is completed, rehabilitation options could include sufficient backfilling with waste or water if continued aquifer pumping is to be avoided. The management of mining and rehabilitation activities requires recognition of the interaction of pumping from each mine on others and on the regional aquifer resource.

9.1.6 Accessing Sufficient Water

Current power stations require significant quantities of water for cooling and other uses. This is attained from surface water dams and aquifer pumping. As outlined in Section 8, there may be sufficient water in surface and underground systems to meet future requirements especially if these are augmented by treatment of industrial waste water (Water Factory) or by diverting treated water from Melbourne into the Latrobe Valley (The Eastern Water Recycling Proposal). Another option for new project proponents is to recover water bound in the coal.

Brown coal found in the Latrobe Valley contains a high proportion of water (60%+). Brown coal has a higher rate of GHG emissions mainly due to its high moisture content. The reduction of the rate of greenhouse gas emissions from the combustion of brown coal is in large part associated with drying the coal. A number of ventures are examining coal-drying technologies. These include the Cooperative Research Centre for Clean Power from Lignite (Mechanical Thermal Expression) and the work by Pacific Edge Holdings. If developed commercially, the use of a coal with 15% moisture content would liberate very large quantities of water. For a new project with 30Mtpa:

$$\frac{\text{(35 million tonnes x 60\% moisture content x 75\% reduction in moisture)}}{\text{(coal density (1.15t/m}^3\text{) x equivalent volume of water (@1t/m}^3\text{)}}$$

$$> 10 \text{ Gl/a}$$

This ‘new’ water will require treatment to avoid polluting water courses with suspended coal particles or causing high Biological Demand (BOD). Whether this new water replaces that extracted from surface or groundwater sources is immaterial, its availability represents an opportunity for Government to reallocate existing water resources to other high-value uses- be it environmental, agricultural or industrial.

9.1.7 Mining impact on natural environment

Some key principles that relate to native flora and fauna management include:

- Disturbance to remnant vegetation communities should be avoided in the first instance where practical, and in the second instance minimised during the site selection and design process;
- There should be no net loss in the current extent of species, communities, and ultimately a net gain. Where loss is unavoidable, appropriate offsets should be determined as required under

Victoria's Native Vegetation Management Framework. As required by the framework suitable offsets will be negotiated with and approved by DSE;

- Ecological processes of communities should be maintained where practical (i.e. natural conditions will be preserved or re-established as far as possible);
- Vegetation should be managed to address, and reverse processes of land degradation associated with land clearing.

Compliance with these principles at the planning stage of any proposed extension of mining activities in the Latrobe Valley may assist in minimising any potential impacts to the natural environment and reduce the likelihood for triggering environmental legislative requirements. Undertaking comprehensive flora and fauna surveys of the areas proposed for any extension of mining operations may provide opportunities to minimise impact to the natural environment or establish appropriate net gain alternatives.

While careful location of any proposed mining developments may minimise the potential for impact to the natural environment, developments will be subject to meeting specific legislation and obtaining certain approvals and permits related to the protection of the natural environment.

Any potential impact to a matter of national environmental significance (NES) will require a referral to the Australian Government Department of Environment and Heritage under the Australian Governments *Environment Protection and Biodiversity Conservation Act* (EPBC Act), and/or permits under the Victorian *Flora and Fauna Guarantee Act*. Depending on the significance of the species or habitat which is to be impacted there is potential for certain restrictions to be placed on the development including the location and nature of the operations. Responsibility for making a referral of a project that could trigger the EPBC Act rests with the project proponent.

Under the Native Vegetation Management Framework, any removal of native vegetation will require a Net Gain Assessment to be undertaken using the habitat hectare methodology. This may have implications relating to requirements for the replacement and or management of additional areas of native vegetation. Removal of native vegetation may also trigger Native Vegetation Retention controls under the planning scheme and will need to be addressed in the EES for each project.

It is anticipated that the extension of mining operations in the Latrobe Valley will have an impact on the natural environment through both the construction and the operation phases of the development. The clearance of land during the construction phase could be significant depending on the location of the mining operations. Different aspects of the operational phase such as noise and emissions to the air shed of nitrous oxide (NO_x), sulphur oxide (SO_x) and particulates may also have an impact on various components of the natural environment.

The most significant biodiversity and conservation issues associated with the extension of mining activities in the Latrobe Valley are likely to be the potential impacts on:

- Vegetation and fauna habitat, including hollow bearing trees;
- Significant flora species;
- Significant fauna species;
- Waterways; and
- Regional biodiversity.

Information obtained from sources such as the EPBC Act protected matters search tool, and Victoria's Flora Information System (FIS) indicates the presence of flora and fauna species of regional, state and

national conservation significance within the Latrobe Valley region. Due to the limitations associated with this broad scale approach additional species may potentially be identified if field surveys were conducted at specific locations. Desktop data reviewed the potential for significant species at 9 sites, this information is summarised in Table 9.1. EPBC Desktop summary: Based on the desktop summary results presented in Table 9.1 it is considered there is potential for all identified areas to require Australian Government approval under the EPBC Act.

There is also potential for a variety of flora and fauna species, including birds (both migratory and non migratory), mammals, fish and amphibians to be impacted by the extension of mining operations. Due to the prolonged timeframe for the development it is anticipated that the at risk species habitat may change over time and detailed assessments will be required at the planning stage for specific developments.

The extension of mining operations could also affect regional biodiversity. This may arise if mining developments lead to the removal of, or significant reduction in specific EVC's within a bioregion or areas of fauna habitat. New projects would need to demonstrate adequate offsets for the clearance of native vegetation.

Table 9.1 Summary of desktop database results

	EPBC Protected Matters Search Tool	
Rating 1 Areas		
Zone H	1 wetland of international significance 18 threatened species 8 migratory species	12 listed marine species 1 state/territory reserve 1 Regional Forest Agreement
Zone K	3 wetlands of international significance 17 threatened species 8 migratory species 1 place on the Register of National Estate	12 listed marine species 5 state and territory reserves 1 Regional Forest Agreement
Zone O	3 wetlands of international significance 17 threatened species 8 migratory species	12 listed marine species 2 state and territory reserves 1 Regional Forest Agreement
Zone P	3 wetlands of international significance 17 threatened species 8 migratory species	12 listed marine species 1 state/territory reserve 1 Regional Forest Agreement
Zone Q	1 wetland of international significance 18 threatened species 8 migratory species 1 area of Commonwealth land	1 place on the Register of National Estate 12 listed marine species 1 state/or territory reserve 1 Regional Forest Agreement
Rating 2 Areas		
Zone A	1 wetland of international significance 18 threatened species 8 migratory species	12 listed marine species 1 regional forest agreement

Zone B	1 wetland of international significance 17 threatened species 8 migratory species	1 place on the Register of National Estate 1 Regional Forest Agreement
Zone E	1 wetland of international significance 18 threatened species 8 migratory species	12 listed marine species 1 state/territory reserve 1 Regional Forest Agreement
Zone J	3 wetlands of international significance 16 threatened species 8 migratory species	12 listed marine species 1 state/territory reserve 1 Regional Forest Agreement

Victoria's Native Vegetation Management – A Framework for Action establishes the strategic decision for the protection, enhancement and revegetation of native vegetation across the state (NRE 2002).

The Framework sets out a broad approach to native vegetation management in Victoria and specifies minimum standards, recognising that as native vegetation values and issues vary across the State, so too will the regional priorities and responses identified by this broad approach. Draft Regional Native Vegetation Plans outline these priorities and responses in detail, setting targets and extending the minimum standards as required.

The principal goal for native vegetation management in Victoria is to achieve:

> *A reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation, leading to Net Gain*

Net Gain is the outcome for native vegetation and habitat where overall gains are greater than overall losses and where individual losses are avoided where possible. The losses and gains are determined by a combined quality-quantity measure over a specified area and period of time. This accounting system is based on the 'habitat hectares' approach, a site-based measure of quality and quantity of native vegetation that is assessed in the context of the relevant native vegetation type (Parkes et al [Ref 34]).

In applying the Net Gain approach to protection and clearance decisions, a three-step process should be adhered to. The three stages are described in order of priority below:

1. Avoid adverse impacts, particularly through vegetation clearance.
2. If impacts cannot be avoided, minimise impacts through appropriate consideration in planning processes and expert input to project design and management.
3. Identify appropriate offset options.

It should be noted that offsets (actions undertaken to achieve commensurate gains) should only be considered after steps one and two have been fully investigated and documented. Calculation of the amount of gain associated with the offset actions will be based on an estimate of the improvements that are likely to be realised over a ten-year period from commencement of the action.

To ensure that the management actions required to achieve offsets are undertaken, and that permanent losses from clearing are mitigated by gains of an ongoing and secure nature, offset arrangements should be formally established through the routine and streamlined use of management agreements or permit conditions. The goal of Net Gain expressed in *Victoria's Native Vegetation Management – A Framework for Action* is given effect in the Victoria Planning Provisions by Particular Provisions Clause 52.17 (Native Vegetation).

9.2 Air Emissions

Any new project will have to meet air quality regulations under the *Environment Protection Act*, and specifically will need to meet the design criteria as specified in the State Environment Protection Policy – Air Quality Management (SEPP- AQM). In addition, the SEPP – Ambient Air sets goals for airsheds in the form of Environmental Quality Objectives set for nominated parameters. The policy relates to particles: PM_{10} (inhalable) and visibility reducing particles: gases and lead. The standards for PM_{10} particles, gases and lead are based on human health criteria. $PM_{2.5}$ and respirable silica particles also need monitoring and modelling. Whilst visible dust standards are based on aesthetic considerations and standards for ozone depleting substances aimed to prevent damage to vegetation, ambient air quality standards are affected by all sources of emissions.

New power stations or coal conversion processes will need to meet all air emission standards and the Victorian Government has set targets for reduced GHG (CO_2) emissions. New coal technology is expected to have lower overall emission levels. Integrated gasification and combined cycle plants are already much cleaner than pulverised fuel power stations such as in current operation in the Latrobe Valley. New projects will also have to ensure, when in combination with other projects, that the overall Latrobe Valley air shed meets acceptable standards. Regional monitoring using the Latrobe Valley Air Monitoring Network, measures the impact of industry, vehicles and other activity across the Latrobe Valley.

Occasionally a background level of pollutants reaches the Latrobe Valley from Melbourne. Currently air quality objectives are, for NO_x and SO_x are easily met, although recent monitoring has measured high SO_x plumes impacting the ranges south of the Latrobe Valley. The weather tends to be channelled to the valley axis on a east-west direction, although very still, cold air layers from slope flows can often form at night at an angle to the axis during periods of clear skies and light gradient winds.

9.3 Other Environmental Issues

A number of other regional environmental issues may exist with continued brown coal development in the Latrobe Valley.

9.3.1 Noise

All new projects will need to meet Victorian EPA standards and like air emissions, compliance with noise limits is pertinent to Council's planning for future urban growth. Buffers do provide some leeway for mines and coal related industry however, any modifications to the La Trobe or Wellington Planning Schemes needs to be mindful that encroachment of urban areas poses a greater challenge to mines to remain within set limits. This is particularly relevant to the Morwell area and the potential development of the Maryvale and Corridor fields immediately west of Morwell respectively.

9.3.2 Fire Protection

The large brown coal mines are at risk from fires ignited from internal sources or from bush fire events. Mine design and mine rehabilitation planning needs to consider defence against fire spread and provide capacity to extinguish fires. Similarly, land management across the Latrobe Valley needs to recognise this risk and ensure plantations of trees, in particular, use appropriate species and contain sufficient breaks to allow fire to be managed.

9.3.3 Cultural and Aboriginal Heritage

The Commonwealth's *Aboriginal and Torres Strait Islander Heritage Protection Act* - The purposes of this Act are the preservation and protection from injury or desecration of areas and objects in Australia and in Australian waters, being areas and objects that are of particular significance to Aboriginals in accordance with Aboriginal tradition.

There is potential for any of the selected sites to contain archaeological artefacts or sites of significance, this potential will increase where sites have not been previously disturbed, it is considered that during the course of site selection and design more detailed assessment of these potential values should be assessed in consultation with local Aboriginal Communities.

The main Aboriginal community in the Latrobe Valley is the Gunnai/Kurnai people. Sites of cultural heritage are protected under the Australian Government's *Aboriginal and Aboriginal Relics Preservation Act (1992)* and any development on Crown Lands must address the provisions of the *Native Title Act (1993)*.

9.3.4 Subsidence

The need for removal of groundwater from deep aquifers, for mine stability purposes, has been discussed in Chapter 8. Aquifer water extraction has been necessary in current mines since the 1960's. Ground subsidence is a consequence of this activity and is currently confined to the Latrobe Valley. Whilst more than 2 metres of settlement has been measured in some areas, the settlement is gradual and differential settlement has been small. There has been little impact on surface infrastructure. Minor changes to stream gradients are unlikely to affect their flows. New mines could be deeper than current operations requiring greater depressurisation of aquifers. As these projects are identified, further study would require to model impacts on these deep aquifers and to review subsidence issues. One option to reduce impacts could be to use artificial recharging of the aquifers. Further study and modelling of the long term subsidence issues should be carried out to see if recharging the aquifers 'down stream' of the mine could lessen the regional impact.

Figure 9 indicates Measured settlement in the Latrobe Valley arising from the depressurisation of the underlying aquifers needs to be a consideration in the development of future infrastructure, particularly as pits expand over the following decades. It should be understood that these patterns of subsidence will ebb and flow as mining starts or stops in a given area.

9.3.5 Public Safety Post Rehabilitation

Following completion of mining operations, closure and rehabilitation must include provisions for public safety and its ongoing maintenance. DPI is placing increasing emphasis on the development of mine closure plans that address the issue of protection of public safety- most notably fire hazards and safe access. Its currently preferred response to both issues is to seek post-closure pit batters with an angle of 1V:3H. This angle allows for safe access and a capacity to hold topsoil for revegetation. Other options to address these concerns may exist.

9.3.6 Visual Impact

The mines, overburden dumps, power stations and associated infrastructure are large and can cause a significant visual impact to surrounding areas. Design needs to be sympathetic to the neighbouring environment and the use of mounds or vegetation screening considered.

9.4 Summary

In summary it is considered that future utilisation of coal resources in the Latrobe Valley has the potential to impact upon the natural environment, however these impacts can be minimised and managed through careful site selection and design. Any proposed development works should be conducted using best practice environmental management principles to ensure impacts to the natural environment as a result of works are minimised.

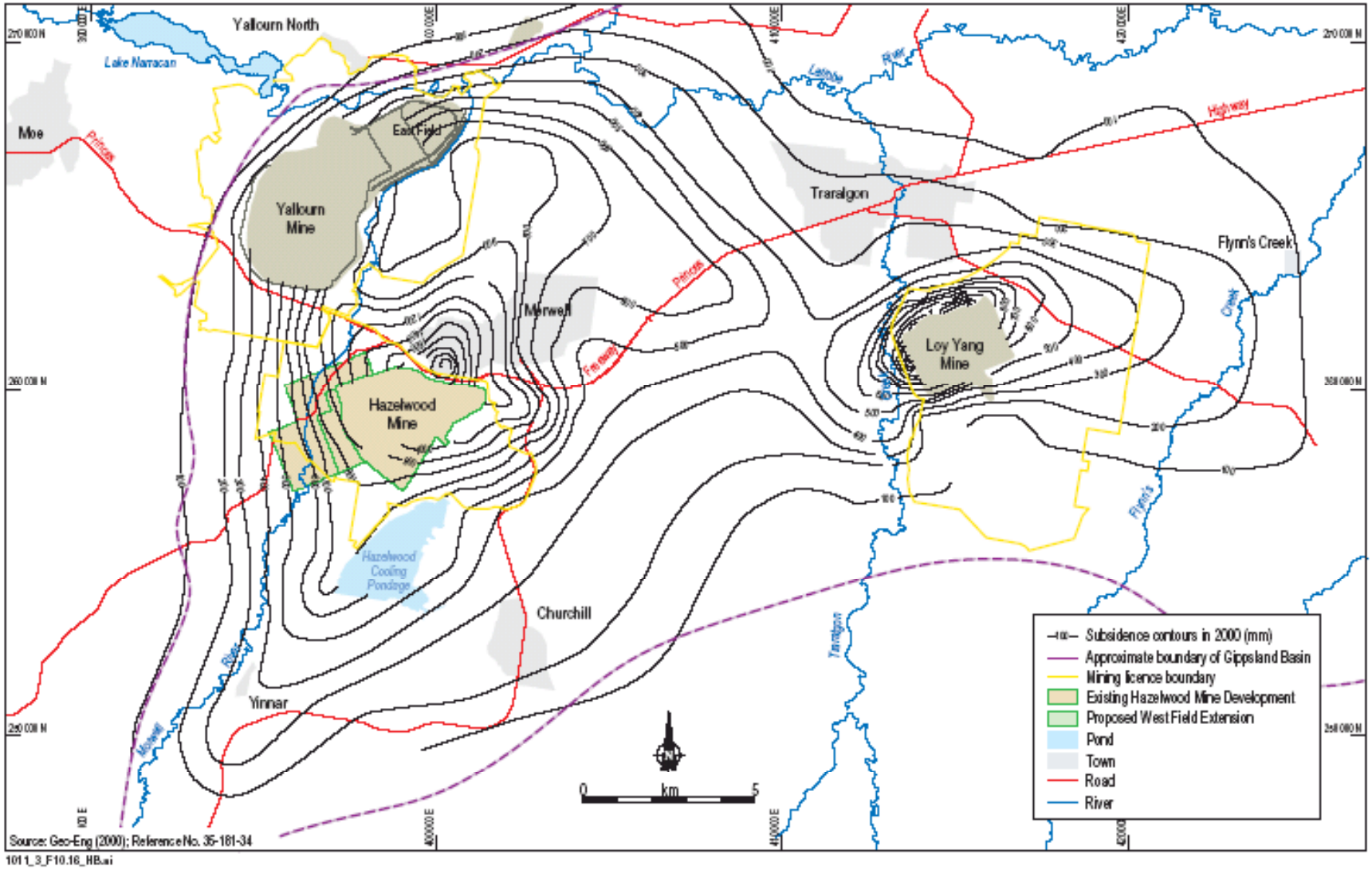

Figure 9.1 Contours of Subsidence in Latrobe Valley in 2000

10. Infrastructure

"To assess regional Infrastructure changes likely to be necessary to accommodate development of brown coal resources in the Latrobe Valley"

Roads, railways, water, power and other services are important to the towns, local communities as well as to major industry in the region. Infrastructure changes could be necessary from growth (or stagnation), changes in industry, coal utilisation and other economic activity. New coal developments could require water or CO_2 collection pipelines, new roads or the augmentation of the electrical transmission system. Whilst it is difficult to look forward in detail to 2100, the predictive energy model has been used to assess the growth related changes which will be necessary in the period, to assist in assessing likely regional infrastructure requirements for coal developments.

Existing infrastructure has been mapped in the "Latrobe Valley Coal fields Development – Strategic Environmental Study" by DSE [Ref 25]. This has been used in Figure 10.1 overlaying likely coal developments.

In this section, infrastructure is discussed under three headings:

- Major physical infrastructure, often referred to as "hard" infrastructure;
- Community or soft infrastructure; and
- New infrastructure, which would be applicable for new technology plants which may occur in the future.

This review has examined the capacity and location of infrastructure in the Latrobe Valley but not its current condition.

10.1 Major Physical Infrastructure

As can be seen in Figure 10.1, most of the current major infrastructure in the Latrobe Valley will not be impacted by likely coal developments to 2100. Changes will be necessary however, to the road/rail corridor west of Morwell and a number of rivers and streams if all of the likely coal developments proceed. These changes will need to be proposed and approved by government with individual project work plans.

MOONDARRA AUGMENTATION PIPELINE
MOONDARRA RESERVOIR
TANJIL
MOONDARRA STATE PARK
TYERS RIVER
TYERS CONDUIT
HWTS - STH MORANG TS 500KV
700 DIA CRUDE OIL/250 DIA LIQUID GAS
750 DIA NATURAL GAS
RIVER
LAKE NARRACAN
YPS - ROWVILLE TS 220KV
YALLOURN NORTH
YALLOURN NORTH EXTENSION MINE
RIVER
LATROBE
GLENGARRY
MAFFRA ROAD
ROSEDALE CREEK
TRARALGON
RIVER
HIGHWAY
SEWER
GPU GASNET 750 DIA NATURAL GAS
700 DIA CRUDE OIL/250 DIA LIQUID GAS
FLYNN
YALLOURN 'W' P.S.
NEWBOROUGH
MOE
REGIONAL
PRINCES
TRARALGON
YALLOURN MINE
SALINE WASTE & LOYS YALLOURN NTH RISING MAIN
CHURCHILL OUTFALL SEWER
FREEWAY
PRINCES
MORWELL
HAZELWOOD MINE
MORWELL P.S. & BRIQUETTE FACTORY
MORWELL CITY GATE
LY GAS SUPPLY
LYP HOWS
HP SALINE
LYP LOYS
SPI SUPER
SALINE WASTE
LOYS
CLARKES RD STORAGE
LOY YANG HIGH LEVEL RESERVOIR
LOY YANG MINE
VALLEY POWER GAS P.S.
LOY YANG P.S. A'
LOY YANG P.S. B'
PROPOSED CONVERTER STATION
EDISON MISSION GAS SUPPLY
CREEK
400KV DC
BASSLINK
SWOP
HYLAND HIGHWAY
MERRIMAN
GORMANDALE
HWTS - ROWVILLE TS 220KV
HAZELWOOD P.S.
HWTS - MTS 220KV
JEERALANG GAS P.S.
HAZELWOOD TERMINAL STATION
MTS - SUB LY 500KV
HWTS - LYPS 500KV NTH
HWTS - LYPS 500KV STH
GPU GASNET MORWELL - DANDENONG
HIGHWAY
HAZELWOOD PONDAGE
HWTS - CRANBOURNE TS 500KV
CHURCHILL
TRARALGON SOUTH
TRARALGON
FLYNNS
YINNAR
MONASH WAY
MORWELL
HIGHWAY

FIGURE 10.1
LATROBE VALLEY 2100 COAL RESOURCE PROJECT EXISTING INFRASTRUCTURE

10.1.1 Roads

The major access to Latrobe Valley is the Princes Highway from Melbourne and from Sale. This is a duplicated facility from the Melbourne CBD via the M1/A1. The Highway has a capacity of about 110,000 vehicles per day (vpd) two way which compares with its current use ranging from 30,000 vpd in Pakenham to 20,000 vpd through the Latrobe Valley. The current bottleneck in Pakenham arising from multiple traffic lights is expected to be resolved by the Pakenham By-Pass, due for completion in 2007.

VicRoads is responsible for the Princes Highway as part of the State arterial road network. It owns and operates the freeway on behalf of the Victorian State Government. VicRoads advises that it sees no major issues for the Princes Highway associated with the ongoing operation of extraction of coal in the Latrobe Valley, given that future employment levels are unlikely to grow markedly.

Construction of new power station or coal conversion plant is expected to involve the transportation of items of machinery or construction materials which are overweight or over-dimensional compared with normal traffic expectations. An over dimension route between Melbourne and Latrobe Valley was identified by the SECV for this purpose. It has been used successfully in the past and is probably satisfactory for the future, even though new technology requirements are not yet known.

VicRoads has proposed several routes for the Princes Highway to bypass Traralgon and the final route is currently being determined. The adopted route will most likely define the northern limits of coal extraction and the southern limit of the town. The results of this LV2100 Coal Project study of the coal resources to the south of Traralgon should be factored into the final alignment, especially if the new bypass is to be built prior to mining commencing. It is recommended that the bypass avoids crossing the defined Coal Resource Area H. The by-pass design should preferably ensure that any rigid infrastructure like bridges constructed close to the identified coal resource are built in a manner capable of coping with the subsidence of deep coal mining. Further to this, the alignment of highway buffers in relation to the resource area will need to be carefully considered at the time of detailed planning scheme assessments. The bypass alignment study is likely to be completed during 2005.

Long term planning could see the need to divert the Princes Highway and the rail line on the western side of Morwell in order to access coal resources in Resource Area A. Such a diversion could be project specific with respect to extent and financial feasibility. However it is a significant issue for long term planning if the highway is to be diverted over the existing Yallourn mine or elsewhere. The options are:

- Resist transport route relocation (road and rail) and therefore freeze/sterilise this coal resource.
- Let the coal development project economics determine if and when relocation and the extent that is required.
- Select a route over the Yallourn Open-Cut and arrange backdumping to allow for a future relocated transport corridor (Figure 10.2).
- Victorian Government initiated broader strategic transport project to re-align or bypass the coalfields. This is beyond a single project or organization capability.

It is recommended at this stage that the viability of routes over the Yallourn Open-Cut or further north be considered as there would be insufficient time for a broad strategic view when a project or projects are being proposed. This could be carried out whilst defining areas for land rezoning.

The Latrobe Valley contains a number of roads of regional status. The majority are two way roads. These cross the coalfields in a number of places. However, the cost of their relocation needs to be accomplished on a project by project basis.

10.1.2 Rail

Rail is important in providing rapid transport access from Latrobe Valley to towns in other centres and in particular Melbourne. The State Government is currently upgrading rail transport from Melbourne to Traralgon for the introduction of a faster train which will improve the passenger service.

Other than passenger access, rail is not an important freight carrier for the power industry in the Latrobe Valley. Trains have been used for briquette transport in the past. There will be potential need for rail transport for any solid products resulting from new technology development. These could include char or activated carbon products. Depending on the volume of these products, some upgrading of the railway may become necessary as well as a review of required routing to suitable ports at Melbourne, Geelong, Hasting or Portland.

Long term coal planning could see the need to divert the rail line on the western side of Morwell in order to access coal resources. As discussed in 10.1.1, the railway could be diverted over the existing Yallourn Mine or to the north of the coalfields altogether. Long term planning is required if the railway is to be diverted by more than minor realignments around new coal projects.

10.1.3 Water

Sufficient potable water for envisaged population centres is considered available.

Water availability for industrial use such as required for future electrical energy generators or coal gasification has been addressed in Chapter 8. This indicated that sufficient water would be available especially should the proposed Water Factory and the Carrum diversion proceed.

Mining could require further diversion of rivers and streams in the Latrobe Valley, principally the Morwell River, which has been diverted several times already. The proposed major Morwell River diversion from Yinnar to the east of Morwell, discharging to the Latrobe River is also discussed separately in Chapter 7.

10.1.4 Gas

The major natural gas pipeline route from the Esso Gas Plant at Longford, to Melbourne, passes through the Latrobe Valley, essentially avoiding coal resource areas. Gas is used in towns and to provide start-up fuel in coal fired stations and energy for peak electrical energy generation located in the Latrobe Valley. Sufficient gas from local sources for these uses is predicted for about 20 years. Considerable exploration effort in the Gippsland and Otway Basins for natural gas, and locally for coal bed methane is aimed to increase gas resources in Victoria. Gas could also be supplied from other states.

New generation technology for processing brown coal may also produce syngas. Subject to economic justification, natural, syngas or coal bed methane may be used for future power generation.

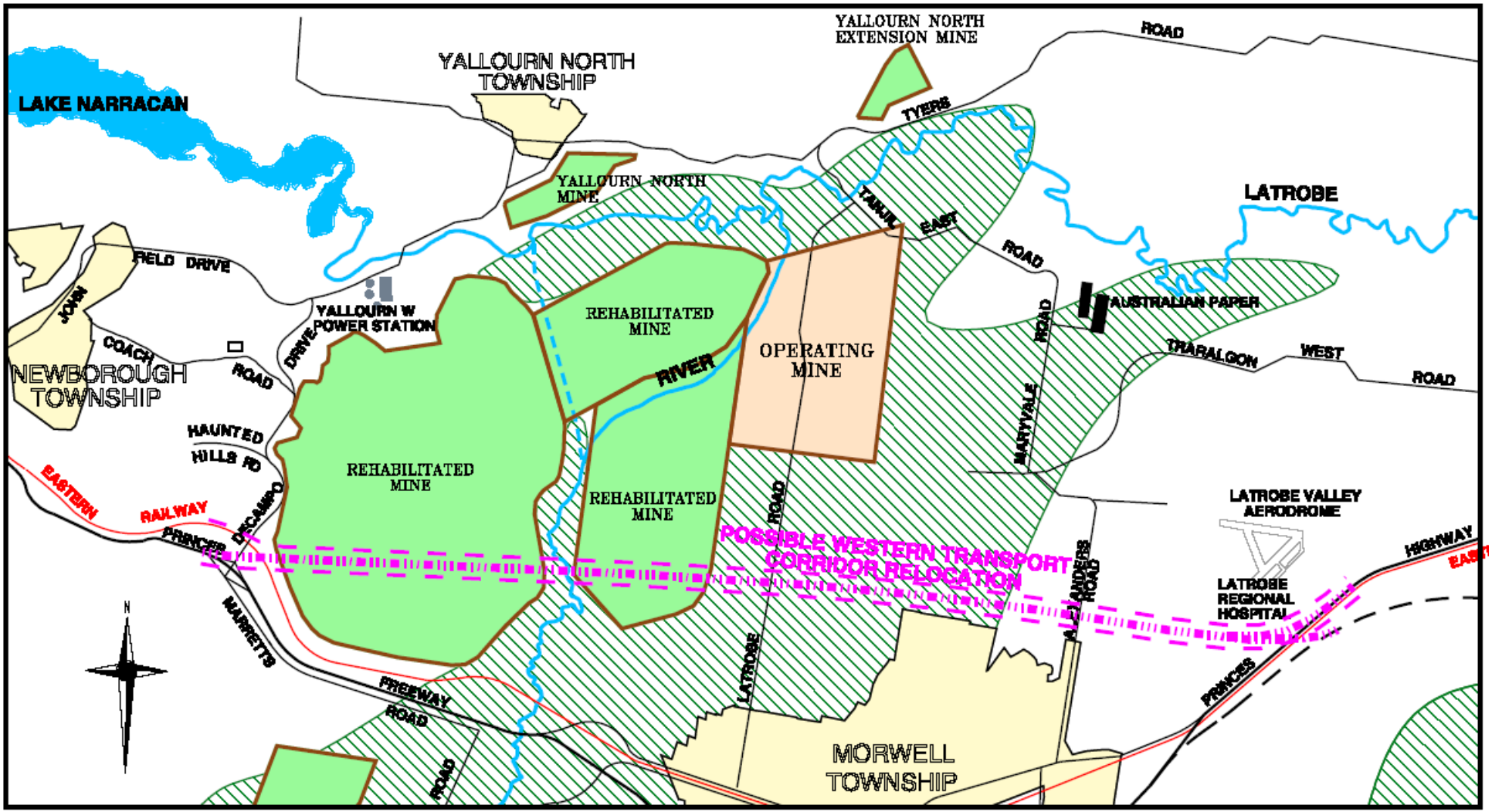

Figure 10.2 Possible Western Transport Corridor relocation

10.1.5 Electrical Transmission to Major Load Centres

The Latrobe Valley is the major source of power generation in Victoria. With more than 7500 MW of brown coal power, several gas peaking plants and BassLink, due to be completed in 2005/6, the high voltage network is critical. A full study of the network, its capacity and augmentation is beyond the scope of this study. However, the adequacy of electrical energy transmission via high voltage (HV) overhead transmission lines between Latrobe Valley, Melbourne and other major users is regularly reviewed by Vencorp. Interconnection to Melbourne is currently being upgraded with replacement of 220 KV lines and the installation of Cranbourne terminal station. As new generation comes on line it is anticipated that transmission upgrades will occur as required.

10.1.6 Communications

The Latrobe Valley is well served with adequate communication systems currently, which will be upgraded to follow demand.

The systems are as follows:

- Mobile phone coverage and capacity;
- Broadband access;
- Copper wire system, which can also be used with new technology utilising copper wire or the existing ducts; and
- Optic fibre cables owned by Telstra, Victrack and Basslink.

New technology is likely to be via wireless technology and will match expected or actual demand.

10.2 Community Infrastructure

10.2.1 Town Infrastructure

Shire Councils and in the case of Latrobe Valley, Latrobe City and Wellington are responsible for roads, stormwater drainage, floodplain drainage, recreation, parks and other town and community infrastructure.

Gippsland Water is responsible for water and sewerage infrastructure within the Latrobe Valley.

Both authorities have the responsibility and capability of upgrading infrastructure to meet population growth as and when it occurs.

Power generation is one of many factors which will influence population growth and infrastructure requirements in the Latrobe Valley.

10.2.2 Community or "Soft" Infrastructure

The provision of schools, hospitals and other health services, recreation and community infrastructure is the responsibility of shire councils and state government through its Departments. It is influenced by Australian Government financial initiatives.

The provision of soft infrastructure is dependent on population and community demand or expectation and in general follows population growth.

This study has produced a 'Planning Tool' that can be used to identify likely employment in the power generation industry over the study period. The planning tool is interactive and can be utilised to test a number of scenarios for employment and then subsequently to assess housing and community needs.

A general observation from the study is that employment for power generation is unlikely to increase even though coal generation is projected to increase, as new technology will have an improved efficiency. Additional staff could be required for coal gasification plants, but these too are expected to be highly automated and only require small staff levels.

During construction periods for new mines and/or new power stations or coal gasification plants, however, there are likely to be peaks in job opportunities and it is recommended that Latrobe City apply a suitable planning mechanism to accommodate future infrastructure peaks.

10.2.3 New Facility Construction Impact

This study predicts a requirement for additional brown coal based energy generation and coal gasification plants over the study period. It is expected that additional people with construction skills will be needed for each project. Given that construction of new coal mine or power stations take about 5 to 10 years, the construction impact on Latrobe Valley local communities will be extended over reasonably long periods. The number of people required and the length of construction effort will be greater if more than one project is running at the same time. Currently there are small numbers of skilled personnel available for the construction effort. Existing maintenance companies based in the Latrobe Valley and Melbourne would be able to import some personnel but shortages are predicted. It is recommended that government and industry consider providing skills development for the local community, to meet the projected demand.

The provision of adequate accommodation, permanent and temporary, together with the provision of adequate hard and soft infrastructure is a matter to be assessed when the size and number of projects begin to emerge.

This study indicates that the current main regional infrastructure can cope with expected growth, however peaks associated with construction activity need careful assessment when projects are being proposed.

10.3 Infrastructure Requirements for New Technology Plants

10.3.1 Inter-regional Transport

New coal mines, power generation and coal gasification plants likely to emerge in the Latrobe Valley will be large, long life facilities. Coal conversion plants are likely to be located close to the coal source to minimise expensive coal transport costs. There is therefore unlikely to be the requirement for additional inter-regional infrastructure between coal mines and power stations within the Latrobe Valley. However, there is likely to be the need to transport waste from new mines to existing operations. Where overburden or coal transport is required, trucks or conveyor systems are expected to be utilised.

10.3.2 New Technology Plants

New technology plants are likely to differ markedly from existing power stations. Advanced fuel technologies being researched or developed are outlined in Appendix G and indicate a range of alternatives being considered for brown coal utilisation. These include brown coal drying, gasification, combined cycle power generation, carbon capture and storage. This new technology in new plants is expected to be sited adjacent to coal resources. Each project will have to meet Victoria's environmental standards to gain development approval.

Products from the utilisation of brown coal are expected to include electricity, syngas and hydrocarbon products. Where possible CO_2 will be trapped and geosequestred in underground natural storage areas. The sites for CO_2 sequestration have yet to be determined, but on the basis of initial studies, are likely to be within the offshore Gippsland Basin.

Exploration and testing activity is planned over the next few years to ascertain the best sequestration sites. Once CO_2 sequestration has been established, compression pumping, pipeline and deep drill holes will be required. These could be installed on a project by project basis or utilise shared facilities and it is recommended that these options be investigated by the Victorian Government. The location of this infrastructure should not be difficult to achieve to avoid local population centres, high value sites or coal resources.

10.4 Summary

The major infrastructure services of road, rail, water, gas, communication and electrical transmission are adequate for present and future use. They are upgradeable to meet specific project or general growth requirements. However when new projects emerge, specific requirements of augmenting HV transmission and rail for bulk shipment is possible. It is understood sponsors have been found for a new project known as the Energy Challenge Project which will, as one of its tasks, provide a Report Card review of the condition of hard and soft infrastructure. This project is projected to significantly improve knowledge of the current status of regional infrastructure and the Victorian Government should consider assisting the project through in-kind support.

The Princes Highway Traralgon By-Pass alignment and utilisation of land areas south of the current highway should be reviewed to avoid impeding utilisation of Coal Resource Area H. The transport

corridor to the west of Morwell crosses coal resources which might be required prior to 2100. It is recommended that alternative routes are considered in long-term strategic plans for the Latrobe Valley.

Regional issues likely to require Government initiative are CO_2 geosequestration (CO_2 storage siting, as well as CO_2 compression, pipeline and discharge drill holes), and a Latrobe Valley transport corridor relocation on the western side of Morwell.

New facility construction impact on hard and soft infrastructure depends on individual project planning, location, size, complexity and timing. Difficulties can be exaggerated when two projects construction activities coincide. However some pre-planning by Latrobe City and infrastructure authorities to identify locations and requirements is recommended. It is also critical that adequate skilled staff are available for construction and operational phases. Extra training and employment opportunities should be made available to provide opportunities for Latrobe Valley people.

11. Mine Rehabilitation

"To consider mine rehabilitation options on a regional basis to enable long term sustainable land use following the mining of coal".

11.1 Introduction

Coal winning in the Latrobe Valley is carried out in large open-pit mines. Due to the very thick coal seams prevalent in the region, disturbed mining areas are smaller than might occur in other mining provinces. Even so, the mines occupy large areas and there is a legislative requirement and community expectation that progressive rehabilitation occurs. Final, stable mine closures are also expected to foster long term sustainable land use following cessation of mining.

Victorian mining legislation – the *Mineral Resources Development Act* (MRD Act) [Ref 30] requires the holder of an exploration or mining licence to rehabilitate all disturbed areas. This includes the mine, external overburden dumps, ash ponds and coal stockpiles. Section 78 of the Act requires the approval of a rehabilitation plan that must take into account:

(i) any special characteristics of the land;

(ii) the surrounding environment;

(iii) the need to stabilise the land;

(iv) the desirability or otherwise of returning agricultural land to a state that is as close as is reasonably possible to its state before the mining licence was granted; and

(v) any potential long term degradation of the environment.

The licencee is required to follow the rehabilitation plan and submit a bond to ensure that the planned rehabilitation work is properly carried out.

Guidelines for mine explorers and operators are provided on the DPI website. These include *The Strategic Framework for Mine Closure*' [Ref 21], *Exploration and Rehabilitation of Mineral Exploration Sites* and *Rehabilitation of Agricultural Land Subject to Mining* [Ref 29], etc. The latter guideline for the environmental management of exploration and mining areas encourages progressive rehabilitation and the development of an acceptable final rehabilitation solution. The end use for the rehabilitated area needs to take into account special characteristics of the land, the surrounding environment and the need to stabilise the land to its previous agricultural use. It is recommended that the company consults with stakeholders on alternative end uses in the formulation of the rehabilitation plan.

In the 1980's, the SECV developed strategies for mine rehabilitation [Ref 19] that included dump shaping, soil development and vegetation. At the time of privatisation of the existing mines, flooding or part flooding was seen as part of the long-term rehabilitation following mining.

The approved rehabilitation work plan for each operating mine is primarily based on this model. Progressive land shaping, top soiling and planting is required for all external dumps and mine batters

exposed above the final flooded water level. Making the mine stable and arranging for mine flooding is to occur following the cessation of mining. However, the source of the large volumes of water necessary to flood each mine has not been established and alternative rehabilitation models need to be considered.

11.2 Disturbed Mining Areas

The brown coal seams being mined in the Latrobe Valley are flat lying, close to the surface and thick. Mines have been located where the coal to overburden ratio is highest and where community and environmental issues can be appropriately managed. Choosing high coal overburden strip ratio areas is driven by the economies of mining and results in the lowest possible area disturbed by mining. As an introduction to the discussion about rehabilitation options, the following describes how mining is carried out in the Latrobe Valley.

11.2.1 Mine Development – External Dumping

Opening up a new mine requires the pre-stripping of overburden and the development of a number of coal benches suited to the mining and transport equipment. It takes a number of years for the mine to reach its planned maximum depth and a large quantity of overburden needs to be externally dumped. External dumping continues to be necessary until there is sufficient room in the base of the mine to commence backdumping.

Overburden dumps should be designed to suit the final rehabilitation plan. Contouring in sympathy with the existing topography and shaping prior to topsoiling and planting can assist in reducing the visual impact. Drainage paths need care and attention during design and construction to avoid erosion over the long term. The use of grass, trees and native vegetation has been shown to provide long-term sustainable agriculture solutions.

Figure 11.1 shows a typical multi-level external overburden dump progressively developed and rehabilitated, layer by layer.

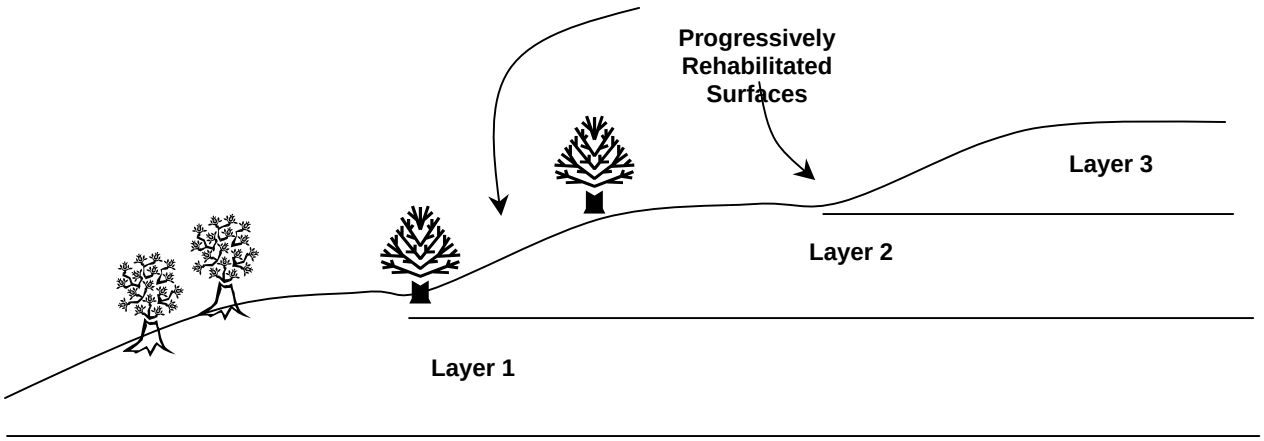

Figure 11.1 Multilevel Overburden Dumping

11.2.2 Mine Development

Figure 11.2 shows a typical section through a fully developed mine. Ahead of the mine, obstacles and topsoil are removed. Overburden stripping and coal development proceed uniformly. The stripping of overburden includes the removal and separation of topsoil critical for rehabilitation purposes. Backdumping of overburden occurs after the base of mine has been reached.

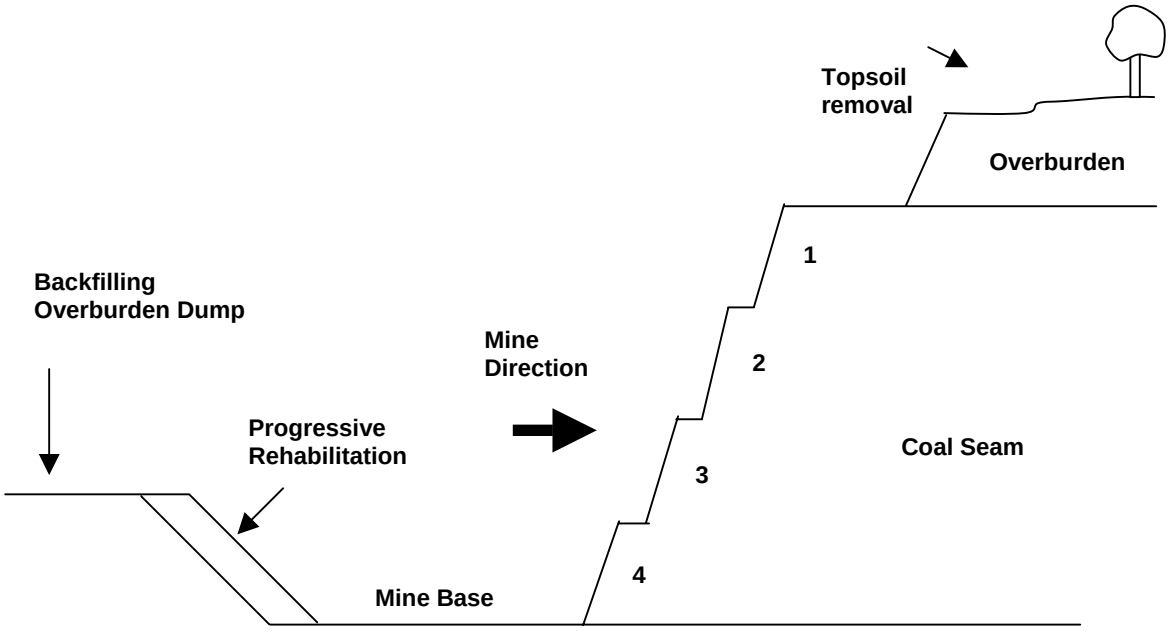

Figure 11.2 Typical Coal Mining Operation

Within the mine, batters can be progressively flattened and topsoiled, providing this is part of the rehabilitation plan. External or internal overburden dumps can also be progressively rehabilitated as each level is completed.

11.3 Rehabilitation Issues

11.3.1 Backfilling to Original Surface Level

The geology of the coal, overburden and interseam layers control the mine design, the mine development and form the basis for progressive rehabilitation of the mine.

Latrobe Valley mines have a very favourable coal to overburden ratio. In a typical mine with a proportion of 4 coal : 1 overburden; for every 5 cubic metres of total material mined only 1 cubic metre of overburden is able to be returned to the mine. Whilst this is a favourable mining situation, it also means that it is not possible to fully backfill the total mine area and return land to identical pre-mining conditions. In this situation, alternative end uses and rehabilitation strategies need to be established for the Latrobe Valley mines.

11.3.2 Groundwater Aquifers

A number of the overburden or interseam layers act as aquifers for groundwater. These aquifers extend across most of the Latrobe Valley and the Gippsland Basin. The pressure of these aquifers can cause flooding or affect mine stability by causing heave in the base of the mine. Water may need to be pumped from these aquifers during mining to lower aquifer pressure for mine stability reasons. Pumping may need to continue following the cessation of mining, if insufficient backfilling has occurred - to balance heave forces that, if left unchecked, would result in the failure of the pit batters. IPRH has recognised this and is reinforcing critical areas such as the northern face of the Hazelwood mine in close proximity to the Princes Highway and urban Morwell. Exposed aquifers and boreholes also need to be sealed during rehabilitation to prevent the interconnecting of aquifers or groundwater contamination.

11.3.3 Soil Preservation & Planting

Soil resources in the mining operations need to be preserved as greater surface area may need to be rehabilitated than mined. The development of alternative subsoil and topsoil material may be necessary to achieve acceptable rehabilitation.

Many of the soils and subsoils in the Latrobe Valley area are dispersive in nature and rehabilitation practice needs to minimise the risk of erosion and the loss of the valuable soil horizon. Other concerns are that overburden, interseam and coal materials can contain sulphides such as pyrite. Rehabilitation designs need to consider this possibility and reduce the occurrence of acid mine drainage.

Planting options for rehabilitation should consider the land capability, sustainability and long term use of the land. Local species should be used where practicable.

11.3.4 Visual Impacts

The mines and overburden dumps in the Latrobe Valley are large and, depending on the topography, can be visible from close-by or from considerable distances away. The use of visual screens should be considered in the mine rehabilitation plan. Rehabilitation designs should be contoured to match existing land forms and progressive rehabilitation can also lessen the visual impact.

11.3.5 Fire hazard

While mining is under way each company is responsible for fire prevention measures. Following mine closure, the currently approved final rehabilitation plans for the three existing mines provides for filling the pits with water to grass level. This inherently reduces the risk of fire to a minimum. However, should this outcome not occur due to inadequate water resources, then the long term management of fire hazard of the exposed coal batters is an issue for the landowner (Crown or freehold). The Victorian Government has voiced its concern over managing this potential liability post-mining due to the potentially vast areas of exposed coal and the risk of spontaneous, accidental or deliberately-lit fires. DPI is working with industry to implement workable solutions.

11.3.6 Public safety

Another aspect of post-mining rehabilitation, irrespective of whether pit flooding eventuates, is the minimisation of risk to public safety. DPI has indicated that one of its preferred options to minimise the risk of death or injury by falls over the pit batters, is to apply batters of 3H:1V to all exposed faces. This option has been applied to IPRH's West Field project and is a potential solution for all new pits.

11.4 Existing Rehabilitation Practices

Of the three operating mines in the Latrobe Valley, both the Yallourn and Hazelwood Mines have been backdumping overburden in the mines for some years. Yallourn is currently completing an earth bridge across the mine to relocate the Morwell River. The Loy Yang mine is to reach its planned full depth in Block 1 in the next few years, allowing backdumping to commence. The rehabilitation requirements for the proposed West Field development of the Hazelwood Mine is currently being considered as part of the environmental assessment for this new mine extension.

Each of the operating mines are actively managing the lands within their lease, according to their approved Rehabilitation Plan. Work includes progressive rehabilitation of external overburden dumps and flattening final overburden batters. These areas are grassed and/or planted with trees.

The Yallourn North Extension Mine is the most recent mine which has ceased operations. It provides an example of a rehabilitated mine. Although coal resources remain at this site, it was rehabilitated in the early 1990's by the SECV and provision was made to allow mining to recommence in the future. External waste dump batters were flattened and grassed for sheep grazing. Coal and fly-ash was successfully used as a topsoil substitute prior to pasture sowing. Coal and overburden batters were cut back to slopes of about 4:1, covered with clay and then topsoiled and sown to pasture. Over the last 10 years, this rehabilitation has been very successful with both the mine and dump areas grazed. A lake was created in the lower section of the mine. The lake allows for settlement time for run-off water prior to discharge and allows quick return to mining, if the coal resources are needed in the future.

Whilst the existing mines will progressively rehabilitate mining areas according to their Rehabilitation Plan, community expectations following mine closure might change during the life of a mining operation. Changing rehabilitation plans is not readily achieved. The best rehabilitation plans are carried out as part of the mining process leaving areas with shaped surfaces, covered and topsoiled ready for rehabilitation. Going back over mined out regions to reshape areas to meet a different rehabilitation plan can be time consuming and expensive. If the government or the community seek changes to rehabilitation standards or practices, these may readily be implemented in a new mine but existing mines need to have an appropriate transition period to incorporate these into future appropriate mine rehabilitation plans. Government may have to facilitate acceptable solutions between old/new pits to achieve satisfactory environmental outcome.

11.5 Rehabilitation Options

11.5.1 Mine Flooding Option

At privatisation, the long term difficulty to backfill each mine with overburden to grass level was recognised as the coal : overburden ratios mean there is insufficient overburden. Flooding each mine with water was considered a logical solution. This solution is now recognised to have a number of risks for its successful implementation.

- is there sufficient water?
- will the water become contaminated?
- will the water storage have oxygen deficiency at depth?
- will wave action affect mine batters?

Take for example a typical 30 year old worked out mine with an overall strip ratio of 4 coal : 1 overburden. Even with all overburden returned to the mine, a void of some 450 million cubic metres would be required to be filled with water. This is about 450 Gl of water, or more than 10 times the current annual available unutilised capacity from the Blue Rock Dam. In reality, larger volumes of water would be required for each of the current mines when their planned operations cease. Even if it were acceptable on environmental grounds, it is unlikely such large volumes of water could be collected and stored in worked out mines from normal river flows. It is possible flood peaks could be diverted into a mine but uncertainties of large flood events this is unlikely to provide sufficient water at the right time. Were flooding possible, the water storages could be extremely deep and in continuous contact with coal surfaces. Once filled, overflow water may not be allowed back into the river system. Top-up water may also be required to counter evaporation. There are many unanswered questions around this option.

The current mines have approved rehabilitation plans based on the Mine Flooding Option. As has been demonstrated in section 8.6, and subject to the outcome of coal drying technologies, this option may no longer be feasible. It is recommended that Government and industry examine the implications of reduced water availability for current and new mine pit closure and develop contingency plans.

11.5.2 Lowered Land Surface

The scale of the Latrobe Valley brown coal mines at the point of pit closure- with floor areas in the vicinity of 10-30 square kilometres and insufficient overburden or water, means that a permanently lowered landscape needs to be considered. This would only be viable if batter stability and water ingress issues are resolved. These pit floors will, to varying extents, be covered with unconsolidated overburden with similarly variable suitability to built structures. Engineered solutions for construction in such a situation may prove feasible in the long term. An alternative mine rehabilitation strategy to flooding of the final void is to backfill the completed mine to a level which ensures mine stability and creates a lower landscape (Figure 11.3). This lowered land surface area would then be rehabilitated and following mining could be used for:

- Agriculture or forestry
- Industrial development

- Water storage or water treatment areas
- Landfill or hard material storage.

Dumps, benches and batters could be covered and planted with areas prepared for farming, forestry or other applications. Because the mines are of considerable size, having a lowered land surface is unlikely to cause significant difficulties. Water catchment may require pumped discharge, although it is possible to attain equilibrium, where rain collected equals the level of evaporation. Excess collected water could be used for agriculture, forestry or industrial purposes. The relatively high return for irrigated crops and the likely need for continued pumping of the warm groundwater from the Morwell Aquifer Formation suggest that this could an option of particular promise. Prior to locating water bodies, landfill or other fill solutions, it will be necessary to seal off aquifers to prevent contamination. Dump design would need to contain any deleterious material to prevent contaminated water discharge (eg acid mine drainage) to aquifers or to surface waters.

11.5.3 Mine Sequencing Opportunities

During the period of this study, a number of new mines are predicted to be required. The most likely locations for these new mines has been detailed elsewhere in this report. In some cases these new mines will be started from ground surface involving the need for external dumping or transporting overburden to a neighbouring mine. In other cases there may be opportunities to extend or enlarge mines already in operation, to meet the additional coal demand. Putting aside issues such as mining licence boundaries, costs for transport of overburden and separate ownership; there are benefits in reducing the disturbance due to mining by minimising external dumping for future mine development.

An example of sequential planning of open-cut mines can be seen in the Rheinbraun operations west of Cologne. When mining operations at Fortuna mine were transferred to the new Hambach mine in the 1980's, overburden was transported across country to complete the backfilling of Fortuna. At that time Rheinbraun had regional responsibility for planning, operations and management much like the SECV in Victoria.

Controlling the sequence of development of mines in the Latrobe Valley is not now as straightforward as it might once have been when the SECV had regional control and management of all electricity mining and generation in Victoria. Now there are a large number of companies involved and whilst this is providing other benefits to Victoria, it makes sequential development difficult to achieve. Each project requires coal allocation for project development and bankable certainty and it is difficult to pick winners before feasibility studies and environmental assessments have been completed.

When opening a new mine, one of the major up-front activities is the pre-stripping of overburden to reach coal. In the Latrobe Valley this may seem to be relatively easy as the coal is only shallow. However, external dumping needs to continue until the base of the mine is reached allowing backdumping to commence. This can be 20 years from the commencement of mining operations. The external dump could contain a significant proportion of the overburden in the total mining project and this further lessens the ability to refill the mine. Ideally, rather than building an external dump, this overburden should be transported to an existing mine, providing fill material for an existing void and eliminating mining disturbance of an external dump. Unfortunately, in some cases this might not be possible due to distance, physical constraints, disagreement between mining licence owners or it raises costs too high for the viability of the proposed development. To facilitate transport of pre-strip overburden from one pit

to another there are a number of issues, in addition to cost, to be addressed. In most cases the mines will be developed by different and competing owners and on separate Mining Licences. Questions of responsibility for managing the overburden dump, water runoff, rehabilitation and how to assess benefits to both parties, need to be considered. Regulating authorities may need to facilitate discussion between mine licence holders to achieve this option for a new mine.

Alternatively, and as seems likely, new mines could be developed from an existing mine. Arrangements to allow a mine to cross a Mining Licence boundary need to be developed. Crossing mining licence boundaries needs to be reviewed against the requirements of the MRD Act and other pertinent Acts, as well as practical implications of mine ownership, responsibility and insurances etc. It is recommended that Government take a facilitation role to encourage existing operators to agree to practical and cost effective solutions for mine expansion prior to approval of a new development.

11.6 Sustainable Use of Rehabilitated Mined Areas

11.6.1 Flooded Mine

In the event that the widespread use of coal drying technologies in the Latrobe Valley and there is a need to store significant quantities of water, it is envisaged that a flooded mine site could provide opportunities for water storage and recreational activities. It could also provide opportunities for retardation or river control. Around the edges of the lake, wetlands could be developed to foster bird habitat and areas set aside for native vegetation. Lands surrounding the lake could be used for agriculture, fish farming, horticulture or low-density housing.

Providing sufficient water was available and that all environmental issues are managed, this option could provide a long term sustainable solution with attractions for the community.

11.6.2 Lowered Landscape

Where total mine flooding is not utilised, even with the maximum return of overburden and interburden into the mine, most of the resultant rehabilitated land areas will be below pre-mining ground levels. The first priority is to ensure mine stability. Unless sufficient backfilling has occurred, it may be necessary to continue pumping from aquifers to maintain stability. The storage of some water in the lowered landscape model can also be used to overcome aquifer pressure uplift and maintain mine stability.

Returning the area to agricultural use for horticulture, grazing, cropping and forestry should be relatively straight forward. Of prime importance would be to have tractable grades and the development of appropriate soil horizons, drainage, runoff and collection. Design would have to minimise the risk of contamination of aquifer systems. Access roads would be required and exposed coal surfaces, where possible would need to be covered to minimise dust and fire risk. Moderately sized water storages are likely to be complementary to agricultural utilisation.

In addition to the use of the land for agricultural purposes, areas could be set aside for landfills, water treatment or industrial development. The rehabilitated dump areas are likely to continue to settle over a number of years making it a poor foundation for heavy buildings. However, this settlement is likely to be gradual and not affect use for agriculture or similar uses.

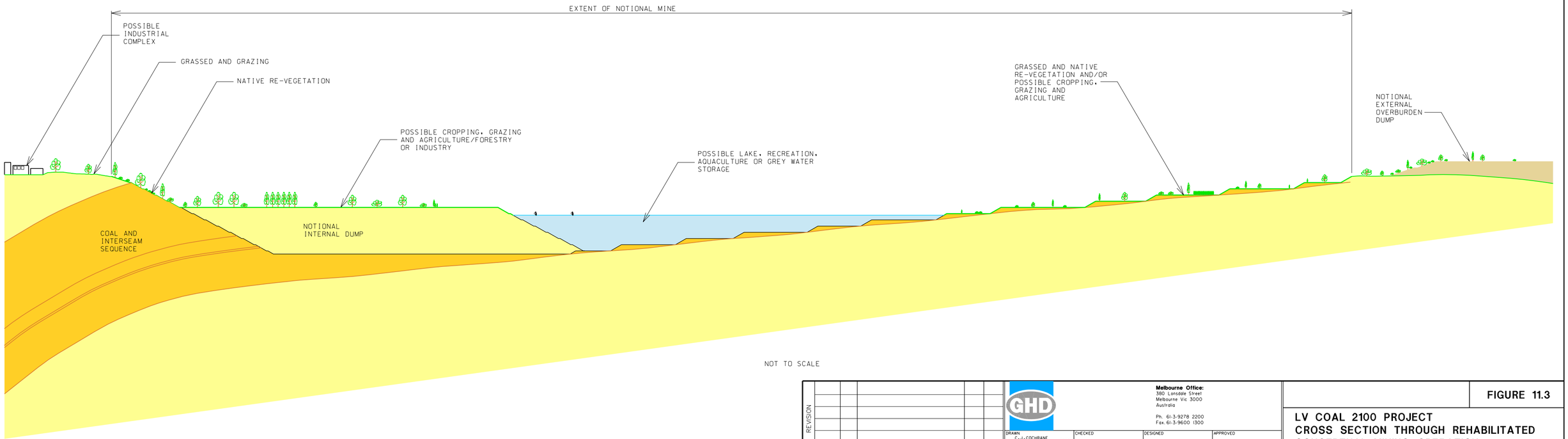

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FIGURE 11.3

LV COAL 2100 PROJECT
CROSS SECTION THROUGH REHABILITATED CONCEPTUAL MINING OPERATION

In the case of using the area for a landfill, studies would have to be carried out to assess the ability of the overburden to seal these materials or to establish if liners would be required. Whilst the demand for landfill areas servicing the local region is small, there may be a time in the future when transport from the Melbourne CBD could be justified.

The lowered landscape could also be a suitable location for grey water treatment. In this situation, water management, the control of acid mine drainage and isolation from aquifers would also need to be assured.

11.7 Principles of sustainable mining practices for the Latrobe Valley

In addition to compliance with prevailing Government policy and law, the following principles are recommended for application to all new mining projects in the Latrobe Valley.

- All new users of brown coal should seek their external water supply from the trade of existing water rights.
- Mine closure plans should aim to provide for self-sustaining and self-funded protection to future landowners and surrounding community in regard to safe access, fire, subsidence and pest, plants and animals.
- Preferentially, dumping of overburden and interburden should be directed to in-pit dumps.
- Government is to facilitate by cooperation between mines in the areas of cross-licence coal extraction, waste dumping and rehabilitation.
- River and stream diversions using pipes or tunnels are to be avoided wherever possible and where they exist, to be removed at the time of their redundancy.
- All current and future users of Latrobe Valley brown coal are encouraged to engage in proactive, positive engagement with the local community with a view to achieving mutually satisfactory outcomes associated with coal mining.

It is Government's desire to work with the existing mines to achieve these same outcomes, where practicable. Further examination by Government and industry is required in order to institute an equitable and sustainable system of groundwater extraction for the maintenance of pit stability at adjoining mines.

11.8 Summary

Mine rehabilitation is a major issue facing current and new mines. Community expectations about the effective rehabilitation of mines is also increasing, with this emerging as a key issue during the consultation process. The rehabilitated mine design needs to take into consideration the visual impact of the new rehabilitated landscape. As well as landscaping, rain and groundwater collection may also have to be stored, treated and any excess pumped from the mine. Rehabilitation designs need to ensure stability and run-off water are appropriately managed. Progressive rehabilitation is desirable to return land to other sustainable uses. The preservation of top and subsoils and the use of local species in rehabilitation activity is needed to restore the local biodiversity.

Unfortunately, the rehabilitation of mines in the Latrobe Valley cannot be based on the conventional model of backfilling mined out areas back to ground level, as there is insufficient overburden. This does not mean successful rehabilitation cannot occur. A varied landscape could be developed where mine area rehabilitation provides opportunities at a lowered level for agriculture, industry, recreation, landfills or water treatment areas. The viability of flooding mines for final rehabilitation now appears to be in doubt due to the large volume of water required and the growing demand from other users. Designs would need to identify the source of the water and demonstrate satisfactory management of any other environmental issues before flooding should proceed.

Industry and Government need to begin active consideration of alternatives futures for the mined-out areas. The viability of these alternatives would be enhanced by the application of more considered emplacement of overburden (sands, clays and gravels) and contingency plans for potentially water constrained pit closure plans.

The opening of new mines has required the development an external overburden dump until the base of the mine is attained. Rather than disturbing more land, arrangements should be examined to facilitate the transport of overburden into a neighbouring mine or allowing an existing mine to expand across adjoining Mining Licence boundaries to minimise the use of external waste dumps. Implementation of these strategies will require cooperation between competing mining companies and possibly the amendments to the MRD Act.

12. Discussion

The Latrobe Valley brown coal fuelled power stations are a significant supplier of electricity into the National Energy Market and provide more than 90% of electrical power requirements in Victoria. Future modelling indicates steady growth of the electricity market in Victoria to 2050 and beyond. Existing coal power stations are planning to continue operations to the 2030's (Yallourn and Hazelwood) and Loy Yang to the late 2040's, and additional baseload generating capacity from brown coal is likely to be required before 2020.

During community consultations it was evident that there is considerable support for the electricity industry in the Latrobe Valley and its growth. However, communities are seeking improved environmental, economic and social outcomes to enhance the benefits of living and working in Gippsland. The Victorian Government has implemented a greenhouse challenge for new projects requiring new technology for brown coal fuelled power plants.

Renewable energy and gas generation are forecast to grow rapidly, increasing their share of the electricity market. Brown coal is expected to continue to be a major source of energy for electricity, providing new emerging coal conversion technology meets community expectations of reduced greenhouse gas emissions and improved efficiency. Other energy alternatives include black coal combined with stronger HV transmission interconnection with NSW or nuclear power generation. Nuclear power is not currently favoured in Victoria and has effectively been banned by the *Nuclear Activities (Prohibitions) Act 1983*. New technology brown coal plants are also likely to be used for conversion to produce syngas and hydrocarbon products separately marketable.

A predictive model was used to test three energy source scenarios by assuming power generation was sourced from different proportions of gas, renewables and coal. A scenario without coal (or nuclear) was considered unlikely. There are questions on the adequacy of Victorian gas reserves to meet long-term baseload power generation requirements and wind power is limited without substantial energy storage systems. Scenarios examined in detail were:

- Scenario 1- In this scenario the existing power stations are phased out earlier than planned and the majority of new generation is based on renewable energy and gas. By 2050 more than 50% of power generation is from renewable energy and gas and brown coal demand drops from about 60 Mtpa to about 30 Mtpa by 2050.
- Scenario 2 - In this scenario new generation is based on a combination of natural gas, renewable energy and coal sourced electrical power. Natural gas and renewables supply about 30% of the power generation demand. Brown coal demand for power generation is about 40 Mtpa 2050 with a further 15 Mtpa assumed for use to convert to other marketable products.
- Scenario 3 - In this scenario, existing brown coal stations continue to the limit of their established coal resources. Natural gas and renewable energy provide about 20% of the power generation demand. Brown coal demand for power generation is about 50 Mtpa in 2050 with a further 40 Mtpa assumed for producing other hydrocarbon products.

What is clear from the Greenhouse Challenge for Energy [Ref 27] is that a high priority must be put on attaining new technology for coal utilisation which will meet improved efficiency and lower GHG emissions in sufficient time for anticipated requirements for new coal plant. A new baseload coal power plant is expected to be required before 2020. Integrated gasification combined cycle generation; coal gasification, high efficiency coal drying development and CO_2 sequestration are in advanced stages of development or implementation. Pre-commercial and commercial new technology developments in coal utilisation are occurring around the globe. New brown coal projects in the Latrobe Valley will need to utilise these techniques or advance research activities fostered by Coal 21, the CRC's for Greenhouse Gas Technologies, Clean Power from Lignite and others. Pilot and demonstration plants may be needed for this purpose. Appropriate technology will need to be proven by 2010 or latest 2015 to make any project bankable in time for design, construction and commissioning by 2020.

This study has demonstrated the need for coal mining for electricity- and probably hydrocarbon production well into the future. It is recommended that adequate coal resources are protected for future generations with long term land use planning and appropriate land protection measures. Scenario 3 is considered the most appropriate scenario for land use planning purposes.

The Latrobe Valley brown coal resources have been reviewed to ascertain where coal development could occur by the year 2100. New coal mining areas are required for growth and to replace current operations as they reach the end of their life. Whilst it is difficult to predict the sequence of development, 9 areas have been assessed as the most likely for development and have been ranked 1 & 2 indicating their attractiveness to potential development based on economic, social and environmental factors. From a regional perspective, these coal areas have well established coal resources, with few apparent environmental or social issues to overcome and are expected to be economically attractive for investors. Between 4 and 10 new mining projects are predicted to be required by 2100.

The protection of high value coal areas by special use zoning has been practiced in the Latrobe Valley since the 1980's. It is recommended that each of the Ranking 1 and 2 land areas of land should be protected for future coal use, to provide flexibility for future decision making on new coal developments.

This report considers that only some of these coal resource areas are appropriately protected by special use zoning (SUZ1) and recommends that the La Trobe and Wellington Planning Schemes should be amended accordingly. There are other areas within the Latrobe Valley which are zoned or influenced by overlays that are no longer considered necessary. Various minor re-arrangements of zoning and overlay boundaries are also proposed. The planning scheme provisions, including the State and Local Planning Policy Frameworks and provisions relating to zones and overlays are generally adequate to protect the coal reserves. Some conditions require modification or updating to reflect this LV2100 study.

It is suggested that the major Morwell River diversion, proposed by the SECV in the 1980's, is unlikely to proceed given the now diverse ownership of mining and generation facilities, the large cost and possibly on environmental grounds. This study also finds it is unlikely that the Anderson Creek overburden dump will be required. Recommended changes are detailed in the report. In order to implement these changes both councils will need to conduct boundary definition studies and Planning Scheme Amendment processes.

The proposed alignment for the Princes highway by-pass of Traralgon is currently being decided. Its alignment and rezoning of lands in the vicinity could impact the future use of Coal Area H. It is suggested that buffer zones are created to secure the future use of this coal and that these are used to

define the by-pass alignment and other land uses. As the by-pass is likely to be built before coal mining, it should be located at or beyond at the northern edge of this buffer zone.

Appropriate mine rehabilitation is a major issue facing current and new mines. Community expectation about the effective rehabilitation of mines is also increasing, with this emerging as a key issue during the consultation process. The rehabilitation of mines in the Latrobe Valley cannot be based on the conventional model of refilling mines back to ground level as there is insufficient overburden. This does not mean successful rehabilitation cannot occur. A varied landscape could be developed where mine area rehabilitation provides opportunities for agriculture, industry, recreation, landfills or water treatment areas providing long-term stability of the mine and collected water is appropriately managed. Using water for final rehabilitation is another possible solution, however fully flooding all mine areas is unlikely to be viable due to the magnitude of water required. Designs would need to identify the source of the water and demonstrate appropriate management of any environmental issues before flooding should proceed. As new rehabilitation standards are developed, transition arrangements need to be negotiated with existing mine operators.

The opening of new mines requires developing an external dump or utilising a nearby mine for overburden removal until the base of the mine is attained. Rather than disturbing more land, arrangements should be examined to facilitate the transport of overburden into a neighbouring mine or allowing current mines to expand across adjoining Mining Licence boundaries to minimise the use of external waste dumps. Implementation of these strategies will require cooperation between competing mining companies and possibly the alteration of the MRD Act.

Water is a key resource for the environment, community and industry. It is sourced from surface runoff, dams, rivers, re-treatment and groundwater. Groundwater has to be extracted to maintain mine stability. The availability of water could be critical in the continuing use of coal in the Latrobe Valley. Water is used in the steam cycle, in plant cooling and in general purpose use for mining and power generation. However, due to different coal conversion processes being used, new technology is expected to require lower volumes of water for their efficient operation. Assessment of the overall balance of water available from surface, groundwater and re-treatment options indicate that there should be sufficient water to satisfy the projected demand for all users however, new users will need to source water needs from within the confines of the existing water rights, or, use new sources of recycled water. Following reviews of the health of the Latrobe River system, it is possible that higher river flows may be necessary.

There are opportunities to reduce water demand growth, divert water into the Latrobe Valley, treat industrial waste water and improve water availability. Competing uses for water was a key issue raised during the consultation activities in terms of industry and agriculture use as well as community interest in re-use and new technology opportunities. Proposals to treat industrial and urban waste in the proposed Water Factory or to divert treated wastewater from Melbourne's Eastern WWTP are to be commended.

Reallocating some of the current groundwater extraction allocations to new mines and greater use of internal dumps provide opportunities for new mine development. The recent White Paper – "Securing our Water Future" [Ref 24] on sustainable practices in water resources concluded that regional groundwater resources are over-allocated on current analysis. Regional solutions are required to improve the health of aquifer systems by protecting recharge zones, maximising internal mine dumps to reduce depressurisation requirements and to consider the potential for recharging aquifers down-gradient of mining operations.

There currently is a Regional Groundwater Committee examining groundwater extraction in the Latrobe Valley area immediately surrounding the coal mines. The area of examination does not include the complete basin or involve all groundwater users, however this may be necessary for the management of brown coal mining extraction licences. It is recommended that new mine owners join this committee as their projects develop. This forum should be utilised to address future groundwater issues and solutions in addition to appreciating the impact of depressurising aquifers for mine stability, recharge zones, new mining licences and arrangements for water trading rights. It is also recommended that DPI attend this committee to foster discussion on finding solutions to future groundwater extraction issues.

It will be important for the long-term water management of Latrobe Valley that the Victorian Government expedites development of the proposed Sustainable Water Strategy for the Central Region of Victoria. Outcomes from the Strategy will provide a greater level of confidence in water resource availability and a more definite basis and which to determine sustainable development for economic, environmental and social benefits.

Other environmental issues to be considered for the continuation of the coal industry in the Latrobe Valley include the impact on the natural environment and on the air shed, especially by emissions of NO_x, SO_x and particulates. Each project will need to meet environmental standards and manage any specific local issues prior to approval by government.

It is anticipated that there will be sufficient regional infrastructure in the Latrobe Valley to meet projected growth in the brown coal industry for the electricity industry. Regional roads, rail, telecommunications are already adequate. However, depending on new technology developments, the requirement to transport solid or liquid products may require augmentation of rail and pipe transport systems. Additional housing and support may be required for peak construction work forces. Whilst there is unemployment in the Latrobe Valley, skill levels are unlikely to be sufficient to meet the needs of construction or new technology operation. As research on new technology proceeds, additional infrastructure may be required. As well as the potential need for infrastructure for exported products, CO_2 collection, pumping, piping and geosequestration may justify shared infrastructure across a number of projects. Future coal mining to the west of Morwell may require relocation of the transport corridor to Melbourne, a suggestion which could be considered for long-term strategic planning.

This study has identified the brown coal requirements in the Latrobe Valley to 2100 and the need for planning changes to protect the highest value coal resources for future use. It has shown that providing new coal technology will be more efficient and emit lower levels of greenhouse gases, the use of these coal resources could be achieved with impacts on the environment that are acceptable to the community of the Latrobe Valley and Victoria.

13. Recommendations

It is recommended that:

1. DSE or Latrobe City Council and Wellington Shire Council protect Ranking 1 and 2 areas with Special Use Zones (SUZ1) and Buffers; and implement processes to accurately define the boundaries of those areas. [Reference 7.5.2, 7.5.4, Table 7.6].
2. DSE or Latrobe City Council should consider deleting planning controls for the Andersons Creek Overburden Dump [Reference 7.5.5].
3. DSE or Latrobe City Council should consider deleting planning controls for the major Morwell River diversion to the east of Morwell [Reference 7.5.6].
4. DSE or Latrobe City and Wellington Shire Councils modify their planning schemes to reflect recommended changes in the protection of coal resources and to implement other zoning and overlay changes in the planning schemes identified in this report [Reference 7.5.7, Table 7.6].
5. DPI establishes a Working Party of industry and Government agencies to identify the key issues and constraints of alternative strategies and contingency plans for potentially water-constrained pit closure plans. [Reference 11.5.1].
6. DPI establishes a working party to review and facilitate State Government policy and legislation as it relates to opportunities for work across Mining Licence boundaries that may include mining, overburden dumping and rehabilitation practices (particularly in regard to the use of aquifers) [Reference 11.7].
7. Industry and Government to support and encourage research and development and the commercialisation of new technologies for coal utilisation, such as coal drying, gasification and geosequestration, which will improve plant efficiencies and reduce greenhouse gases, so that commercially viable technologies are available before 2020 [Reference 5.2].
8. DPI and DOI investigate and facilitate the opportunity for sharing facilities for CO_2 collection, transport and geosequestration [Reference 10.3.2].
9. Broaden the terms of reference of the Regional Groundwater Committee to include reviewing long term regional issues relevant to the mining sector and include representation from DPI to foster discussion on finding solutions to future groundwater extraction issues [Reference 8.9].
10. Government and Industry support and advance the White Paper review of the water resources in the Latrobe Valley, in order to ensure that adequate and proper examination of surface and groundwater issues such and that opportunities such as the Gippsland Water Factory and water re-use are implemented and optimised [Reference 8.2.1].
11. VicRoads and Latrobe City Council should avoid impacting coal resource H by way of careful location of the Traralgon By-pass and appropriate use of buffers [Reference 10.1.1].
12. Latrobe City Council review proposals of urban expansion to the south of the current Princes Highway in the vicinity of Coal Resource Area H to provide appropriate buffer distances for future mining projects [Reference 10.4].

13. DSE, Latrobe City Council and VicRoads develop options for long-term relocation of the transport corridor on the western approach to Morwell for the purpose of future coal development [Reference 10.4].
14. Latrobe City to plan for appropriate accommodation and community facilities likely to be required during future project construction phases [Reference 10.2.2].
15. Industry and DIIRD support skills development training so that Latrobe Valley people can participate in construction periods and the coal mining and conversion industry [Reference 10.2.3].
16. DPI and Industry make available the energy/coal prediction model to appropriate organisations for planning purposes [Reference 5.4].
17. DOI encourage the Energy Challenge Project and make available data from this study for the Report Card review of the condition of hard and soft regional infrastructure [Reference 10.4].
18. New mining licensees are invited to join the Groundwater committee [Reference 8.9].
19. DPI works with the Latrobe and Wellington Councils and industry to further develop the principles of sustainable development for the Latrobe Valley coal resources [Reference 11.7].

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Appendix A

Project Scope & Methodology

Consultants Brief

Study Activities and Timeline

Reconciliation of Work Carried Out

Latrobe Valley 2100 Coal Resource Project

"A strategy for integrated planning and sustainable development of the brown coal resources in the Latrobe Valley of Victoria"

CONSULTANTS BRIEF

1. Introduction

The Latrobe Valley contains an estimated 35,000 million tonnes of economically mineable brown coal and directly supports over 85% of Victoria's electricity generation. The installed generation capacity of over 6000 MW is reliant on annual brown coal production of around 60 million tonnes. The three mines, Loy Yang, Hazelwood and Yallourn all rank in the top five of Australia's largest coal mines. At 30 million tpa, Loy Yang is Australia's largest coal mine.

The Latrobe Valley also hosts a number of significant regional towns and infrastructure important at the local (roads, rivers and railways) and state levels (natural gas pipelines, high-voltage power transmission lines and the Princes Highway).

In **order to protect the unallocated coal resources of the Latrobe Valley, the Victorian Government has placed them under an exemption. This allows the Government greater control over applications for new Exploration Licences and Mining Licences.**

The Latrobe Valley is a critical part of the Victorian economy. The continued economic health of Victoria in large part depends on the continued ready access to high quality brown coal resources and with it, low-cost electricity production. The sterilisation of coal resources by inappropriate land uses or infrastructure limitations could have significant adverse impacts at the local, state and national level in the longer term.

Currently all mining and infrastructure developments are assessed by Government on a case-by-case basis. A more strategic and holistic assessment is needed to ensure that the optimal outcome economically, socially and environmentally, is achieved.

> *The Latrobe Valley 2100 Coal Resource project (LV 2100) will develop a strategy to guide planning and sustainable mine development practices for brown coal in the Latrobe Valley.*

The project is part of the Australian Government's Regional Minerals Program (RMP), the objective of which is to promote regional economic development by facilitating the growth of mining and minerals industries. The project has been funded by contributions from the Australian Government Department of Industry, Tourism and Resources (DITR), State and Local Government and, industry.

2. Project outline

The project shall consider the development of the Latrobe Valley coalfield over a nominal period through to the year 2100. The project will examine the current and potential interplay between infrastructure systems, resource development, planning schemes and the environment in order to identify:

- the best coal resources and the probable order of resource development
- infrastructure needs for new mine developments
- potential conflicts between continued mining and infrastructure (current and planned)
- environmental constraints such as water and flora-fauna
- preventative or mitigating strategies that will ensure the sustainable development of the coal resources
- planning scheme amendments that may be required
- final mine rehabilitation strategies that could complement the regional economy, particularly in relation to competition for water resources.

Probably the most critical issue is the management of competing land uses. Land uses and infrastructure that can restrict access to economic coal resources include urban growth and river or road diversions.

The study will have regard to both the short-term infrastructure needs of specific projects through to longer-term, more strategic considerations. This will include the identification of new infrastructure that can facilitate mining and minerals-related development and, measures to protect important areas. A number of new major investments plans (APEL, HRL etc) have already been announced following an exhaustive Government tender process for access to coal resources. These projects are reliant on continued access to economically viable brown coal resources and underscore the need for a thorough, long term view of these important issues.

3. Scope of Project

The Project will be limited geographically to that part of the Latrobe Valley bounded by the towns of Moe, Traralgon, Rosedale, Gormandale and Boolarra. See also Figure 2. Work associated with the planning schemes of the Latrobe City and Wellington Shire will be confined to those municipalities however, it is reasonably expected that some aspects of the Project will necessitate a more regional context eg. Hydrology.

The Project should utilise publicly available information where applicable, information supplied by members of the Principals Committee and conduct original research where necessary. This also includes the digital data on the Latrobe Valley brown coal resource available from the Geological Survey of Victoria.

4. Project Management

The Department of Primary Industries (DPI), on behalf of all the Principals, shall contract the consultant to deliver the terms of reference of the project.

A Project Management Committee will manage the project with the consultant responsible for fulfilling the contract. In addition, a Principals Committee will provide guidance to the consultant and Project Management Committee.

Project Manager- DPI shall appoint a Project Manager to be the primary administrator of the project and under whose signature all instructions to the consultant shall be issued.

Project Management Committee- the Project Management Committee shall comprise an independent chairperson, the Project Manager, an industry representative and a project officer from DITR. The committee will have responsibility for the overall administration of the project including project finances, timetable and outputs. The consultant shall report every two months to the Project Management Committee.

Principals Committee- the Principals Committee shall comprise the Project Management Committee and all financial contributors to the project. The function of this committee is to review progress reports and provide advice and guidance to the Consultant. It is expected that the Consultant shall make at least five presentations to the Principals Committee during the course of the project. The Principals Committee members include a representative from each of the sponsoring organisations.

There is a range of other stakeholders that will have an interest in the potential impacts arising from continued mining in the Latrobe Valley. These include the community, neighboring municipal Councils, traditional owners of the land, field naturalists clubs, rate payers associations, West Gippsland Catchment Management Authority, Chambers of Commerce and Victorian Farmers Federation to name a few. It is important that stakeholders are consulted at a number of points during the development of the project.

The Consultant shall provide a plan for stakeholder consultation with all Principals and other stakeholders in the Region as part of the tender and within the fixed tender price.

5. Terms of Reference

The project shall consider the development of the Latrobe Valley coalfield over a nominal period through to the year 2100. This will therefore require an understanding of the likely mining developments through to that point in time.

In considering the strategic management of the brown coal deposits in the Latrobe Valley, overlain by urban centres, infrastructure, other industries such as agriculture, and features of the natural environment such as rivers and native vegetation, the project will, at a strategic level, examine, identify, evaluate and deliver on each of the following:

a) the likely sequence and extent of development of the brown coal resources through to the year 2100 including demand model, map(s), and, quantity and location of brown coal development
b) infrastructure requirements for the optimum development of the brown coal resource (including downstream industries such as hydrocarbons, electricity generation and other industries), service industries and the community including details of land, transport, utilities, overburden and waste disposal, river diversion etc.,

c) likely infrastructure requirements for service industries and the community needed to keep pace with these developments, including transport, utilities, urban and green space etc.,
d) options, strategies, guidelines and recommendations within a planning framework that will optimise the placement of new and existing infrastructure.
e) research and tabulation of all aspects of surface- and sub-surface water resources on mine and downstream industry development including demand, supply, disposal, competition for water resources both during and after mining, and related environmental factors
f) identify potential conflicts, constraints and barriers between the environment, infrastructure or land use in coal resource and associated development examined in a), b), c) and e) and outline options and/or strategies to mitigate these, and list the parties most suited to manage the outcomes

g) review and tabulate current mine closure plans including mine rehabilitation strategies in a regional context, particularly in relation to water resources and the landscape, and comment on additional innovative options in the context of development to the year 2100
h) review the existing principles of the Latrobe City and Wellington Shire planning schemes and recommend amendments in relation to brown coal mining and mining infrastructure in the context of the proposed development outlined above
i) review and tabulate the likely impact of the above developments (mine, industry, urban growth, infrastructure) on the natural environment, particularly rare or threatened species and plant communities, and outline options and/or strategies to mitigate these, and list the parties most suited to manage the outcomes

In addressing the above the consultant shall present strategies and recommendations to avoid, mitigate, manage and action any issues and/or impediments (constraints and barriers) that are identified in the project and not otherwise addressed in a) to i).

6. Greenhouse Gases

The matter of Greenhouse gas as a potential constraint or influence on the development of the Latrobe Valley coal resources is subject to separate and extensive studies being undertaken by other parties. This project shall not consider the environmental constraints to coal field development due to Greenhouse gas emissions. It may however consider the likely future infrastructure needs for effective greenhouse gas abatement measures ie. sequestration.

7. Costs

The Consultant shall provide a fixed, GST-inclusive price to cover the cost of undertaking the project including the preparation of the final report. This price shall include all fees and services associated with an agreed program of work approved in writing by the Project Manager. No additional work shall be paid for unless prior approval to a variation of the Terms of Reference and associated cost is agreed in writing by the Project Manager.

Disbursements associated with travel, accommodation, meals etc. will be a separate item and paid at cost when supported by receipts. An estimate of disbursements shall be agreed and any expenditure beyond that estimate shall not be approved unless the Project Manager gives prior approval in writing, for a revised estimate.

As part of the fixed tender cost, the Consultant shall quote separately for each of the following:

- disbursement
- project fee
- 50 copies of the entire report on CD-ROM
- 50 copies of the associated technical data on CD-ROM
- 50 copies of the entire report as colour, double-sided hard copy
- 500 copies of the executive summary as colour, double-sided hard copy

The Project Manager will confirm, in writing, at a later date, whether the consultants' offer for publishing will be accepted.

No further claims of any nature will be accepted without the written approval of the Project Manager and endorsed by the Project Management Committee.

8 . Report

The consultant will deliver a report incorporating executive summary, report and technical appendices, that fully addresses the terms of reference as confirmed by the Project Management Committee and authorised by the Project Manager.

Key findings, options, strategies, guidelines and recommendations must be acceptable to the Project Management Committee with differences resolved in the period between submission of the draft report and acceptance of the final report.

The report shall be written for public exposure and the executive summary should not be more than 30 pages. The report shall contain a summary of the deliverables a) to i) above and include specific action-based recommendations including clear implementation strategies. All other material (that would normally be appended) shall be presented on CD-ROM for the restricted access of the Principals.

The consultant shall:

- provide section numbers in the report in line with the deliverables listed above. • provide page numbers in the report and appendices and a full table of contents (sections, tables, figures, plates and appendices).
- compile figures and photos at the end of the report (not inserted into the Word file)
- include a checklist of deliverables against section, page, paragraph etc. to facilitate project management
- prepare a CD-ROM of all contacts, sources, notes, calculations, analysis etc relevant to the deliverables listed above.

9. Detail of the deliverables

The consultant shall deliver:

- Figures, maps and photo electronic files as PDF, JPEG or TIFF.
- 50 copies of the entire report as bound, colour, double-sided hard copy
- 50 copies of the entire report on CD-ROM (PDF format)
- 50 copies of the associated technical data on CD-ROM
- 500 copies of the executive summary as bound, colour, double-sided hard copy

The Consultant will not acquire any intellectual property rights arising from the terms of reference and the project specifications.

10. Proposal and study schedule

The project will commence in March 2004 and is to be complete by 31 December 2004. The key project milestones are as follows:

Proposal to Steering Committee	February 2004
Proposal review and study commissioning	March 2004
Inception report to Project Management Committee	31 May 2004
Draft report to Project Management Committee	31 August 2004
Final report completed by	31 December 2004

In addition to the above, we anticipate informal progress reporting during the field survey to discuss progress, problems and successes.

11. Contact information

The main contact and Project Manager is Guy Hamilton.

Guy Hamilton Development Manager Department of Primary Industries PO Box 3100
Bendigo Delivery Centre VIC 3554 Phone: 03 5430 4697
Mobile: 0407 560 704

Fax: 03 5430 4610

Email: guy. ham ilton@dpi.vic.gov.au

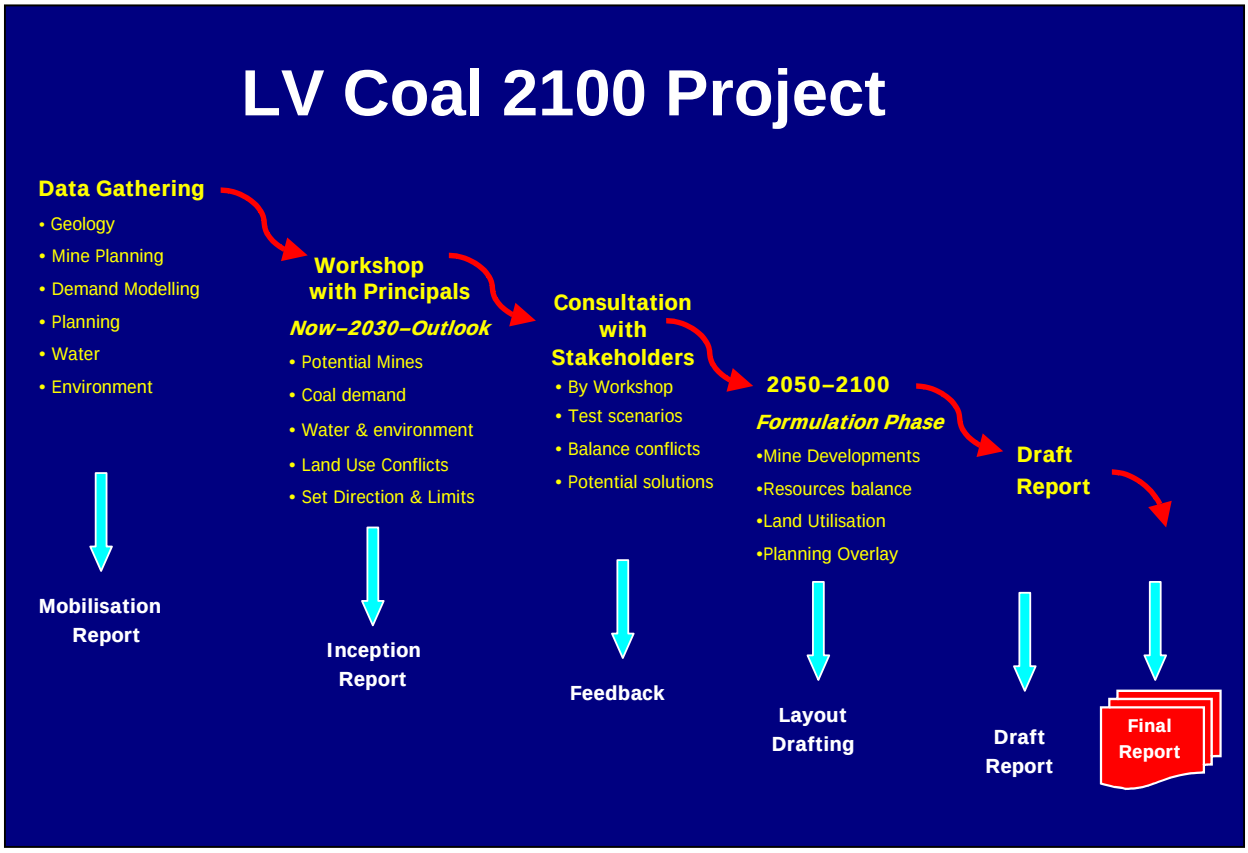

Figure A.1 Study Activities and Timeline

Reconciliation

The project shall consider the development of the Latrobe Valley coalfield over a nominal period through to the year 2100. This will therefore require an understanding of the likely mining developments through to that point in time.

In considering the strategic management of the brown coal deposits in the Latrobe Valley, overlain by urban centres, infrastructure, other industries such as agriculture, and features of the natural environment such as rivers and native vegetation, the project will, at a strategic level, examine, identify, evaluate and deliver on each of the following:

Terms of Reference	Addressed in Report / Comments
a. the likely sequence and extent of development of the brown coal resources through to the year 2100 including demand model, map(s), and, quantity and location of brown coal development,	Chapters 5 and 6 Appendix D Demand Model available for future use as new planning numbers become available
b. infrastructure requirements for the optimum development of the brown coal resource (including downstream industries such as hydrocarbons, electricity generation and other industries), service industries and the community including details of land, transport, utilities, overburden and waste disposal, river diversion etc.,	Chapter 10
c. likely infrastructure requirements for service industries and the community needed to keep pace with these developments, including transport, utilities, urban and green space etc.,	Chapter 8
d. options, strategies, guidelines and recommendations within a planning framework that will optimise the placement of new and existing infrastructure,	Chapter 6, 7, 10 and key land planning figures.
e. research and tabulation of all aspects of surface- and sub-surface water resources on mine and downstream industry development including demand, supply, disposal, competition for water resources both during and after mining, and related environmental factors,	Chapter 8
f. identify potential conflicts, constraints and barriers between the environment, infrastructure or land use in coal resource and associated development examined in a), b), c) and e) and outline options and/or strategies to mitigate these, and list the parties most suited to manage the outcomes,	Chapter 6, 8 and 9 Appendix E

g. review and tabulate current mine closure plans including mine rehabilitation strategies in a regional context, particularly in relation to water resources and the landscape, and comment on additional innovative options in the context of development to the year 2100,	Chapter 11
h. review the existing principles of the Latrobe City and Wellington Shire planning schemes and recommend amendments in relation to brown coal mining and mining infrastructure in the context of the proposed development outlined above,	Chapter 7
i. review and tabulate the likely impact of the above developments (mine, industry, urban growth, infrastructure) on the natural environment, particularly rare or threatened species and plant communities, and outline options and/or strategies to mitigate these, and list the parties most suited to manage the outcomes.	Chapter 9 and 12

Appendix B

Community Consultation

Critical Issues Workshop

Community Consultation

Visioning Survey

Visioning Survey Summary Report

Community Workshops Summary Report

Department of Primary Industries

Latrobe Valley Coal 2100

Principal Stakeholders Workshop Summary Report

Report

November 2004

Contents

Figure Index

Appendices

1. Introduction

1.1 Project Context

The Victorian Government, supported by Federal and local government and industry, recently began the Latrobe Valley 2100 Coal Resources Project to consider how coal resources could be developed over the next 100 years.

Assuming a number of environmental challenges can be met, the project will develop a strategy to guide practices for brown coal in the Latrobe Valley. It looks to the future and aims to optimise the outcomes for Victoria according to the principles of sustainable development. The project intends to examine options for future coal developments that are environmentally sustaining, financially viable and balance competing land interests in the Latrobe Valley communities.

1.2 Engaging Stakeholders

An important part of the Latrobe Valley 2100 Coal Resources Project is to gather ideas, issues and opinions from the Latrobe Valley communities about future coal development.

One of the recognised stakeholder groups comprises those agencies working within and in close collaboration with the coal industry. A Workshop for these principal stakeholders was undertaken on 2nd June 2004. Attendees consist of the Project Management Team and Principals Committee Members. See **Appendix A** for a complete list of workshop attendees.

Other community consultation activities undertaken on the project to-date include a community survey and a fact sheet. A Project Information Desk including a toll-free number (1800 88 44 11) and a project email address has been established to answer community enquiries and receive submissions related to the project. In the coming months, activities will extend to community workshops and focussed interviews. Ongoing written information will also be issued.

Figure 1 Workshop attendees chat over morning tea

2. Principal Stakeholder Workshop

The objectives of this workshop were to:

- Confirm projected coal development to 2030;
- Assess the current situation relative to water, environment, planning;
- Discuss potential coal demand scenarios;
- Review potential developments beyond 2030;
- Discuss issues relating to water, environment, infrastructure, mine and closure plan; and
- Discuss the direction of remainder of the project.

The Project Inception Report was circulated to all Workshop participants prior to the Workshop.

The workshop was held on Wednesday June 2nd, 2004 at the Traralgon Convention Centre from 8:30 am - 3:00 pm. Facilitators from GHD were Chris Robinson and Amy Hubbard. Members of the Project team who also supported the workshop were Ted Waghorne, Ken Tabart, Russel Hawken, Paul Currie, Katherine Butler (all of GHD) and Dan Magasanik of MMA

The workshop participants identified, prioritised and then developed in more detail a range of issues related to the Latrobe Valley 2100 Coal Resources Project. All were documented on A1 sized sheets (see **Appendix B**).

Concerns were raised about the meaning and implications of the Inception report. A number of attendees felt that it had too much of a pro-development stance, and that there were some factual inconsistencies, especially relating to coal mine developments of exploration companies. The participants agreed that for these reasons the document should not be made a public document, and that it should be kept confidential.

Before the group exercises, the facilitators asked the workshop participants: **"What do you want to get out of the workshop?"** In the table below is a list of outcomes the participants hoped to achieve.

- Ensure project is on right track – right issues on agenda
- Make sure that the future of Latrobe Valley is reflected in the project process
- Better understanding of water and plan
- Sponsors get what they expected
- Project brief / scope followed
- Provide up to date planning framework – stakeholders and community
- Understanding of proposal current government position
- DPI and Principal Stakeholders get value from workshop

2.1 Issue Identification

The first exercise involved participants listing independently the three things they felt were the most important issues for the project. Each of their issues were then grouped under five themes

As groups of four or five, the next exercise involved discussing the five themes. A1 working sheets and regional maps were provided for each table and groups were asked to identify five key issues/ideas from the themes. One group representative then briefly reported these back to the rest of the workshop. Participants were encouraged to use the maps to aid their discussions as well as write comments on them or highlight areas of interest or concern.

The following summarises the key issues raised by groups at the workshop:

2.1.1 Planning

A number of planning related issues were raised including a perceived lack of ongoing management, planning and communication structures for responding to the changing needs of the region. Concerns about whether the current planning framework is suitable were also discussed with regard to tools and provisions including buffer zones, land use planning and overlays. It was suggested that the current modelling being undertaken inform the project and provide the basis for changes to the planning framework and other strategic initiatives in the region. Issues relating to the Morwell River Diversion and its implications for the municipal planning scheme and infrastructure coordination were also raised.

2.1.2 Mine Rehabilitation

This was an issue highlighted by a number of stakeholders with concerns about the use of water for flooding mines and the lack of regional coordination and planning on the issue of mine closures. It was suggested that legislation changes were required to encourage economical and environmentally sustainable site rehabilitation.

2.1.3 Water

Water was recognised as a key natural resource, and was a recurring theme for the day. Specific issues related to best use, balancing competing demands, storage and treatment, water recycling and broader issues of ground and surface water quality. Questions were asked about whether current water management is appropriate and how waterways should best be managed into the future.

2.1.4 Politics, Community And Triple Bottom Line Principles

Workshop attendees recognised the need to gain the support of the broader community on the project and for the project report to reflect the values of the community. Suggestions on this issue included the need to articulate Government policy on importance of coal and the importance of protecting the coal resource for the future, the community benefits from coal development, and the need to consult the community and be clear about the community's values.

2.1.5 Technology, Infrastructure and Markets

Lastly, the stakeholders acknowledged a number of issues relating to infrastructure developments and the need to protect key coal resources, regardless of coal demand forecasts. It was made clear that the study must also take account of environmental and technologies and potential market changes. A number of people also suggested that a more strategic and holistic focus was required to find solutions to common Latrobe Valley/ regional infrastructure and environmental challenges, such as future CO_2 pipelines and river diversions.

Figure 2 The group works through issues relating to infrastructure and technology

2.2 Issue Prioritisation

Following the presentations of all the groups' issues, participants were provided with four red dots. These acted as votes for the top three issues they felt should be discussed in more depth in the afternoon. The votes were then tallied and the top five issues were allocated, one to each of the groups.

2.3 Exploring Issues and Actions

Groups were asked to work through the issue in detail with the following questions acting as prompts for their discussions:

- **Describe the issue:** What are the main elements to this issue? What is the scope of the issue?
- **Why is this a priority issue for the Latrobe valley 2100 coal resource project?** What are the opportunities or strengths of this issue? What challenges might this issue trigger?
- **Involvement:** what can stakeholders, including the project team; key agencies and the community do to address this issue?
- **Actions**: What are the first steps for addressing this issue?

The A1 working sheets with the groups' workings and decisions were then fixed on the walls and all workshop participants could add yellow Post-It Notes with additional comments to the other group's working sheets. The issues and Post-it Note comments are summarised below.

Community, Politics and Triple Bottom Line principles

Define the issue

Community values must influence the report outcomes

Issue Significance

For report credibility and community ownership

Determine and identify community values and expectations

Create future vision scenarios and test acceptability

Right to influence decisions/ outcomes affecting future generations

Involvement

Steering Committee/ principals: Determine "community" – Latrobe Valley/ Melbourne/ VIC/ National

Industry: Use existing networks/ forums (environmental review committee)

Government Agencies: "Whole of Government" – forum!!

Local Community: Indigenous communities, existing community groups, and industry groups

Project team: Crafting the report – consult, acknowledge, feedback, record

Actions

Time plan (– prior, during, post); All during the report for no surprise outcomes

Comments

This is key to the success of the project

Future vision a must-have

Critical – but must beware scope creep and dead ends

Absolutely critical to the success of this exercise succeeding in the Valley

Council and DPI need to be more proactive in relation to discussing with the community. I.e. long – term, strategic level mine development issues – where mines are likely to be, planning and environmental considerations

Test whether community is prepared to input money to see values implemented. Levee on power bills for water/ rehabilitation

Outstanding and insightful action plan

Local community should include landowners too

Which community? Strategy 1: Local people 2: Victorian electricity users. Pay more – better Valley outcomes

Agree. Make sure we use existing groups where possible

Mine Rehabilitation

Defining the issue

Lack of regional imperative to coordinate optimal rehabilitation within a mining framework – planning for rehab is currently undertaken on a site-by-site basis.

Issue Significance

Uncertainty for new developers

Rehabilitation must meet community expectations

Optimal use of all resources (water, land, over burden)

Protect coal / water resources from sterilisation for future use

Involvement

Community: Industry and government to explore /define (within coal development context)

Industry: Clear expectations for rehab at time of resource offer

Agencies: Guidelines / policy to aid “new” developers re: rehabilitation/ water/ landscape

Agencies: Guidelines based on process following consultation

Agencies: Regular review process

Actions

Review strategic plan (framework 1987)

Assess opportunities (regional) develop proposal

Review community expectations

Consult with all stakeholders with regard to potential guidelines /policy

Finalise regional rehabilitation framework

Comments

Establish a fund to pay for good rehab outcomes over a longer term (i.e. electricity consumers pay over mine life)

What are community expectations? Which part of the community? Should this be community expectation that there will be reasonable rehabilitation?

Need government general principles/ guidelines on reasonable rehabilitation process of the mine at closure

Water

Defining the issue

Optimisation of water resources for the region

Issue Significance

Water required to develop the coal resource

Potential scarcity/ competition for water resources

Balance allocations between beneficial uses

Water quality protection and fit for purpose/ use

Involvement

Water authorities: Develop and implement pricing structures to reflect value

DSE / water authorities: Develop and implement processes for allocation to appropriate uses

Users and regulators: Ensure no further water quality degradation – coal development

Community/ government /users: Reduce demand and maximise water use efficiency

DSE / Users: Optimise water reuse / future opportunities

Actions

Ensure Gippsland Water and Melbourne ETP reuse implemented

Review regional water strategies

Improve understanding of drivers (eg technology) for water use

Engage and inform broader community in water debate

Comments

Focus must be on all stakeholders across the state

Make sure pricing system is free-market based to ensure 'the community of Victoria' can determine the most appropriate use of water

Technology, Infrastructure and Markets

Defining the Issue

All Infrastructure developments in the Latrobe Valley need to be planned to protect key coal resources, regardless of demand forecasts.

Challenges & Opportunities

Globally significant energy resource

Future need/demand projections only –'unknowable'

Bad planning could sterilise resource

Community certainty (& user certainty) crucial

Involvement

Study team: Assessment of resource against existing resource and planning provisions

Local government: Process/act on recommendations

DPI: Process/act on recommendations

Developers/residents in key resource zones

Actions

Assess and define the resource (energy, value, recoverable?)

Review the planning scheme boundaries and buffers and recommend amendments

Communicate with stakeholders

Amendment process (planning)

Careful management and communication plan to scope issue

Comments

Take into account existing infrastructure i.e. PS – conveyor networks

Agree this process

Planning

Defining the issue

Lack of Management/planning/communication structures – for ongoing updating and adjustment of procedures

Need for an overarching framework that guides future development of the Latrobe Valley coalfields area

Challenges & Opportunities

Integrated decision-making provides more consistent and coordinated outcomes

A sustainable framework for coal planning would allow better understanding of collective impacts and benefits (to meet Triple Bottom Line objectives)

The community needs an overview and input into the development of the coal resource and its place with the Latrobe valley and Victoria.

Nobody currently addresses cumulative impacts.

Involvement

Study team: Assessment of resource against existing resource and planning provisions

Local government: Process/act on recommendations

DPI: Process/act on recommendations

Developers/residents in key resource zones

Actions

Assess and define the resource (energy, value, recoverable?)

Review the planning scheme boundaries and buffers and recommend amendments.

Communicate with stakeholders

Amendment process (planning)

Careful management and communication plan to scope issue

Comments

Take into account existing infrastructure i.e. PS – conveyor networks

Agree this process

2.4 Workshop Evaluation

Workshop participants were asked to fill out an evaluation form before leaving and 17 forms were completed with the following results:

- A large majority of respondents (82%) felt that the output from the workshop was good or excellent.
- Nearly all participants (88%) considered the workshop time was used well.
- All of the participants (100%) believed that they had been involved equally in the workshop.
- The rating slipped a little when asked how well thought out participants felt the workshop decisions were: While the majority (59%) felt they were good, 41% felt they were just satisfactory.
- More diverse views emerged when asked how clear and do-able our action plans were. 53% of respondents believed the action plans were good to excellent while 35% considered they were satisfactory. The remaining 12% felt they were fair.
- A majority (59%) believed the workshop was run very well (excellent). The remaining 41% felt it was run well (good).

General Evaluation Comments:

- Overall a worthwhile and lively day
- Workshop facilitation exceeded my expectations
- Good stuff
- A relatively good workshop
- Very good presenter/facilitator but the process tended to be a bit forced, i.e. drive to fill out sheets regardless of quality of ideas (always a risk in workshops)
- I will be very interested to watch what comes from this
- A good start to project. Building on this is key
- Some things could have been looked at more carefully to be parked in the parking lot – as they are outlined in the brief
- Good facilitation, interactive workshops and I felt a good progress in the LV 2100 project
- Need to keep up the flow of information and the feedback loop
- Lot of ground covered in the time frame
- High-energy workshop with good inputs by participants and Very good facilitation by Chris Robinson. Good outcomes, involvement, engagement, ownership and outcomes.
- Focused and well-facilitated workshop

Appendix A

Workshop Attendees

Name	Title	Organisation	Address	Suburb	Postcode	Telephone	Email Address
Guy Hamilton	Project Manager - LV 2100	Dept of Primary Industries	PO Box 3100	Bendigo Delivery Centre	3544	03 5430 4697	guy.hamilton@dpi.vic.gov.au
Roger Dawson	Regional Environment Officer	Dept of Primary Industries	71 Hotham St	Traralgon	3844	03 5172 2184	roger.dawson@dpi.vic.gov.au
Charlie Speirs	General Manager Mining	Loy Yang Power	PO Box 1799	Traralgon	3844	03 5173 3000	cspeirs@loyyangpower.com.au
Roland Davies	Manager Business Development Prosects	Loy Yang Power	PO Box 1799	Traralgon	3844	03 5173 3487	roland.davies@loyyangpower.com.au
Richard Polmear	Mine Engineering Manager	International Power - Hazelwood	PO Box 195	Morwell	3840	03 5135 5055	rpolmear@hazpower.com
Ron Mether	Mining Manager	Yallourn Energy	PO Box 444	Moe	3825	03 5128 2353	RMether@yallournenergy.com.au
David Lea	Project Coordinator, Victorian Power & Liquids Project	Australian Power and Energy Corp Ltd	Level 14, 390 St Kilda Rd	Melbourne	3004	03 9868 7800	dtlea@telstra.com
Elaine Wood	Manager Land Use Strategy	Latrobe City Council	PO Box 345	Traralgon	3844	03 5128 5665	elainwo@latrobe.vic.gov.au
Ted Mouritz	Manager Marketing New Technologies	HRL Developments P/L	677 Springvale Rd	Mulgrave	3170	03 9565 9888	mourt@hrl.com.au
Alan Freitag	Planning Manager, Resources & Regional Services	Dept of Sustainability and Environment	71 Hotham St	Traralgon	3844	03 5172 2530	alan.freitag@dse.vic.gov.au

Name	Title	Organisation	Address	Suburb	Postcode	Telephone	Email Address
Peter McCluskey	Client Manager Resources Based Industries, Regional Development Victoria	Dept of Innovation, Industry and Regional Development	Level 4, 55 Collins Street	Melbourne	3000	03 9651 8123	peter.mccluskey@iird.vic.gov.au
Graeme Jackson	Natural Resources Manager	West Gippsland Catchment Management Authority	PO Box 1374	Traralgon	3844	03 5175 7803	graemej@wgcma.vic.gov.au
Roy White	Manager Business Development	Gippsland Water	PO Box 348	Traralgon	3844	03 5177 4630	roy.white@gippswater.vic.gov.au
Martin Kent	Chief Executive Officer	Southern Rural Water	PO Box 153	Maffra	3860	03 5139 3162	martink@srw.com.au
Terry Flynn		Southern Rural Water	PO Box 153	Maffra	3860	03 5139 3169	terryf@srw.com.au

Appendix B

Transcribed Worksheets

KEY ISSUES: Planning

ISSUE 1 Lack of ongoing management/planning/communication structures – for ongoing updating and adjustment of procedures (8)
ISSUE 2 Are the current planning tools appropriate?
Zones/overlays/ provisions
ISSUE 3 Current modelling being undertaken should inform/provide the basis for changes to the planning framework and other strategic initiatives in the region (1)
ISSUE 4 Buffers need to be reviewed. Location, use, justification, purpose, width, site specific circumstances (3)
ISSUE 5 Review of the Morwell River Diversion is needed and its implications for the planning scheme and infrastructure coordination

KEY ISSUES: Mine Rehabilitation

ISSUE 1 Changes to legislation to encourage rehabilitation (3)
Legislation on rehabilitation is single mine
ISSUE 2 Use of water should be minimised
ISSUE 3 Encourage optimisation of Over burden/Waste for back dumping
ISSUE 4 Lack of Regional Planning (7)
Regional Planning Integrated – Landscape, resource
ISSUE 5 Objectives for final rehab must meet community benefit. (3)
Not costing – Safety – other uses – Environment - Cost
ISSUE 6 Need for Progressive Rehabilitation

KEY ISSUES: Water

ISSUE 1 Flooding of Mines
- Use other resources for stability – Use for water storage, treatment etc.
ISSUE 2 Water for all beneficial uses (10)
- By use and location (inc outside region)
- Water quality (protection/best use)
- Integration between demands
ISSUE 3 Water in the landscape
- Attribute
- Amenity
ISSUE 4 Appropriate Planning Provisions (1)
- Infrastructure
- River diversion
ISSUE 5 Long term decline in resources (2)
- Groundwater
- Climate change

KEY ISSUES: Politics Community And Triple Bottom Line

ISSUE 1 Why is the project significant? (1)
- Define for community but don't scare them.
- Articulate Government policy on importance of coal.
- Importance to protect for the future
ISSUE 2 Community Perspective (4)
Quality of Life - define
Scenarios – grow/static/decline (affected by technology)
Values for the future – what to pass on to children etc
ISSUE 3 Environment/Community
What is affected – perception vis reality
Community benefits from coal development
ISSUE 4 Community values must influence (10)
Report outcomes
Vision/values Acceptance

KEY ISSUES: Technology, Infrastructure and Markets

ISSUE 1 All infrastructure developments in LV need to be planned to protect key coal resources, regardless of demand forecasts (11).
ISSUE 2 The study must take account of environmental and technologies and potential market changes (eg Hz) (4)
-Of keynote is presentation of report-
ISSUE 3 Strategic and holistic focus required to find solutions to common LV/regional infrastructure and environmental issues (eg future CO2 pipelines, river diversions) current lack (2)

OPPORTUNITIES & ACTIONS: Politics, Community and TBL

Ron Mether, Roland Davies, Ken Tabart & Peter McCluskey

1. DESCRIBE THE ISSUE:

Community values must influence the report outcomes

2. WHY IS THIS A PRIORITY ISSUE FOR THE LATROBE VALLEY 2100 COAL RESOURCE PROJECT?

A) For report credibility and community ownership

B) Determine and identify community values and expectations

C) Create future vision scenarios and test acceptability

D) Right to influence decisions/ outcomes affecting future generations

3. WHAT CAN STAKEHOLDERS, INCLUDING THE PROJECT TEAM, KEY AGENCIES AND THE COMMUNITY DO TO ADDRESS THIS ISSUE?

STAKEHOLDER	ACTIONS
A) Steering Committee/ principals B) Industry C) Government Agencies D) Local Community E) Project team	Determine "community" – Latrobe Valley/ Melbourne/ VIC/ National Use existing networks/ forums (environmental review committee) "Whole of Government" – forum!! Indigenous communities, existing community groups, industry groups Crafting the report – consult, acknowledge, feedback, record

4. WHAT ARE THE FIRST STEPS?

A) Actions as above

B) Time plan (– prior, during, post)

C) All during the report for no surprise outcomes

5. COMMENTS

A) This is key to the success of the project

B) Future vision a must - have

C) Critical – but must beware scope creep and dead ends

D) Absolutely critical to the success of this exercise succeeding in the Valley

E) Council and DPI need to be more proactive in relation to discussing with the community. I.e. long –term, strategic level mine development issues – where mines are likely to be, planning and environmental considerations

F) Test whether community is prepared to input money to see values implemented. Levee on power bills for water/ rehabilitation

G) Outstanding and insightful action plan

H) Local community should include land owners too

I) Which community? Strategy 1: Local people 2: Victorian electricity users. Pay more – better Valley outcomes

J) Agree. Make sure we use existing groups where possible

OPPORTUNITIES & ACTIONS: Mine rehabilitation

Ted Waghorne, Charlie Speirs, Roger Dawson & Richard Polmear

1. DESCRIBE THE ISSUE:

Lack of regional imperative to coordinate optimal rehabilitation within a mining framework – planning for rehab is currently undertaken on a site-by-site basis.

2. WHY IS THIS A PRIORITY ISSUE FOR THE LATROBE VALLEY 2100 COAL RESOURCE PROJECT?

A) Uncertainty for new developers

B) Rehabilitation must meet community expectations

C) Optimal use of all resources (water, land, over burden)

D) Protect coal / water resources from sterilisation for future use

3. WHAT CAN STAKEHOLDERS, INCLUDING THE PROJECT TEAM, KEY AGENCIES AND THE COMMUNITY DO TO ADDRESS THIS ISSUE?

STAKEHOLDER	ACTIONS
A) Community	Industry and government to explore /define (within coal development context)
B) Industry	Clear expectations for rehab at time of resource offer
C) Agencies	Guidelines / policy to aid "new" developers re: rehabilitation/ water/ landscape
	Guidelines based on process following consultation
	Regular review process

4. WHAT ARE THE FIRST STEPS?

A) Review strategic plan (framework 1987)

B) Assess opportunities (regional) develop proposal

C) Review community expectations

D) Consult with all stakeholders with regard to potential guidelines /policy

E) Finalise regional rehabilitation framework

5. COMMENTS

A) Establish a fund to pay for good rehab outcomes over a longer term (i.e. electricity consumers pay over mine life)

B) What are community expectations? Which part of the community? Should this be community expectation that there will be reasonable rehabilitation?

C) Need government general principles/ guidelines on reasonable rehabilitation process of the mine at closure

OPPORTUNITIES & ACTIONS: Water

Russel Hawken, Martin Kent, Elaine Wood, Roy White & Terry Flynn

1. DESCRIBE THE ISSUE:

Optimisation of water resources for the region

2. WHY IS THIS A PRIORITY ISSUE FOR THE LATROBE VALLEY 2100 COAL RESOURCE PROJECT?

A) Water required to develop the coal resource

B) Potential scarcity/ competition for water resources

C) Balance allocations between beneficial uses

D) Water quality protection and fit for purpose/ use

3. WHAT CAN STAKEHOLDERS, INCLUDING THE PROJECT TEAM, KEY AGENCIES AND THE COMMUNITY DO TO ADDRESS THIS ISSUE?

STAKEHOLDER	ACTIONS
A) Water authorities	Develop and implement pricing structures to reflect value
B) DSE / water authorities	Develop and implement processes for allocation to appropriate uses
C) Users and regulators	Ensure no further water quality degradation – coal development
D) Community/ government /users	Reduce demand and maximise water use efficiency
	Optimise water reuse / future opportunities
E) DSE / Users	

4. WHAT ARE THE FIRST STEPS?

A) Ensure Gippsland Water and Melbourne ETP reuse implemented

B) Review regional water strategies

C) Improve understanding of drivers (eg technology) for water use

D) Engage and inform broader community in water debate

5. COMMENTS

A) Focus must be on all stakeholders across the state

B) Good stuff

C) Make sure pricing system is free-market based to ensure 'the community of Victoria' can determine the most appropriate use of water

OPPORTUNITIES & ACTIONS: Technology Infrastructure and Markets

Paul Currie, David Lea, Guy Hamilton & Ted Mouritz

1. DESCRIBE THE ISSUE:

All Infrastructure developments in LV need to be planned to protect key coal resources, regardless of demand forecasts.

2. WHY IS THIS A PRIORITY ISSUE FOR THE LATROBE VALLEY 2100 COAL RESOURCE PROJECT?

A) Globally significant energy resource

B) Future need/demand projections only –'unknowable'

c) Bad planning could sterilise resource

d) Community certainty (& user certainty) crucial

3. WHAT CAN STAKEHOLDERS, INCLUDING THE PROJECT TEAM, KEY AGENCIES AND THE COMMUNITY DO TO ADDRESS THIS ISSUE?

STAKEHOLDER	ACTIONS
A) Study team	Assessment of resource against existing resource and planning provisions
B) Local govt.	Process/act on recommendations
C) DPI	Process/act on recommendations
D) Developers/residents in key resource zones	

4. WHAT ARE THE FIRST STEPS?

A) Assess and define the resource (energy, value, recoverable?)

B) Review the planning scheme boundaries and buffers and recommend amendments.

C) Communicate with stakeholders

D) Amendment process (planning)

E) Careful management and communication plan to scope issue

5. COMMENTS

A) Take into account existing infrastructure i.e. PS – conveyor networks

B) Agree this process

OPPORTUNITIES & ACTIONS: Planning

Campbell Watts, Alan Frietag, & Graeme Jackson

1. DESCRIBE THE ISSUE:

Lack of Management/planning/communication structures – for ongoing updating and adjustment of procedures

Need for an overarching framework that guides future development of the Latrobe Valley coal fields area.

2. WHY IS THIS A PRIORITY ISSUE FOR THE LATROBE VALLEY 2100 COAL RESOURCE PROJECT?

A) Integrated decision making provides more consistent and coordinated outcomes

B) A sustainable framework for coal planning would allow better understanding of collective impacts and benefits (to meet TBL objectives).

C) The community needs an overview and input into the development of the coal resource and its place with the LV and Victoria.

D) Nobody currently addresses cumulative impacts.

3. WHAT CAN STAKEHOLDERS, INCLUDING THE PROJECT TEAM, KEY AGENCIES AND THE COMMUNITY DO TO ADDRESS THIS ISSUE?

STAKEHOLDER	**ACTIONS**
A) State/ Commonwealth government agencies B) Local govt. C) Community (intergenerational) (local and state) D) Generators/operators E) Project team	Improved integrated policy (greenhouse, water, pricing, coalfields i.e. update "framework for the future" and SPPF/ LPPF). Establish an entity to implement the outcomes at the project (all stakeholders) Review planning scheme to update provision s /improve community awareness. Be vigilant in highlighting social issues – use and strengthen existing community networks Ensure needs of industry interests; communicate emerging industry trends and likely acceptance of project outcomes. Deliver a justifiable strategic framework for the LV coalfields including for planning scheme amendments

4. WHAT ARE THE FIRST STEPS?

A) Deliver project outcomes – inc above suggestions

B) Gain political and community acceptance of outcomes (and intergovernmental acceptance)

C) Implement through planning schemes, RCS, govt policy influences, WRS

D) Establish regional entity – LV2100 coordination taskforce – implementation, facilitate dialogue on coal field future

E) Develop a resourcing /funding strategy to implement A-D

5. COMMENTS

A) Under section 2, D is unrealistic, needs an endpoint in mind which doesn't and can't exist, and C – community is involved but only case by case with each new development planning permit or EES

B) What is process to determine resource priority and required buffers

C) Support LV2100 coordination taskforce proposal for ongoing reviews.

D) Acknowledgement of traditional approach SECV and recognition of changed community expectations.

E) Need to properly resource the entity

F) Political reality is that only council/shire, and state departments can enforce

G) Forum/Co-ordination entity Need accountability and some regulatory responsibility to be effective

Appendix C

Stakeholder issues and other workshop notes

Identifying Stakeholders' Desired Workshop Outcomes

- Endure project is on right track – right issues on agenda
- Make sure future of Valley opportunities reflected in process
- Better understanding of water and plan
- Sponsors get what they expected
- Project brief followed/scope
- Provide up to date planning framework – stakeholders and community
- Understanding of proposal current government position
- DPI gets value from workshop.

Preliminary Issues Identified

Political / Community Perception	Public presentation of report and ideas is critical Project target is an interactive model, not a fixed prediction To allay fears this is not development at all cost Describing this process as an interactive model Community perception and political agenda about renewable energy sources Community Consultation (see below for possible stakeholders) Community: what are the core expectations? Quality of Life
Sustainability/ Triple Bottom Line	Triple bottom line factors Triple bottom line Sustainability Balance Community, environment, development Provide guiding principles that address the cumulative impacts of brown coal mining in the valley
Water	Water balance Make clear that there is a way to fairly allocate and provide enough water Water – surface and ground Water Water uses and other sources Critically assess best use of water resources and their role in final rehabilitation Effect of demand from government for use by community of re-use water River relocation Coal and water demand Balanced water use (cycle) Sustainable use of water

Mine rehabilitation	Maximise opportunities for cooperative rehabilitation between adjacent coal mines Future use of mine voids Long term land use and rehabilitation plan for the mines Mine closure is an outcome of the project a new planning framework for closure? Rehabilitation Acceptability of rehabilitation Practical mine closure – rehabilitation and water level Rehabilitation of mines (future use?)
Efficiencies and technology markets	Identify the “dead end” practices/ policies Technology impact Basis for assumptions – technological, behavioural What would happen if coal could not be utilised? Continuous efficiency gains in resource use Knowledge constraints: planning horizon in question – “what-ifs” Protection of the economic fundamentals underpinning future use of brown coal Identify practical and feasible enhancements to making mining more sustainable
Infrastructure	Infrastructure optimisation Infrastructure to support development Coordination of infrastructure, eg roads, rivers Relocation options for transport corridors and services How will infrastructure changes be managed and by whom?
Environment	Environment issues need ti be identified and crystallised to major issues Make clear the environmental issues that need to be resolved: GHG, water What will the Latrobe Valley environment be like in 2050? How to plan for reduced GHG generation
Planning	Maintaining land use so not competing with future development Clear, strategically justified planning framework to guide sustainable development in the coal field areas Buffer zones to secure resources and communities Certainty and balancing land use activity conflicts Flexible and responsive tool to guide planning scheme controls Strong planning provisions Need for the planning system to respond ongoing to the management of the coal resource Future township growth and mining buffer zones Up to date planning scheme provisions that reflect development of the coal fields

Technology, Infrastructure and Markets Notes

- If you get Strategic Planning right, infrastructure fall in behind (eg Agreed plans for mine rehab)
- Infrastructure currently restricted (?) by rivers creeks and related buffers
- LV Air monitoring network
- Other markets – liquids, dry coal products eg coking coal – export markets?
- PEH
- Gasification
- Changes impact and rehab issues
- 2100 long way off to look at future technologies.
- What is impact of mines (need to map prevailing impacts – odour, flares, dust, noise)
- No “business as usual” option
- What is the message? What are the assumptions? Drivers
- Technology key to material output beyond today.
- CO2 major – GHGs
- Thermal efficiencies
- Stays in the ground unless environment sound
- Balancing ideals and positions within govt.
- How do we find environmentally acceptable way to develop this resource? What are the implications of this for this study?
- Outputs vs predictions. Models, instruments, tools to measure these.
- Clarify assumptions made in predictions to date
- What will bring technological change? -Community pressure (Market) – Research – Political pressure – Legislation – planning, environmental
- What improvements do we make?
- What infrastructure will support this?
- Keep infrastructure away from mines (quarantine zones)
- Liquid hydrocarbons declining? Broader energy issues – Need to hedge bets against energy shortage?
- Premium future resource
- Community enabling – planning issue, - Joint mine development need new paradigm. Infrastructure
- Current system flawed?
- How mgmt mine developments serve multiple uses? (Means to maximising efficiency)
- Coordination between mines – very hard and not focus for today?
- Do we need cooperative body to collaborate effects b/w all mines?

- CO2 pipelines/injection would need to be done cooperatively
- Common problems: Mine rehab, Water, CO_2 Disposal, Air Shed, Natural environment, Transport, Transmission, Rivers, buffers
- Common interests, common solutions, common optimisation
- Current planning not holistic approach
    - Reconfirm, refocus

Stakeholders	Actions
Council? LPPFs, planning scheme	Review. Refocus zones/planning laws to clarify and protect infrastructure
State Government – Act of Parliament?	Need formula defining key/prime areas – depth and quality of coal (what is the research supporting i.e. technology Raw technology at moment not economically viable) – environmental and economic challenges/opportunities
VFF and broader community	Resource depletion – project team Technology Communication Still uncertainty on time frame for resource use but ensures no infrastructure build on site

Water Notes

- Water in the landscape
    - Attribute
    - Amenity
- Avoid use of water for engineering purposes (eg mine floor stability)
    - Use for storage
- Appropriate Planning provisions for infrastructure
    - River diversion
    - Roads
    - Urban Dev
- 2) Integration of Water – use between developments and other uses.
- Long term groundwater decline
    - Town Supplies
    - Agriculture

- Stream flows

- Impact of climate change
  - Reduced water supply?
  - Increased variability?
- Artificial flooding of mines should be off the agenda
- Recognise water supply to broad beneficial uses
- Competition for water resources – by use (ind/dom/ag/env) – by location (eg Melbourne/Victoria/ South West/Vic Central)
- Water quality
  - Prevent Degradation
  - Requirements for varying uses
  - Apply higher quality to higher values.

Planning Notes

- Modelling currently being undertaken should be used to review Planning Provisions/ zones/ overlays
- Existing schemes is causing Planning blight around edges – updating the schemes would prevent this
- Spatial extent of coal resource areas should be reviewed into the zones/overlays
- Application of zones/overlays to be reviewed (Technique/method/tool appropriate?)
- Strategic/Policy Directions in framework (important, accepted by the community)
  - Priorities
  - Coal protection
  - Sequential – when sec was in place\
  - SPPF/ LPPF provisions
- Strategic and policy directions for town growth, economic development, infrastructure dev, environmental issues to be integrated with management of coal resource.
- Responsibilities for strategic planning the coal resource
  - Coordination – interdepartmental interests
  - Point of contact
- Ongoing management/planning, communication structures to be established with ongoing updating/adjustment
- Continual improvement model for scheme. Review – connect to above
- Anderson Creek Overburden dump
  - Is it needed?

- Connection to Rehab issues

- Better connections between EES process and planning process – implications for the scheme
- Process of designation buffers
- Need for new/additional buffers
- Need to review buffers
- Protecting existing buffers/what can be done in these site specific differences
- Review process/justification of detail of buffers – eg 1km width
- Use new modelling for coal mining to review buffers
- Morwell river diversion – justification needs to be reviewed –separate projects may now suggest a different diversion outcome
- Risk Analysis
    - Physical and administrative aspects of the diversion
    - Long term growth of mines – impact on diversions

Mine Rehabilitation Notes

- Individual mines Separate
- Legislation is mine specific
- Rehab bond
- Aquifer is a regional issue
- Rehab solution using water
- Need to make final voids stable
- Batters and basal leave
- A solution is to use aquifer water to achieve balance then rain collection
- Uncertain what mines need for water long term
- Filling one mine could affect-
    - Adjoining coal mining
    - Aquifer depressurisation
- Coal resource and multiple owners
- Could market dried coal or slurry coal
- Over burden, back dumping into another mine
- Potential cost penalty
- Ownership of mine area
- Benefit reducing artesian pumping

- Improve stability
- Exposed coal above WL issue do we cover or not?
- Tip…risk to contaminate ground water.
- Back dumping sterilise deeper resources
- Do you need to change our rehabilitation to convince community
- Need to back dump
- Should we be flooding mines?
- Mines should use Over burden to minimise use of water
- Water is worth $1000/ML – water factory, $38/ML – rural, less – power use.
- Current mines – Rehab plans will be challenged
- Future Mine – start with an acceptable rehab
- Need a common rehabilitation philosophy/theme
    - Social
    - Engineering
    - Landscape solution

Triple Bottom Line Notes

- Cumulative interests
    - Community, environment
- Ensure water are properly considered – ground – direct – indirect
- Understanding of issues from all groups participating
- Making sure resource used properly
- Planning framework appropriate for long term
- Gather outputs from others
- Co-exist development opportunities
- Ensure integrated process – TBL

Ken Tabart's Notes

1. Workshop

2. Thermal ___ of new Power station

- New stations ~ 50% +
- If old stations ~ 40%

State the assumptions and show in the model

3. GHG Issues are not included in the report and likely to impact on outputs and renewables	Not included in study
4. Coal conversion and water conversion: Assumptions to be clear and what is expected	Note and show assumptions and how incorporated in model
5. Report on Infrastructure needs and environment needs not included	
6. Output to be a model of prediction, Not a fixed prediction. Interactive model.	Target of report = model
7. Abandonment and rehabilitation of mines not covered and is not in brief.	Best use for future = cultural change, opportunities /limits
8. Post 'White Paper' likely to say no water availability in LV	Terry Flynn
9. Water Mgt For domestic use will have future effect	
10. Report appears ' development oriented', is 'anti green' and presentation to public needs to be more 'sensitive '.	"Coal resources" to = TBL or no go
◗ Public interest in environmental and mine closure/rehabilitation. ◗ ___ process is planned. Long term use for policy advisors	State / Local government
11. Response issues	
◗ Mine closure/rehab/land use /winter activity/cooperation	
◗ Infrastructure o Impact of technology no gain o Development/optimisation o Co-ordination of inform – how/corridors	
o Town/community/main inf	Hard and soft
◗ Planning a. Land use and update schemes b. Strategic drivers/conflicts/flexibility c. Township growth/buffer zones (Community, _____)	Preserve Coal and protect environment
◗ GHG is not an aspect of the study but must be acknowledged as issue being. – Model will enable inclusion of impacts	Language and presentation
◗ Environmental Issues a. TBL drivers and Sustainability b. Cumulative impacts	

- Water
    a. Water balance/surface and ground
    b. Control and availability –sustainability
- Outcomes/Presentation
    a. Interactive model for future use
    b. TBL attributes in Project and community impacts
    c. Future community – what will it look like?
- Futures issues
    a. Technology impacts
    b. Changes in communities
    c. "Dead end practices" – identified and study impacts
- Knowledge constraints

Work Group

a. Water (Russell)
b. Infrastructure/technology and efficiencies (Paul)
c. Environment and planning (Cam)
d. Political and Community (Ken)

Rehab (Ted)

Rehab is a _____

Issues and Actions

- Why the project is significant?
- Community perspective
    a. Quality of life
    b. Scenarios –grow – static – recline
    c. Vic government committed to LV coal and growth
    d. Values of the future + 50 years. What do you want to pass on to children/grand children
    e. Towns/people/facilities
    f. Environment – water, visual awareness – noise/dust – natural features/river

Don't scare community but needs to identify values and vision

Community Values

- Health/hospitals
- Schools/education
- Community services

Perceptions vs actual

- Recreation
- Transport (Melbourne)

Align of final report to community vision

- Values/acceptance

Protection of Brown Coal as resource for future

- Most _____use of brown coal for the time being but may change over time – 50/100 years. May not.
- 1100 ha @ $7000/ha as agricultural land
- If _____ @ 100 homes/ha x $100k/house. Prevent houses/land use from impact on community growth.
- Technology changes may drive. New scenarios and LV may decline!! As alt energy emerges
- Prediction model must be flexible and interactive to reflect new technology and alt energy sources/use.

Too much. Morwell is unlikely to be consumed

Study to postulate

- New energy options
- H2 (hydrology)
- Protect and retain resource because don't know what want in 50-100 years/
- Environmental/infrastructure
- Common use of mine/s
- 'Regional' authority/decisions

Action Planning Group

- Community credibility and ownership
- Community values – identify and define
- Community has 'right to know' – freedom of information

LV versus Victoria's role and input and significance of resource Vic/Aust if 'pro industry' and profit drivers

What is the community? Who are they?

- Towns/areas
- LV
- Mel/Vic or Aust

Protection

Sustainability

Viability

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Draft 1	K Butler	S Walker		T Waghorne		10.06.04

Department of Primary Industries

Latrobe Valley 2100 Coal Resources Project

Consultation Report




August 2005

Contents

Appendices

1. Introduction

The Latrobe Valley 2100 Coal Resources Project is a joint government and industry sponsored initiative to consider how coal resources may be developed over the next 100 years and the key influences and outcomes relating to that development.

Assuming a number of environmental challenges can be met, the project will develop a strategy to guide practices for brown coal in the Latrobe Valley. The Strategy will look to the future and aim to optimise the outcomes for Victoria according to the principles of sustainable development. It will not revisit existing Government approvals for current mines or exploration licences, nor is it to approve future projects. However, it will examine options for future coal developments that are environmentally sustaining, financially viable and balance competing land interests in the Latrobe Valley communities.

Consultants GHD Pty Ltd were engaged in March 2004 to develop the strategy and manage the stakeholder and community consultation process. Initial research was conducted to prepare a project inception report covering the areas of coal demand, mining, water, environment, community and planning. A Critical Issues Workshop was held on June 2, 2004 involving the Project Management Team and Principals' Committee Members for the Project. Since then, the project team has focused on research relating to energy predictions and an assessment of areas of coal protection. The next steps will be to examine in more detail particular areas of the strategy being environment, mine rehabilitation, community growth and infrastructure. The final project report is due for completion in December 2004.

This Consultation Report provides a summary of the consultation activities conducted since April 2004 under the Stakeholder Consultation Program for this project.

2. Stakeholder Consultation Activities

A Stakeholder Consultation Program was developed in April 2004 with the aim of informing and consulting the Latrobe Valley communities and relevant agencies so that community ideas and opinions could be considered in the development of the Strategy.

Consultation activities have primarily been conducted during Stage 3 of the project covering the period from June to September 2004. Communication mechanisms were established prior to the public announcement of the project for enquiries, submissions and the community workshops.

The objectives of the Consultation Program were to:

- Provide the Latrobe Valley communities with information about the Project in an open and accessible manner, utilising a number of communication techniques and channels;
- Provide the Latrobe Valley communities with an opportunity to identify key issues in relation to the Project area and submit ideas and opinions to the project team;
- Document all community responses and feedback in relation to the Project and its outcomes and ensure this information is disseminated regularly to the project team in an efficient and effective way; and
- Encourage information sharing and consultation early in the project between key community stakeholders and the project team and to later report back on the outcomes of the Consultation Program.

An Activities Framework was developed, integrating community consultation and communication tasks and techniques. This included:

- Establishing a Project Information Desk and Stakeholder List
- Formally announcing the project to the communities through an introductory letter
- Producing two Project Updates
- Disseminating a Visioning Survey (hard copy and online)
- Conducting four Community Workshops

A summary of these activities is provided below while further detail on the outcomes and results is contained in the specific Appendices.

2.1 Project Information Desk and Stakeholder List

The initial phase of the Stakeholder Consultation Program involved the establishment of communication mechanisms. A Communications Protocol was developed to clarify the process for handling community and media enquiries for the project.

A Project Information Desk was then established to answer community enquiries and receive submissions related to the project. Community members and other stakeholders could obtain more information about the project or register interest in participating in the upcoming consultation activities by calling **1800 88 44 11** or emailing lvcoal2100@ghd.com.au.

Research was then conducted to develop a Stakeholder Database in Microsoft Access to enable dissemination of information about the project and sending invitations for consultation activities. This database evolved during the consultation program to include those who subsequently participated in the consultation activities and wanted to receive the consultation outcomes.

As at September 2004, there were 204 entries on the Stakeholder Database (see Appendix A for snapshot of database).

2.2 Project Announcement

In May, a one page letter was disseminated to all on the Stakeholder Database to introduce the project and encourage involvement and input. Details of the Project Information Desk were also provided for those wanting to obtain more information or to register for upcoming consultation activities. A copy of the letter has been attached as Appendix B.

2.3 Project Updates

Two project updates were produced in April and September 2004 to provide a concise summary of the project progress to date. These updates were distributed at a Coal Energy Summit in May and at the community workshops in September as well as disseminated to those enquiring about the project via the Project Information Desk. Copies of the two project updates are included as Appendix C.

2.4 Visioning Survey

A three page visioning survey was distributed on June 22, 2004 to the community organisations or individual contacts in Stakeholder Database. The survey was also available for completion online at http://www.ghd.com.au/survey/lvcoal. A reply paid post address was available to encourage responses and the deadline for survey responses was extended by three weeks to July 26th, 2004 (a total of six weeks). The survey was also distributed to Latrobe City Council office and service centres.

The purpose of the survey was to obtain an indication of issues and concerns within the Latrobe Valley communities about the future development of the area and brown coal development in particular. It encouraged respondents to describe their vision for the Latrobe Valley. The survey was not distributed to the whole community with the intention being that it was more of a gauge of issues in preparation for the four community workshops held in September. The following results are based on 28 responses received.

The complete results of the survey are contained in Appendix D and key issues raised by respondents are summarised in the Issues Matrix in Section 3.

2.4.1 Community Visions

As the project looks to 2100, part of the visioning survey asked respondents about their vision for the future. A sample of responses are contained below.

> "Increased employment opportunities from a diverse range of industries and far less dependence on power stations"
>
> "Diversified industrial development including new industries based on utilisation of brown coal resources, managed in an environmentally acceptable manner"

"Balanced development to provide increased opportunities for employment while allowing access to reasonably priced housing/ accommodation options"

"Growth whilst keeping the country feeling"

"A vibrant, thriving economy with clean air and a healthy environment"

"A strengthened focus on community will facilitate ecologically sound industrial diversification (e.g. solar energy, recycling) within the Valley, ensuring that residents feel secure about their future and that environmental improvement and conservation is seen as a key priority"

"A community working cohesively and sustainably with our environment"

"A vibrant working cultural community with a "sense of community"

"A clean and vibrant place that relies on a diverse range of industries, businesses and farming to ensure the economic and social well being of the community"

"The Latrobe Valley should be viewed as a great place to live with a wide range of experiences and a huge number of environment-related employment opportunities"

"The best of city and country living together"

"One city able to provide quality living, strong economic opportunities, innovation and a caring environment for families, children and individuals"

"A centre of excellence for environmentally sympathetic energy production"

2.5 Community Workshops

Four community workshops were organised in Traralgon, Churchill, Moe and Morwell in September. The dates, times and locations of these workshops were advertised in the Latrobe Valley Express on August 30 and September 2nd (page 4 and page 10 respectively) and the Moe & Narracan News on August 31 (page 2). In addition, a one page invitation with the workshop details was also sent to all those on the Stakeholder Database. (See Appendix E for newspaper advertisements and the one page invitation)

With two facilitators[1] and an introductory presentation by Project Director Ken Tabart, it was intended that the two hour workshop involve a semi-structured format with a number of group exercises. However, given the attendance was low at all the workshops, the format changed to a roundtable discussion. Participants were encouraged to raise issues, comments and concerns around the key areas of the project – community values, environmental values, economic growth, water resource management, land use planning and governance and any other issues they felt were relevant. Discussions were assisted by a large coal resource area map. All notes from the workshops have been included as Appendix F and the key issues raised at the community workshops have been summarised and included in the Issues Matrix contained in Section 3.

The workshops were held from 6-8 pm in Traralgon on September 14th (four participants), Churchill on September 15th (two participants), Moe on September 22nd (three participants) and Morwell on September 23rd (eight participants).

[1] GHD Community Facilitators Sophie Walker and Amy Hubbard

In addition to the community workshops, Project Director Ken Tabart also conducted a presentation about the project to the Advance Morwell quarterly meeting on September 15th in Morwell.

2.6 Public Submissions

A total of two public submissions were received during the course of the community consultation process with the issues raised in these submissions included in the Issues Matrix contained in Section 3 and outlined in full in Appendix G.

3. Matrix of Key Community Issues

Community Issues	Survey	Traralgon workshop	Churchill Workshop	Moe Workshop	Morwell workshop	Public Submissions
Rehabilitation or reinstatement of mine sites						
Issue of overburden (less of it) and use for stabilising the floor of the mines and battens		✓	✓		✓	
Yallourn used as a test case for progressive rehabilitation					✓	
Innovation in rehabilitation practices, look to examples in other countries (i.e. Germany) for possible adoption in Australia		✓	✓		✓	
Use of rehabilitated land for recreation activities (i.e. water sports if lake created)	✓		✓	✓	✓	
Quality of rehabilitated land					✓	
Funds put aside for rehabilitation and ongoing maintenance – possible introduction of 'user pays' levy					✓	
Increasing community expectations that mines should be rehabilitated.	✓	✓		✓	✓	
Community perceptions that movement of buildings is connected with the big mine holes			✓	✓		
Stability issues to be addressed especially regarding housing/freeways in the Latrobe Valley area					✓	
Cessation of dewatering of the Hazelwood mine and affects on instability of the batten adjacent to the southern end of the Morwell township					✓	✓
Land use planning						
Preservation of quality land for agricultural and horticultural purposes - prime agricultural land in Latrobe Valley and across Victoria being lost		✓				
Balance between rural residential versus agricultural potential of the land	✓	✓	✓			
Land use has crept into some buffer areas, consistency required in planning frameworks		✓	✓		✓	

Community Issues	Survey	Traralgon workshop	Churchill Workshop	Moe Workshop	Morwell workshop	Public Submissions
Mapping of agriculture and forestry areas required					✓	✓
Mapping of quality soil areas		✓				
Relocation of highways/railways and how this would impact new settlements. Planning easements need to take this into account					✓	
Landscape plan developed and implemented in Latrobe Valley to ameliorate industrial landscape					✓	✓
Traralgon bypass route options and impacts on coal resource areas				✓		
Interface with neighbouring councils (Wellington and Baw Baw) important in land use planning context				✓		
Consideration of land use possibilities in Latrobe Regional Hospital and aerodrome area				✓		
Buffer areas						
Subsidence in buffer areas unsuitable for residential development		✓				
Regional subsidence caused by mining and dewatering of underground aquifers	✓					
Clarification on the purpose of buffer areas and the use of land in buffers		✓		✓	✓	
Consistency in the minimum distance of buffer areas				✓		
Buffer area minimum distance should be 1500 metres (especially around south of Traralgon and to north around Morwell). Issues re: noise, dust and stability					✓	✓
Morwell could be a moat by 2030, consideration of the impact on amenity and generally Morwell as a place to live		✓			✓	
Identification of buffer area soil types and impacts		✓				
Water						
Use and availability of water in the future		✓	✓		✓	✓
Level of water use required for new coal technologies		✓	✓			✓

Community Issues	Survey	Traralgon workshop	Churchill Workshop	Moe Workshop	Morwell workshop	Public Submissions
Example of the Water Factory as option for water reuse in the future		✓				
Use of recycled water in power stations, salt water		✓				
Utilisation of coal as a filter for water purification					✓	✓
Rivers and creeks drying up as water used by open cut mining operations					✓	
Alternate Energy Sources/Technologies						
Greater use of alternative technologies (wind/solar/nuclear) to address greenhouse problem	✓				✓	
Accelerate the implementation of new coal technologies to reduce greenhouse and particulate emissions	✓				✓	
Increased research and development activity based in Latrobe Valley		✓	✓		✓	✓
Further research on alternative uses for brown coal and more money and effort	✓				✓	
Regional integration with new technologies and innovation		✓			✓	
Governance – cooperation and coordination						
Regional cooperation and coordination for funding of major infrastructure and to manage the physical environment		✓			✓	✓
Cooperation amongst privatised industries especially for common challenges and issues (i.e. common infrastructure funding).		✓			✓	✓
Establish regulatory body to oversee future of Latrobe Valley with government, industry and community representation					✓	✓
Suggestion of a Gippsland Regional government in the future		✓				
Community perception unclear about government roles and responsibilities at local, state and federal level			✓			
Long term vision and planning for development in the Latrobe Valley especially major infrastructure investments and environmental changes such as river diversions			✓			

Community Issues	Survey	Traralgon workshop	Churchill Workshop	Moe Workshop	Morwell workshop	Public Submissions
Dust Emissions						
Impact of dust emissions on health	✓	✓				
Impact of dust emissions on industry (i.e. sheep and wool)		✓				
Progressive dust control					✓	
Community understanding/perceptions of dust emissions	✓	✓	✓		✓	
Employment and Economy						
Investigate alternative sustainable industries to coal industry to sustain Latrobe Valley employment and economy	✓				✓	✓
Employment growth in coal industry in future likely to be minimal and not likely to contribute to new wealth. Retention rather than growth issue			✓		✓	✓
Ageing of the population and impacts on the economy/employment			✓			
Certainty in future employment opportunities in coal industry important otherwise people will leave the Latrobe Valley especially young people	✓		✓		✓	
Political uncertainty an inhibitor to investment, climate not conducive to investment opportunities			✓			
Economic confidence in Latrobe Valley has returned, concern that the 2100 Strategy may 'spook' people again					✓	
Poor image of the Latrobe Valley (in other parts of Victoria) as a place to live and work	✓	✓	✓			
More secondary and tertiary employment required			✓		✓	
More value adding industries tying in with these already operating brown coal infrastructures	✓					
Secondary or spin off industries have potential to add value with byproduct reuse, waste products		✓	✓			✓
Skills base to run the coal industry is narrow, needs to be an inventive culture	✓	✓				

Community Issues	Survey	Traralgon workshop	Churchill Workshop	Moe Workshop	Morwell workshop	Public Submissions
Brown coal industry development						
Brown coal is inefficient source of energy and should not be developed further as alternative technologies already exist	✓				✓	
Consideration of a Brown Coal Commission in the Valley to control development	✓					
Brown coal development should be in line with greenhouse gas reduction technology	✓				✓	
Community should be involved in the development of new brown coal technologies	✓					
Sustainable environmentally compatible coal industry/power consumption should be developed	✓					
Power industries examine their public perception and provide simple communication about changes/technology without a lot of technical jargon			✓			
Greater commitment from brown coal industry to build sustainable communities in the Latrobe Valley	✓					
Environmental Effects						
Community concern about environmental effects of mining	✓		✓			
Need to reduce greenhouse gas emissions	✓				✓	
Well trained specific fire fighting force for dealing with brown coal as a fire hazard					✓	
Environmental protection and enhancement	✓					
Other Issues						
Broader education of community to increase understanding of benefits of brown coal	✓		✓			
Creating better transport systems within the Valley and to the City	✓					
Keeping cost of housing affordable	✓					

Community Issues	Survey	Traralgon workshop	Churchill Workshop	Moe Workshop	Morwell workshop	Public Submissions
Increasing technical schooling and jobs	✓					
Safety of community – power generators are critical infrastructure, could be terrorist target					✓	

Latrobe Valley

Visioning Survey

The Department of Primary Industries recently commissioned a project to develop a strategy to guide planning and sustainable mine development practices for brown coal in the Latrobe Valley. The Latrobe Valley 2100 Coal Resource Project will consider how coal resources will be developed over the next 100 years. Consultants GHD have been engaged to carry out the project and to manage the community consultation process.

This survey is intended to help us understand your views on:

- ❑ The future of **development** in the Latrobe Valley
- ❑ The future use of **brown coal** in the Latrobe Valley

The survey is an important component of the consultation process. We ask you to take five minutes to complete this survey by July 12, 2004 and return it to: Reply Paid XXX, **Community Projects, GHD 180 Lonsdale Street, Melbourne VIC 3000.** The survey can also be completed online at **http://www.ghd.com.au/survey/lvcoal**

Part One: The future of development in the Latrobe Valley

Question 1: What is your connection to the Latrobe Valley? (Select one only)

- ❍ I live in the Valley
- ❍ I work in the Valley
- ❍ I live and work in the Valley
- ❍ I visit the Valley on a regular basis
- ❍ Other _____

Question 2: What is the postcode where you live? _____

Question 3a: What do you like most about the Valley?

Question 3b: What do you like least about the Valley?

Question 4: Please rate the following statements

	Strongly Agree	Agree	No Opinion/ Don't know	Disagree	Strongly Disagree
The Latrobe Valley should have little additional industrial development	❍	❍	❍	❍	❍
The townships of the Latrobe Valley should develop, but with limited outward growth to protect surrounding agricultural land and other natural features	❍	❍	❍	❍	❍
Industry and businesses in the Latrobe Valley should diversify to create more economic and employment opportunities	❍	❍	❍	❍	❍
The Latrobe Valley should improve transport links to Melbourne and the rest of Victoria	❍	❍	❍	❍	❍
Growth of the Latrobe Valley townships should be encouraged to provide greater opportunities for future housing	❍	❍	❍	❍	❍
New development in the Valley should maintain the existing identified heritage character and environmental value of the region	❍	❍	❍	❍	❍
People here are confident about the future of our communities	❍	❍	❍	❍	❍

Question 5: What *ONE* sentence best describes your vision for the future of the Valley?

Part Two: The future use of Brown Coal in the Latrobe Valley

Question 6: What do you think are the *THREE* most important issues related to the future growth of the brown coal industry in the Latrobe Valley? (Please select three)

❑	Reducing water consumption	❑	Quality of life
❑	Creating and maintaining employment	❑	Providing a strong economic future
❑	Flora and fauna protection	❑	Noise emissions
❑	Dust emissions	❑	Maintaining current landscapes
❑	Improving and maintaining water quality	❑	Cost of electricity
❑	Greenhouse gas emissions	❑	Maintaining viable communities

OTHER
1.
2.
3.

Question 7: Please rate the following statements

	Strongly Agree	Agree	No Opinion/ Don't know	Disagree	Strongly Disagree
The brown coal is crucial to the future economic health of Victoria	❍	❍	❍	❍	❍
Future coal technologies will overcome existing environmental issues	❍	❍	❍	❍	❍
The brown coal industry supports Latrobe Valley communities	❍	❍	❍	❍	❍
The future of the Latrobe Valley lies in brown coal electricity production	❍	❍	❍	❍	❍
The brown coal industry fosters innovation in its operations	❍	❍	❍	❍	❍
The brown coal industry is doing irreversible damage to the environment	❍	❍	❍	❍	❍
Town planning needs to clearly show the whereabouts of coal resources to prevent future competition between different land use demands	❍	❍	❍	❍	❍
Buffers between coal fields and townships are of satisfactory distance to ensure the health and wellbeing of nearby residents	❍	❍	❍	❍	❍
Victoria needs to protect its coal assets, even if these assets are not used immediately	❍	❍	❍	❍	❍
I am willing to pay more for electricity I know to be environmentally sustainable	❍	❍	❍	❍	❍

Question 8: Do you have any comments about brown coal development in the Latrobe Valley?

Thank you very much for taking the time to complete this survey. The results of the survey will provide an important part of the community consultation process and the development of the Latrobe Valley Coal 2100 Project. Please return completed surveys to: **Reply Paid XXX, Community Projects GHD, 180 Lonsdale Street Melb 3000**

If you would like more information about the project or find out about the upcoming community consultation activities, please contact the Project Information Desk by calling **1800 88 44 11 (freecall) or email: lvcoal2100@ghd.com.au**

GHD respects and upholds your right to privacy protection under the *Privacy Act 1988* (Cth). Any personal information provided by you will only be used for the purposes of communication and consultation in relation to the Latrobe Valley Coal 2100 Project.

VISIONING SURVEY SUMMARY REPORT

Introduction

As part of the community consultation process, a visioning survey (Appendix B) was distributed in June to 170 community organisations and community contacts currently on the project's Stakeholder Database. The survey also distributed in the Latrobe City Council office and service centres. The survey could be completed online at http://www.ghd.com.au/survey/lvcoal or by using a reply paid service made available to encourage responses. The response was extended to a total of six weeks.

A major purpose of the survey was to obtain an indication of issues and concerns within the Latrobe Valley communities about the future development of the area and brown coal development in particular. Another purpose was to encourage respondents to describe their vision for the Latrobe Valley. The survey was filled out by 28 respondees. Although disappointing, the results were regarded as more of a barometer of issues ahead of the community workshops in September.

Summary

The majority of the respondents lived or worked in the Latrobe Valley. Respondents indicated benefits of the Latrobe Valley including its rural outlook, closeness to mountains, bush, sea. Respondents were concerned about the affects of industrial development; smell, dust and visual, but recognised the need for development for employment and economy. Respondents indicated that coal provides a strong economic future for the Latrobe Valley, providing a solution of greenhouse gas emission issues was carried out. They also sought clarity on land use issues to avoid future competition between different land use demands.

Results Part One – The future of development in the Latrobe Valley

Question 1: Respondents were asked about their connection to the Valley. 53.5% said they lived and worked in the Valley, 28.5% said they lived in the Valley, 10.7% worked in the Valley while 3.5% visited the Valley on a regular basis. One respondent selected other ("it's where my electricity comes from").

Question 2: The postcodes of where respondents lived were fairly well spread with the majority from Traralgon 35.7%, followed by Morwell 21.4%, Moe 10.7%, Churchill at 10.7% and then one respondent each from Reservoir, Warragul, Warrenbayne, Braeside, Tarwin East and Glengarry (some community organisations are not based in Latrobe Valley, hence the postcodes from other areas of Victoria).

Question 3: Respondents were asked what they liked most about the Valley and there were a number of common themes that emerged:

- **Proximity** – A key theme was the proximity of the Valley to areas of natural beauty and environmental value as well as being easily accessible to Melbourne. While close to city areas, it retained a rural aspect or feel of country living. One respondent said having the space to move and not feeling hemmed in was one of the things they liked most.
- **Environment** – The scenery, picturesque surrounds or natural environment were described as things that people liked about the Valley and as related above these included National Parks, mountains, snowfields, lakes, rivers and sea as well as beautiful touring drives through the countryside. Several respondents added lifestyle and cost of living as other connected aspects.

- **Country and Community Spirit** – A number of respondents said there was good community spirit in the Valley, people were friendly and willing to help although this spirit was fragmented in the larger towns. Another respondent said the environment was more personal and friendly than the city and “Evidence of strong community service ethic is a pleasing factor”. One respondent felt there were good community and cultural activities.
- **Opportunity** – Some respondents highlighted that they liked the variety of experiences, environments and opportunities available in the Valley and that there was also creativity and cultural diversity. One respondent felt that there were skills and experience in the Valley and the capacity to take on major projects.
- **Services** – The Valley also had good shopping centres and services - “Everything is here for the average person” and specifically in Traralgon “The town of Traralgon has all the facilities”.
- Other things respondents liked about the Valley were that friends and family lived nearby; golfing opportunities; climate; and that there were a lot of historical sites “on our doorstep and we should promote tourism more than we do”.

Question 4: What respondents liked least about the Valley was related to industry, pollution and emissions with the resultant effect on the Valley’s image, unemployment and people’s attitudes.

- **Pollution and emissions** – A main theme was the smell, pollution or emissions from the power stations, APM and National Foods as well as the presence of power stations and coal mines in general. The visual ugliness of industry and the coal mining areas was another aspect that people liked least as well as the heavy dependence on industry.

  Some respondents disliked the dust “that coats everything” or as described by one respondent the “lung damaging fine particulate emissions” from open cuts and power station stacks as well as questioning the impact on health. Other aspects that respondents disliked were the ageing dirty industrial sites, as well as the large-scale earthmoving.

- **Image** - The image or reputation of the Valley as a dirty, industrial and polluted region was also raised by a number of respondents, “The reputation for being polluted and poor”, “poor 'image' particularly from media” and a lack of knowledge Victoria wide about the Latrobe Valley.

  One respondent disliked the fact that the economy was dependent on coal mining, while another questioned the “campaigns” that suggested power station emissions rise above the Valley and are deposited south, with the real cause of pollution being cars: “How stupid do you think we are?”

- **Unemployment** – Another main theme that emerged was the lack of opportunity for young people particularly in gaining ongoing long-term employment. One respondent felt that this forced their children to leave the Valley to find work. Public transport options for young people were also part of this theme. Some respondents were concerned about the worsening drug situation.
- **Attitudes** – The negative attitudes of some residents in the Valley were another area that respondents liked least such as “everything for nothing”, laziness, “too much of the too hard basket attitude” and that negative self-image would inhibit growth and belief. Disunity in Latrobe City towns led to an unfavourable social climate in the Valley, according to another respondent.

- Other specific responses were:
    - The cold wet winter days
    - "A Council that is not transparent and is looking after certain factions", factional brawls between towns and within Council
    - Inter-town parochialism i.e. "is Traralgon really better than everyone else?"
    - Lack of a good network of bike paths
    - Strip development along the highway between Morwell and Traralgon
    - Lack of cultural and entertainment facilities
    - Need to improve Central Business Districts of each town and the still-depressed areas in some towns

Question 5: A number of statements were listed about development in the Latrobe Valley and respondents were asked to rate whether they strongly agreed, agreed, had no opinion/were neutral, disagreed or strongly disagreed. These are shown as numbers and percentages:

	Strongly Agree	**Agree**	**No Opinion**	**Disagree**	**Strongly Disagree**
The Latrobe Valley should have little additional industrial development	**5 17.8%**	**3 10.7%**	**4 14.2%**	**10 35.7%**	**6 21.4%**
The townships of the Latrobe Valley should develop, but with limited outward growth to protect surrounding agricultural land and other natural features	**10 37%**	**11 40.7%**	**1 3.7%**	**5 18.5%**	
Industry and businesses in the Latrobe Valley should diversify to create more economic and employment opportunities	**20 71.4%**	**7 25%**	**1 3.5%**		
The Latrobe Valley should improve transport links to Melbourne and the rest of Victoria	**14 51.8%**	**12 44.4%**	**1 3.7%**		
Growth of the Latrobe Valley townships should be encouraged to provide greater opportunities for future housing	**8 28.5%**	**7 25%**	**4 14.2%**	**8 28.5%**	**1 3.5%**
New development in the Valley should maintain the existing identified heritage character and environmental value of the region	**14 50%**	**9 32.1%**	**3 10.7%**	**2 7.1%**	
People here are confident about the future of our communities		**8 28.5%**	**9 32.1%**	**11 39.2%**	

Question 6: Survey respondents were asked what one sentence best described their vision for the future of the Valley. These responses are shown grouped below:

Economic Development

Development of natural resources and utilising the skill base to continue future growth

Increased employment opportunities from a diverse range of industries, far less dependence on power stns

Diversified industrial development including new industries based on utilisation of brown coal resources, managed in an environmentally acceptable manner

Balanced development to provide increased opportunities for employment while allowing access to reasonably priced housing/ accommodation options

Growth whilst keeping the country feeling

Increased economic growth would have a positive flow on for all aspects of life in LV

A vibrant, thriving economy with clean air and a healthy environment

People-centred sustainable development

Community

A strengthened focus on community will facilitate ecologically sound industrial diversification (e.g. solar energy, recycling) within the Valley, ensuring that residents feel secure about their future and that environmental improvement and conservation is seen as a key priority.

A community working together, not against each other, who can drop the 'we've been trodden on, beaten, lied to by government at all levels who made decisions that have economically killed the region' baggage and take pride in the achievements made in the past decade to start turning the social and economic situation into positive mode. i.e. get past the "SEC good old days" - they're gone.

A strong, vibrant, united valley with good jobs and facilities

An emphasis on acting together, not a superior and inferior attitude by various sections

A community working cohesively and sustainably with our environment

A vibrant working cultural community with a "sense of community"

A community living without dependence on coal mining

A clean and vibrant place that relies on a diverse range of industries, businesses and farming to ensure the economic and social well being of the community

Lifestyle and potential

The Latrobe Valley should be viewed as a great place to live with a wide range of experiences and a huge number of environment-related employment opportunities.

There is so much potential here.

The best of city and country living together.

One city able to provide quality living, strong economic opportunities, innovation and a caring environment for families, children and individuals.

Latrobe Valley will continue to be a good place to live, work and enjoy life as the power centre for SE Aus.

The rural aspect is maintained with clean up of industries.

A centre of excellence for environmentally sympathetic energy production.

Results Part 2 The future use of brown coal in the Latrobe Valley

Question 7: Respondents were asked to select the three most important issues relating to the future growth of the brown coal industry. The issues have been ranked by the number of votes received.

- Greenhouse gas emissions 20
- Providing a strong economic future 13
- Maintaining viable communities 12
- Creating and maintaining employment 8
- Dust emissions 8
- Reducing water consumption 7
- Improving and maintaining water quality 5
- Maintaining current landscapes 4
- Quality of life 3
- Flora and fauna protection 3
- Cost of electricity 2
- Noise emissions 0

Other issues that respondents added were:

- Alternatives for employment and energy
- Providing a strong economic future (extra comments) Sustainable, environmentally compatible coal industry/power generation will improve quality of life, economic growth and development, reduce water consumption and therefore maintain viable communities
- Implementation of new technology
- Creating better transport systems within the Valley and to City
- Keeping cost of housing affordable
- Bring back technical schooling and jobs
- Environmental protection and enhancement (including water)
- Reduced costs to public
- Supporting positive community development

Question 8: Respondents were asked to rate the following statements again with the strongly agreed to strongly disagreed rating.

	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
The brown coal is crucial to the future economic health of Victoria	6 21.4%	13 46.4%	1 3.5%	4 14.2%	4 14.2%
Future coal technologies will overcome existing environmental issues	3 10.7%	12 42.8%	11 39.2%	1 3.5%	1 3.5%
The brown coal industry supports Latrobe Valley communities	6 21.4%	12 42.8%	4 14.2%	6 21.4%	
The future of the Latrobe Valley lies in brown coal electricity production	2 7.1%	9 32.1%	8 28.5%	6 21.4%	3 10.7%
The brown coal industry fosters innovation in its operations	1 3.5%	6 21.4%	13 46.4%	6 21.4%	2 7.1%
The brown coal industry is doing irreversible damage to the environment	6 21.4%	9 32.1%	6 21.4%	6 21.4%	1 3.5%
Town planning needs to clearly show the whereabouts of coal resources to prevent future competition between different land use demands	9 32.1%	16 57.1%	3 10.7%		
Buffers between coal fields and townships are of satisfactory distance to ensure the health and wellbeing of nearby residents	1 3.5%	6 21.4%	6 21.4%	11 39.2%	4 14.2%
Victoria needs to protect its coal assets, even if these assets are not used immediately	8 28.5%	13 46.4%	4 14.2%	2 7.1%	
I am willing to pay more for electricity I know to be environmentally sustainable	6 21.4%	12 42.8%	4 14.2%	5 17.8%	1 3.5%

Question 9: Respondents were invited to provide further comments about brown coal development in the Latrobe Valley but it must be noted that not all respondents completed this section. The following are all the responses received for this question with the actual wording.

- Utilising existing and future technologies are essential in the future use of brown coal as a viable energy provision. Strong lobbying is required and essential to ensure education of those that are looking from outside in and have little understanding of benefits of brown coal.
- Brown coal is known to be an extremely inefficient source of energy and to be a major contributor to climate change. I am at a loss to understand how any talk of further brown coal development can even be entertained, given the knowledge and the alternative technology that we already have. Strategic planners need to look at creating alternative, sustainable industries in the Valley in order to prevent further unemployment and economic downturn.
- Brown coal may have a limited future unless new technology can solve the greenhouse problem. Latrobe Valley needs to look at alternative industries and stop being fixated on brown coal power stations.
- The realist costs involved for the average resident and their standards of living viability.

- Brown coal is such a pollutant, any additional stations would be disastrous to our environment and quality of life. Other technologies should augment coal use (wind/solar, even nuclear power)
- Implementation of new technology to reduce greenhouse and particulate emissions needs to be accelerated.
- The brown coal industry needs to be more committed to building sustainable communities in the Valley.
- Brown coal is a viable source of electricity. There needs to be more value adding tying in with these already operating infrastructures. Look after environment and emissions.
- I think it is overdone, old technology, and has gone far enough.
- Planning framework essential to avoid land use conflicts from current and future privately owned generation companies seeking least cost options. Establishment of a Brown Coal Commission in the valley to control developments may be worth considering.
- The use of brown coal to produce electricity produces large quantities of CO_2. Efforts should be continued to reduce greenhouse gases. As a community we should be making efforts to reduce the amount of electricity we use, particularly in heating and cooling houses. The use of recycled water in our power stations would help return water to our streams.
- Very significant that it continues for: LV community, Victorian public, SA NSW and soon Tasmanian public.
- Technology should assist in cutting down the damage to the environment and the re-building of past coal sites to be of some future use is needed. Build up production and get the jobs back.
- Brown coal development must be in line with greenhouse gas reduction technology. Coal exploitation should only continue for industries that can demonstrate reductions in GHG.
- Should switch more and more to non-coal development i.e. use environmentally sustainable processes e.g. solar, wind, geothermal etc.
- I would prefer to see other sustainable or re-usable environmentally friendly methods used. I firmly believe that we are creating long-term problems for short-term gains. Also we have had enough studies, thesis, Green & White papers, working groups, discussion groups and strategies. It's way past time to act responsibly.
- The community should be involved in the development of new brown coal technologies.

COMMUNITY WORKSHOPS SUMMARY REPORT

Introduction

As part of the consultation program for the Latrobe Valley 2100 Coal Resource Project, four community workshops were organised in Traralgon, Churchill, Moe and Morwell. With two facilitators (Sophie Walker and Amy Hubbard), and an introductory presentation by Ken Tabart, it was intended that the two hour workshop involve a semi-structured format with a number of group exercises. However, given the attendance was low at all the workshops, the format changed to a roundtable discussion. Participants were encouraged to raise issues, comments and concerns around the key areas of the Study – community values, environmental values, economic growth, water resource management, land use planning and governance and any other issues regarded as relevant. A large coal resource area map aided discussions.

The workshops allowed full discussion on a wide range of issues associated with coal developments in the Latrobe Valley. The issues discussed in each workshop focussed both on particular issues and regional development issues. Local issues included the alignment of the Traralgon bypass and the potential for Morwell to be surrounded by mines. Regional issues included concern about the role, location and use of buffer areas around towns, mine rehabilitation, water use, dust and the need to maintain satisfactory environmental emission levels. There was discussion about the need for better regional planning relating to coal use. Coal development was supported provided that community concerns can be adequately addressed.

A full summary of each workshop is included in Appendix B.

Traralgon Community Workshop, September 14th, 2004

The workshop was held at the Traralgon Sundowner Inn 6 pm – 8 pm with four community participants.

Summary of key issues:

- **Water** – use/availability/ Water Factory example / environmental flows (Gippsland Lakes)
- **Dust** – health/ impact on industry (quality of products such as wool and dust in wool) / community understanding/ general amenity and perception from outsiders
- **Rehabilitation** – encourage mine operators to reinstate / opportunity for increase in agricultural land / 'now' issues of overburden
- **Land Quality** – agriculture / horticulture (best returns) / quality soils – where? Need to preserve!
- **Buffers** – location – settlement/ land use/ distance/purpose / Soil types and impacts
- **Regional Integration** – economic and community diversity/ new technologies and innovation / local research and development
- **Governance** – regional cooperation and coordination / funding of major infrastructure

The following bullet points provide more detail of the discussions and issues raised:

- One participant questioned why **Morwell township** was untouched on the coal resources map in terms of the coal ranking areas as it was said that some of the best coal was under Morwell. Ken Tabart responded that during the ranking assessment (taking into account strip ratio, quality of coal, environmental and community factors), the community cost was huge and physical cost of acquisition too great for moving the town and mining under Morwell. However, another participant felt that the fact there was good coal under Morwell should not be cancelled out as an option particularly with the long 100 year timeframe of the Study – perhaps it would be more feasible in three or four decades.
- An issue raised was **dust emissions** and the 'brownness' of the atmosphere. It was noted that this was a concern for a number of respondents to the Visioning Survey in relation to affects on their health. However, there was also recognition that air quality had improved rather than worsened in last decades.
- **Water** – The Water Factory was regarded as an option for water use and management if there was the willingness to make initiatives like this work. It was noted that the Water Factory was very expensive water and not enough volume (120 Gigalitres) to make it a viable alternative at the moment for the coal generators and with reprocessing more expensive. Another option discussed was the use of salt water for the coal process with adequate filtering to remove salt build up from the equipment. Also questioned was whether there would be enough water for new technology such as carbon sequestration.
- **Reinstatement** – It was noted that Germans reinstate their mine sites as they go but that this was not really the Australian culture/mentality to look at holistic reinstatement regarding mines. Countries where land was not a premium were forced to look at how to reinstate the land following mining activities. Participants felt this was an area in Australia where there could be innovation but there needed to be encouragement rather than punitive action for this to occur. Another point raised was the use of water in the reinstatement process. Ken Tabart said the Study would provide a broad view of reinstatement.
- Another issue raised was the **strip ratio** and the lack of overburden to stabilise the floor of the mines and the batters. Where will the overburden be placed? It was questioned as to whether black holes should continue to be created and keep putting fences around the site. It was believed that there was a general perception in the community that there was no alternative and they would just have to put up with them.
- **Agricultural quality of the land** – It was pointed out that there was high quality agricultural land in the Traralgon Creek flats area that needed to be considered in land use planning. Several participants regarded this as a very important issue as in Victoria there was a loss of prime agricultural land. It was also suggested that agricultural quality as an overlay could be developed. Latrobe Valley was not thought to be involved in the DPI mapping of agricultural land. Participants wanted this identified as an ongoing issue in the Study.
- **Residential versus agricultural** – related to the above point was land use planning. Participants felt that there would increasingly be the issue of rural residential development versus the agricultural potential of the land - balance between agriculture and houses.
- Horticulture was highlighted as providing good returns with small plot areas and on better soils. There was a water quality issue and water in general was a limiting factor. Another up and coming agricultural development was grain-fed dairy.

- **Buffer areas** were raised as an issue of community concern – The buffer areas around Morwell could be like a 'moat' by 2030. Subsidence was also regarded as part of this issue and that there could not be residential development in these buffer zones. Participants queried the land uses for buffers (purpose) and how wide they should be. Also what the soil types in the buffer zones were and their potential for agriculture. It was noted that different land use has crept into some buffer areas and there was a need for consistency in planning frameworks.
- **Economic future** – There were a number of economic issues primarily related to employment and investment in the Latrobe Valley. Latrobe First had been trying to attract small and medium enterprises to the Valley but in some ways they were pushing uphill against a cultural issue and also the poor perception of the Valley. Participants felt that there was a stereotype of the Valley being a terrible place but people who lived in these communities did see the beauty.
- It was noted that the Latrobe Regional Commission did create some consciousness changes.
- Participants felt there was a need for people involved in the creative side of business/economy to be based here as well as secondary industries having the potential to value add with by-products.
- The skill base to run the coal industry was narrow but it needed to be an inventive culture.
- **Cooperation and coordination** – The area of governance was discussed in terms of there needing to be more cooperation and economic sharing in the region, and clarification of the roles of Council and the State government.
- Participants noted privatised industries were now competing with each other but there needed to be a cooperative method going forward. Everyone was 'doing their own thing' but it would not be too long before they needed common infrastructure. E.g. carbon sequestration needed a common pipeline to all generators – how would this be funded? How would major infrastructure be funded and the physical environment managed? In the past there was the former SEC as a central coordinating body and participants felt that now this was lacking.
- **Regional integration** – This issue was raised in terms of economic and social diversity, new technologies and innovation, local research and development and the pursuit of niche opportunities. The idea of a regional government in Gippsland was also raised.
- A question was raised as to where the exploration licenses fitted into this Study – Ken Tabart explained where the licenses are currently located on the coal resources map.
- Participants felt that it was important to be prudent with the use of any resource and that there was a lot of 'what ifs' requiring courage and 'brave' planning in the future.

Churchill Community Workshop, September 15th, 2004

The workshop was held at the Churchill Leisure Centre 6 pm – 8 pm with two community participants.

- **Long-term planning** – A participant raised the issue that communities were forward looking and questioning the future and what's going to happen with their children. Example given was International Power and diversion of the Morwell River that could again need diverting in 50 years time. People were supportive of the current diversion but it might not be the last diversion and people were starting to question why lots of money was being spent on infrastructure to then rip it down again in the foreseeable future. As taxpayers there was a view that the community want to see money spent on something that will remain.

- **Community views** – There was a perception in the community that the brown coal industry was vital to Latrobe City for employment and the economic future of the area. While it was seen as vital, there was great concern about the effect on the environment. Another community perception was that movement of buildings (particularly with clay foundations) was tied in with the 'dirty great holes' around the Valley.
- **Employment** – One participant felt that in the future there would be a static level of coal production and it was not going to be a growth industry for employment. Ageing of the economy was another factor with the average age of the workforce in Latrobe Valley being 46 years. While the coal industry was vital for the economic continuance of the region, it was not likely to contribute to new wealth. It was a retention issue rather than a growth issue - how much work was it simply to sustain what was already there? Another aspect of this was certainty in terms of employment in the power industry. One participant felt that if this disappeared then the young people would leave the Latrobe Valley to seek employment elsewhere. There was also the need for more secondary and tertiary employment while waste product and by-product reuse were other types of spin off industries. It was also noted that electricity was fundamental to the new economy (IT especially) and future employment.
- Political uncertainty hindered **research and development** according to one participant and that this was an inhibitor to investment. It was felt that currently the political environment did not help private investment. There was a need for long term visioning as part of the problem was stability with politicians going from one election to the next. One participant said people felt it was difficult to know what level of government was responsible for infrastructure such as roads. For most people it was about Council, not really understanding who was responsible as well as the various government partnerships and how they worked. This was the same as water with many people not understanding that there were several water authorities in the area.
- **Land use** – It was noted that the area on the coal resources map flagged as H indicated that coal areas were heading to population centres and this could lead to greater community resistance. There was a potential for population increase with people moving to the Latrobe Valley for lifestyle changes - opportunity to have a couple of acres, one of the desirable things about the Latrobe Valley is the lifestyle factors. However the issue of land developments as rural residential, low density, and subdivision of farms was leading to a loss of agricultural land.
- **Return of land to public stock** – This issue was raised in terms of the environment and there being a lot of waste processes on what could be highly valuable agricultural land. It was noted that **rehabilitation** of land for prime agricultural use had been thought of from an innovation point of view but not pursued actively. Ken Tabart pointed out that topsoil was being preserved and a lot of overburden was being placed back into the mines now. There is insufficient overburden to fill all the mines. Innovation and a broader vision of rehabilitation was not thought to have yet materialised.
- **Water stocks** - Coal drying technologies and other new technologies used or produced vast amounts of water that comes out dirty and has to be cleaned. Participants questioned how land was going to be used in the future and what the water use would be particularly with the new technologies.
- One participant questioned possible future uses of mine rehabilitation could be for recreational water sports. The Hazelwood pondage was regarded as a community asset and attracted many visitors with the caravan park often full. One participant questioned if there was a proposal to extend the pondage at the southern end or whether that was a rumour.

- **Image** – There was a general perception outside of the Latrobe Valley that the area was a dirty place. Participants said dust emissions were part of this perception. EPA have said the Latrobe Valley was filthy and that perception needed to be challenged constantly. Power industries themselves needed to take a lead and start looking at their public perception. Simple communication about changes to technology etc must be communicated to the Latrobe Valley communities without using a lot of technical jargon.
- Another issue raised was that Churchill should be utilising piped hot water not gas, and there was a failure to use the heat generated from industry for other purposes i.e hothouses for horticulture. Infrastructure existed for secondary industry to be developed.

Moe Community Workshop, September 22nd, 2004

The workshop in Moe was held at the Moe Racing Club 6 pm – 8 pm with three community participants.

- **Planning zones** – Participants indicated that the coal resources map needed to show existing rural residential areas. It was highlighted that there was a planning challenge in the H area near Traralgon as developers with a short-term focus would by trying to take profits though land development. It was noted that studies of rural living requirements and urban living requirements resulted in Planning Scheme amendments C7 and C27 (Panel reports are located on the DSE website).
- One participant said a bushfire last year that destroyed a plantation near the H area (on the resources map) owned by APM has changed the strategic land use planning for that area with the site now proposed for rural residential and urban use. In terms of planning the 1950s *Land Over Coal Act* was one of big sticks that SEC used, last referred to in the 1980s.
- **Traralgon Bypass** route options – VicRoads have been conducting hearings for route options for the Traralgon Bypass and some of the Ranking 1 and 2 areas on the coal resources map might influence the final route selection. Participant discussions focused on the impacts of various routes on future housing development particularly in relation to Traralgon. It was noted that people living in buffer areas was an issue in selecting routes for the bypass. Bypass Advisory Committee will decide in six weeks time whether to select a route or recommend further investigations. Planning scheme amendments by mid next year (worst case), early next year (best case).
- If the coal resource was free to use – how long will it take at 8000 megawatts to use up all the Ranking 1 and Ranking 2 areas on the resources map? How long does it last at that rate?
- Further coal developments around Morwell or Traralgon will likely increase Moe property values as it is geographically separated, and while there are some particulate emissions, most are dispersed by prevailing winds.
- Other local council interfaces – One participant felt there needed to be consideration of neighbouring local government areas (Wellington and Baw Baw) and entrepreneurial development in Trafalgar.
- **Latrobe Regional Hospital** could be squeezed from the north and south with the aerodrome and road corridor respectively. There have been significant discussions with Latrobe City Council in regards to the whole airport precinct. There was a potential for a road corridor with one of the Traralgon bypass options very close to it.
- It looks as though developing the high rated coal areas would require looking at transport corridors and would necessitate changes to the Morwell River.

- **Rehabilitation** - Community perceptions were changing about mine sites with people now starting to expect significant rehabilitation. Pressure to rehabilitate is certainly starting to grow. Were there opportunities to utilise the 'big holes' for other purposes such as recreational or agricultural. The German experiences were cited as an example of land restoration.
- **Buffer zones** – One participant said there was a degree of community support and sympathy from Moe to Morwell township. Participants questioned the purpose of buffer areas as there was confusion as to what was allowed in the buffer. There was a definition of buffers under the *Mines Act* but it was not being implemented and there needed to be consistency in implementing planning controls. Land use could occur in buffers if there was not an adverse impact on urban/rural residential development and coal mining. Buffers need not be permanent especially if mining moves away from an area i.e. Loy Yang
- Landscaping and the visual barrier of the buffer was an issue especially for Morwell.

Morwell Community Workshop, September 23rd, 2004

The workshop was held at the Italian-Australian Social Club 6 – 8 pm with eight community participants.

- **Rehabilitation** – This issue was raised several times in general and in relation to specific mines. Participants felt a rehabilitation plan was needed for both Yallourn and Hazelwood open cut mines, and that Yallourn could currently be used as a 'test case' for progressive rehabilitation. The quality of rehabilitation and matter of progressive rehabilitation were key aspects of this issue.
- One participant questioned who would bear ongoing costs and was there reserves put aside for rehabilitation and ongoing maintenance? It was suggested that contingent liabilities could be raised by putting a levy per tonne of coal burnt through a user pays system.
- **Future use of rehabilitated land** – Connected to the rehabilitation issue was how rehabilitated land would be used in the future ie for recreation, agriculture and/or market gardens. Was there a need to protect views and vistas? The German example of surface rehabilitation was raised as possibly an approach to explore for the Australian context. One participant noted that for open cuts, the water table tended to be above the bottom of the hole and even if it was filled right to the top with overburden there would still be some sort of lake.
- **Stability –** This was an issue regarding housing and the freeway. For example cessation of dewatering at Hazelwood could cause instability of mine batters and affect the southern section of Morwell.
- **Water Use –** Participants discussed related issues of water as a valuable resource; creation of lakes as a rehabilitation option for filling in open cuts; and utilising coal as a water purifier. One participant was concerned that many rivers and creeks around the Latrobe Valley area were now barely a trickle with many tapped into by open cut mining operations.
- **Dust and Fire** – Full cover of vegetation was regarded as a first requirement, with dust control progressive. Brown coal, when exposed, was powdery and highly flammable. There was concern as to the adequacy of fire fighting resources for brown coal. It was noted that the SEC used to have a trained fire fighting force but now there was a reliance on CFA volunteers - regarded as a "cheapskate" alternative by a meeting participant.

- **Buffer Zones** – One participant proposed that the minimum distance for buffers be 1500 metres around the south of Traralgon, and to the north around Morwell for any future coal mine developments. It was suggested that the buffer distance figure should be further explored with the main issues regarding noise, dust and stability.
- **Future Employment and Industries** – This issue was discussed in a number of ways. It was raised that the privatised coal industry was employing less people and that this was not likely to change in the future. However, losing power generators from the Latrobe Valley would significantly impact on employment and the overall economy in the Latrobe Valley. There was a need to carefully plan for alternative industries and for these to be located in the Latrobe Valley so that jobs would not be lost from the area. If planning for exodus from coal burning occurred, then other infrastructure and employment opportunities would result in a net gain, with carbon reduction alone having a benefit. Participants felt the transition needed to occur over 40 years, changes could not be made over a decade. Associated industries were also important; it was not just power companies that had the jobs.
- **Energy alternatives** – Discussions centred on better use of coal rather than burning it, although coal was still a fossil fuel and still creating carbon regardless of what one did with it. Participants felt there needed to be energy resources that were clean and cheap with nuclear power a suggestion. Another participant was not philosophically against nuclear power but the question of spent fuel rods and their storage was an issue.
- **Research and Development –** There was a need for further research on alternative uses for brown coal and more money and effort. The Ceramic fuels unit at Monash University was an example but there was not sufficient funding. There was coal technology in the Latrobe Valley waiting to be used, e.g. HRI products to clean up the Murray River and coal as a soil conditioner, one participant said.
- **Land Use Zones** – A suggestion was for a proper land use plan that showed arable and forestry areas. A participant also raised the issue that planning needed to be carried out by planners who lived in the area so as to identify with local people.
- There needed to be thought put into the how the relocation of the highway and railway would impact new settlements and in terms of the coal resource area. Easements on planning need to take into account relocation of highways/railways. It was noted on the coal resources map that the Pines housing development cut the H Ranking area in half.
- **Amenity Issues -** Amenity issues with the region need to be weighed up especially if people are reluctant to live in the Valley because of the intrusion of industry. One participant questioned how much would be tolerated?
- The Latrobe Valley needed a coordinated approach to **landscaping** such as a single body to ameliorate the industrial landscape with softening and greening. This could be a task of a regional agency. One participant said there had been no attempt to develop a landscape plan for the Latrobe Valley despite a lot of reports being produced.
- **Governance** – While it was noted that the days of central management and a single entity in the SEC were gone, there was currently a fragmented and insular approach with privatisation. One participant proposed that there needed to be a regulator body over the future of Latrobe Valley to control infrastructure, allocate resources, and develop new industry. Another participant proposed that this could be an organisation with representatives from government, industry and the community. Another regarded the State government as having a lot of power over the coal industry in terms of granting licenses and while there did need to be an overseer of the resource, the government already had a lot of power.

Other issues:

- Governments of the future have to be prepared to build new towns and relocate existing towns in terms of mining operations. This was an issue that needed to be considered (examples were in Queensland).
- **Confidence** – participants highlighted that economic confidence was returning to the Latrobe Valley with thoughts of progress and young people returning to the Latrobe Valley to live and work. And they did not want the 2100 Strategy to be released and 'spook' people again particularly those that may have land strategically developed. They did not want the report to affect the air of confidence that was returning to the Latrobe Valley.
- **Safety** of communities – One participant raised the issue of the power generators as significant infrastructure being a target for terrorist attacks and that this would clearly affect not just the workers but also the surrounding communities.
- One participant raised the issue of **wind farms** being a great idea but no one wanted them in their backyard (the NIMBY issue).

Appendix C

Newsletters

Latrobe Valley 2100 Coal Resources Project



The Victorian Government, supported by Federal and local government and industry, recently began the Latrobe Valley 2100 Coal Resources Project to consider how coal resources could be developed over the next 100 years.

Assuming a number of environmental challenges can be met, the project will develop a strategy to guide practices for brown coal in the Latrobe Valley. It looks to the future and aims to optimise the outcomes for Victoria according to the principles of sustainable development. It will not revisit existing Government approvals for current mines or exploration licences, nor is it to approve future projects. However, it will examine options for future coal developments that are environmentally sustaining, financially viable and balance competing land interests in the Latrobe Valley communities.

Latrobe Valley Coal

The Latrobe Valley contains one of the world's largest economically viable reserves of coal (35,000 Mt). Current mining operations directly support more than 85% of Victoria's electricity generation. The Latrobe Valley hosts three of Australia's largest coal mines and also contains significant regional towns and infrastructure that are critical to the Victorian economy.

It is likely that these coal resources will play a continuing part in providing energy for Victoria's sustainable future. If managed properly, coal developments should offer employment and wealth creation. Challenges to alternative land uses, water resources and the environment must be properly considered and appropriate rehabilitation strategies put in place.

Principal Project Stakeholders

The Principal Project Stakeholders are:

Department of Primary Industries

Department of Industry, Tourism and Resources

Loy Yang Power

International Power – Hazelwood

Yallourn Energy

Vemco Australia

Australian Power and Energy Corp.

Latrobe City

HRL Developments Pty Ltd

Department of Sustainability and Environment

Department of Innovation, Industry & Regional Development

Project Update

Consultants GHD Pty Ltd have been engaged to develop the strategy and manage the stakeholder and community consultation process. Currently, a number of GHD specialists are preparing papers for the period to 2030 and beyond in the areas of:

Coal Demand

Mining

Water

Environment

Community & Planning

These papers will form a Project Inception Report.

Principal Stakeholders Workshop

A Workshop in the Latrobe Valley is planned for 2nd June, 2004 involving the Project Management Team and Principals Committee Members.

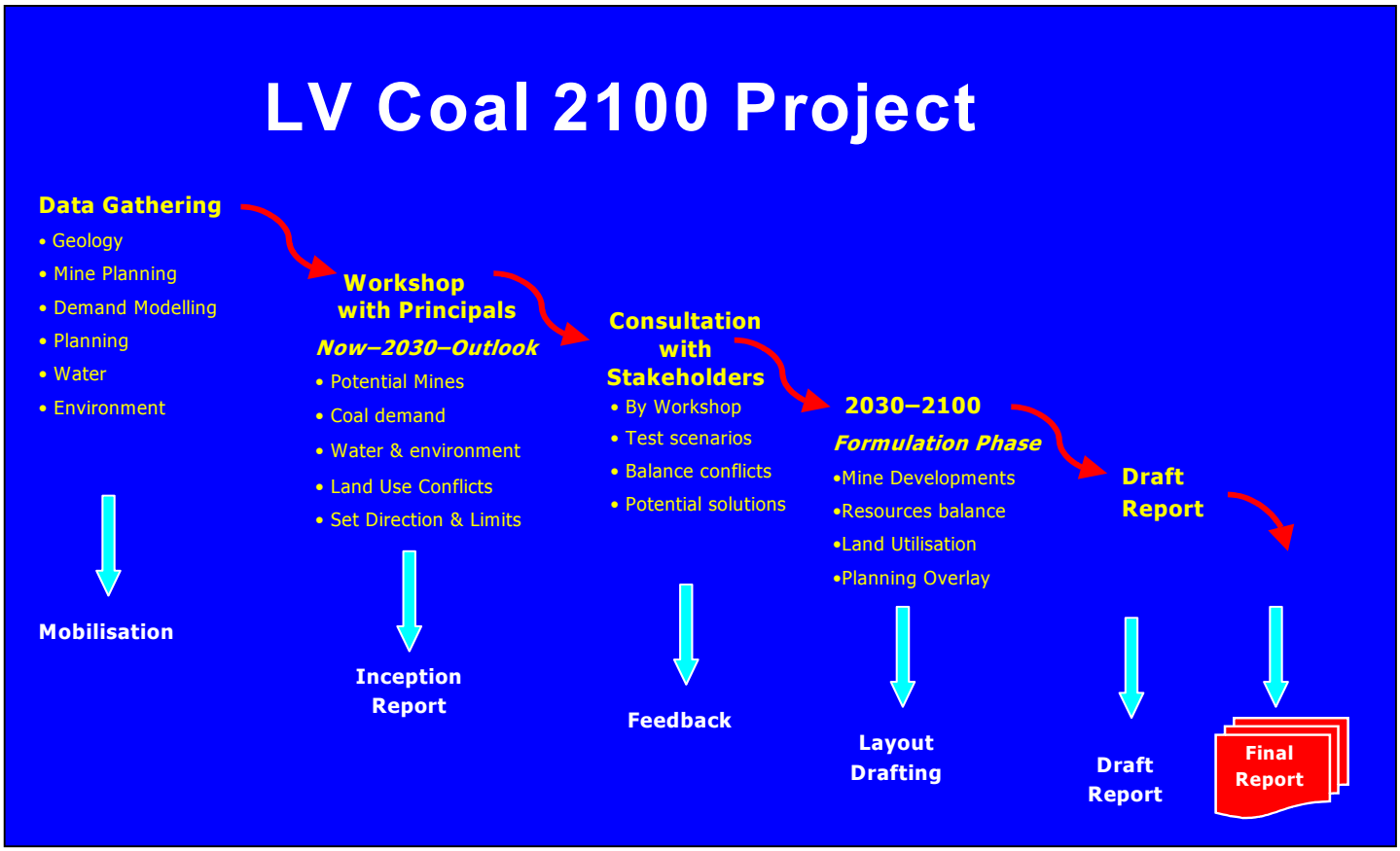
The objectives of this Critical Issues Workshop are to:

- Confirm projected coal development to 2030;
- Assess the current situation relative to water, environment, planning;
- Discuss potential coal demand scenarios;
- Review potential developments beyond 2030;
- Discuss issues relating to water, environment, infrastructure, mine and closure plan;
- Agree on the direction or remainder of the project.

The Project Inception Report will be circulated to Workshop participants at least one week prior to the Workshop. Further details about the Workshop will be forwarded to Principal Stakeholders shortly.

Project Methodology

The following methodology for the project has been developed.



Community Input

An important part of the project will be to gather ideas, issues and opinions from the Latrobe Valley communities about future coal development. GHD will be conducting a number of different consultation activities over the next eight months to encourage community groups and individuals to contribute to the development of the strategy. These activities will include a community survey, issues workshops and focussed interviews. A fact sheet and newsletters about the project will be issued regularly.

Project Information Desk

A Project Information Desk has been established to answer community enquiries and receive submissions related to the project. Community members and other stakeholders can obtain more information about the project or register interest in participating in the upcoming consultation activities by calling **1800 88 44 11** or emailing lvcoal2100@ghd.com.au

Details about the community consultation activities will be disseminated shortly.

Project Timetable

Preparation of Papers primarily addressing the period to 2030 but with some projection beyond this point: ◗ Demand ◗ Mining ◗ Water ◗ Environment ◗ Community & Planning	April/May
Introduction Letter to Principals, other Stakeholders and Community Groups	May
Principal Stakeholders Workshop	2 June
Workshop Report on Process and Deliverables	Mid June
Community Workshops	Late June/July
First Draft Final Report	18 August
Final Report	15 December

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Victoria The Place To Be

Latrobe Valley 2100 Coal Resources Project



The Latrobe Valley 2100 Coal Resources Project is a joint government and industry sponsored initiative to consider how coal resources could be developed over the next 100 years. Consultants GHD Pty Ltd have been engaged to develop a strategy and manage the community consultation process.

This is the second update of the project, outlining its background and objectives, the activities and research conducted to date and the next steps.

Project Background

The aim of the project is to develop a strategy to guide planning and sustainable mine development practices for brown coal in the Latrobe Valley. This assumes that a number of environmental challenges can be met.

The strategy will examine options for future coal developments that are environmentally sustaining, financially viable and balance competing land interests in the Latrobe Valley communities. It will not revisit existing Government approvals for current mines or exploration licences, nor is the strategy to approve future projects. The aim is to look to the future to optimise the outcomes for Victoria according to sustainable development principles.

The Latrobe Valley contains one of the world's largest economically viable reserves of coal (35,000 Mt). Current mining operations directly support more than 85% of Victoria's electricity generation. The Latrobe Valley hosts three of Australia's largest coal mines and also contains significant regional towns and infrastructure that are critical to the Victorian economy.

It is likely that these coal resources will play a continuing part in providing energy for Victoria's sustainable future. If managed properly, coal developments should offer employment and wealth creation. Challenges to alternative land uses, water resources and the environment must be properly considered and appropriate rehabilitation strategies put in place.

The project is part of the Australian Government's Regional Minerals Program with the involvement of a range of government agencies and departments, and industry.

Project Update

Initial research was conducted to prepare a project inception report covering the areas of coal demand, mining, water, environment, community and planning. Since then, the project team has focused on research relating to energy predictions and a coal protection assessment.

Community consultation activities have involved an introductory letter to community organisations and other stakeholders and a visioning survey. The purpose of the survey was to gain community opinions and views on the future of development in the Latrobe Valley, and the future use of brown coal in the Latrobe Valley.

A report of the survey results is available.

Community Workshops

Four workshops for the Latrobe Valley communities are being held in September at Churchill (September 15), Traralgon (September 16), Morwell (September 22nd) and Moe (September 23rd).

The workshops are another way for community members to identify key issues in relation to the areas of the project and put forward ideas and opinions to the project team. The community input and ideas will be documented and considered in the project strategy's development.

Project Next Steps

Following the community workshops, a report of the outcomes will be prepared and distributed to all participants.

The next steps for the project team will be to examine in detail the areas of the strategy being environment, mine rehabilitation, community growth and infrastructure. The final report will be produced in December 2004.

For more information about the project, please contact the Project Information Desk:

Ph: 1800 88 44 11 (toll free)

Email: lvcoal2100@ghd.com.au

GHD MANAGEMENT ENGINEERING ENVIRONMENT

Victoria The Place To Be

Appendix D

Scenarios for Power Generation in 2050

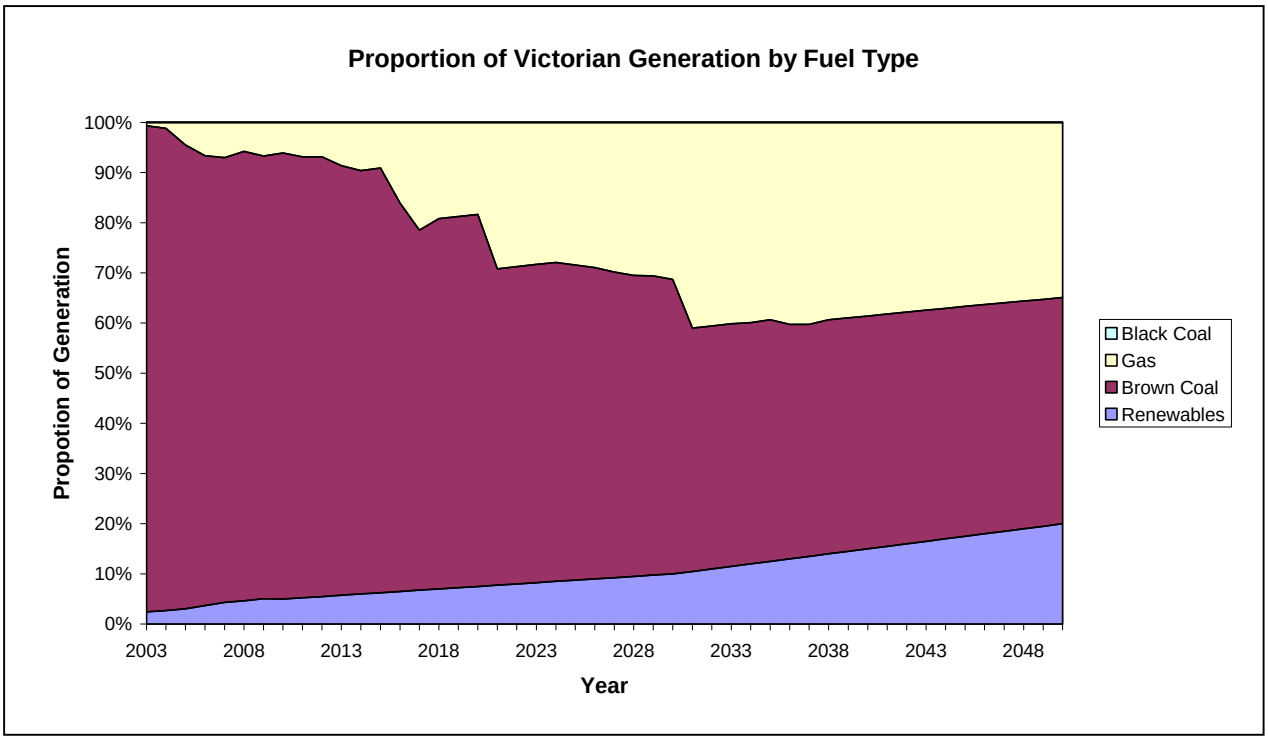


Figure D1 Scenario 1 – Energy Sources for Power Generation

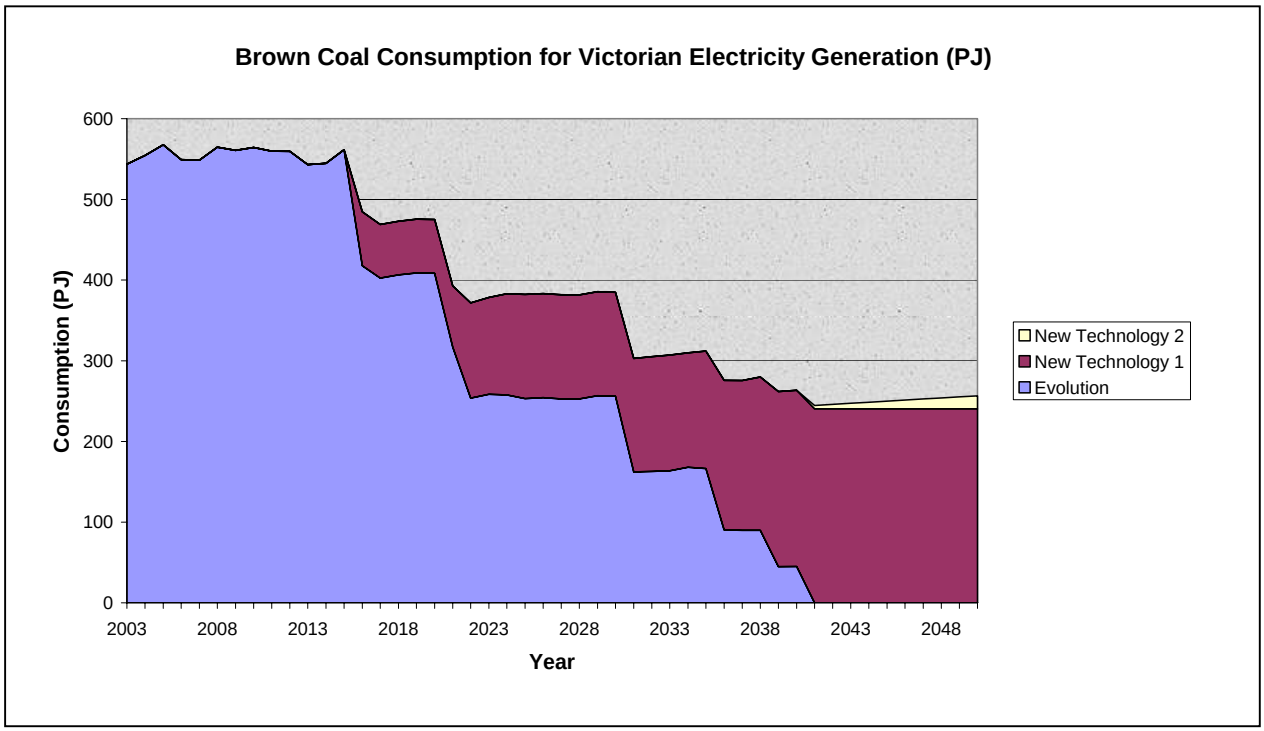


Figure D2 Scenario 1 – Coal Use for Power in PJ

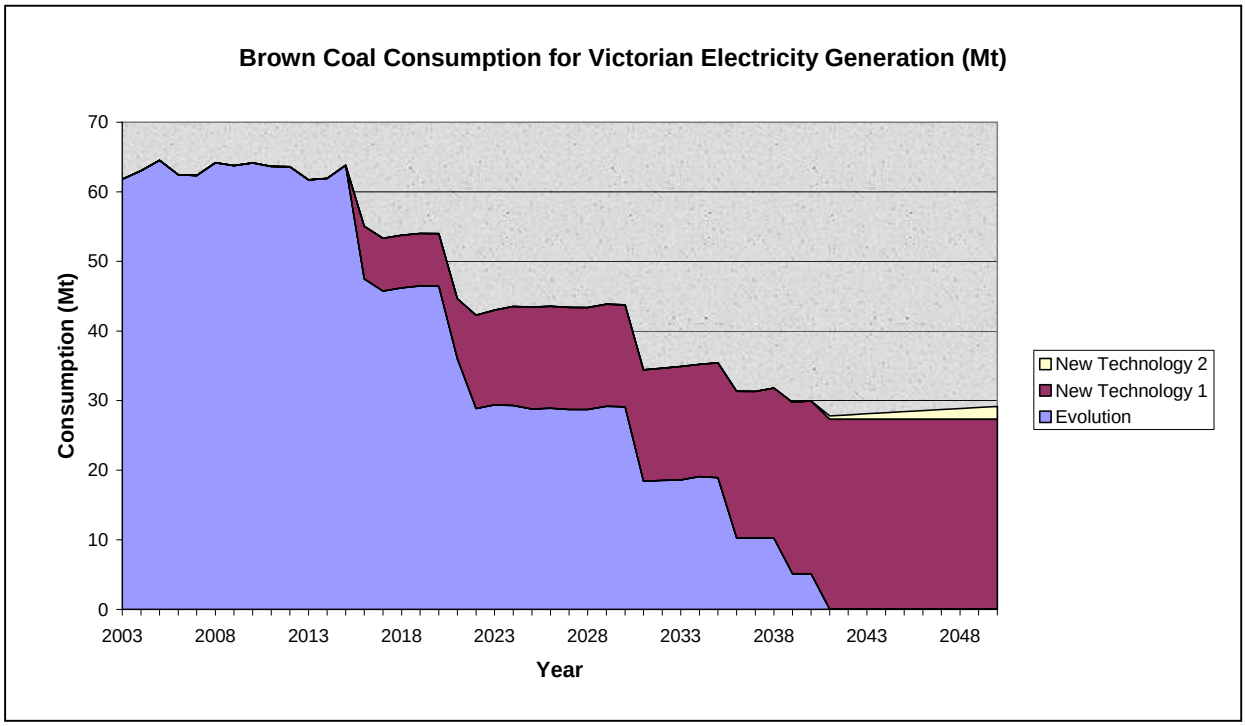


Figure D3 Scenario 1 – Coal Demand for Power (Mt)

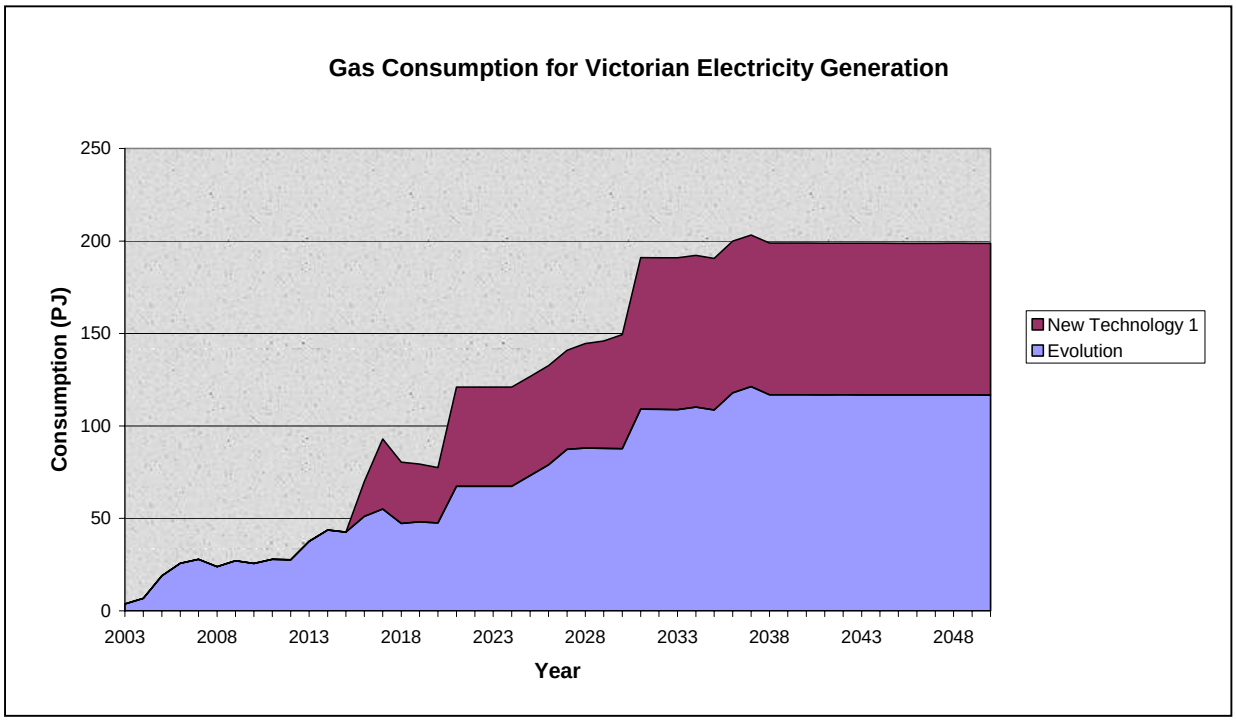


Figure D4 Scenario 1 – Gas Demand for Power (PJ)

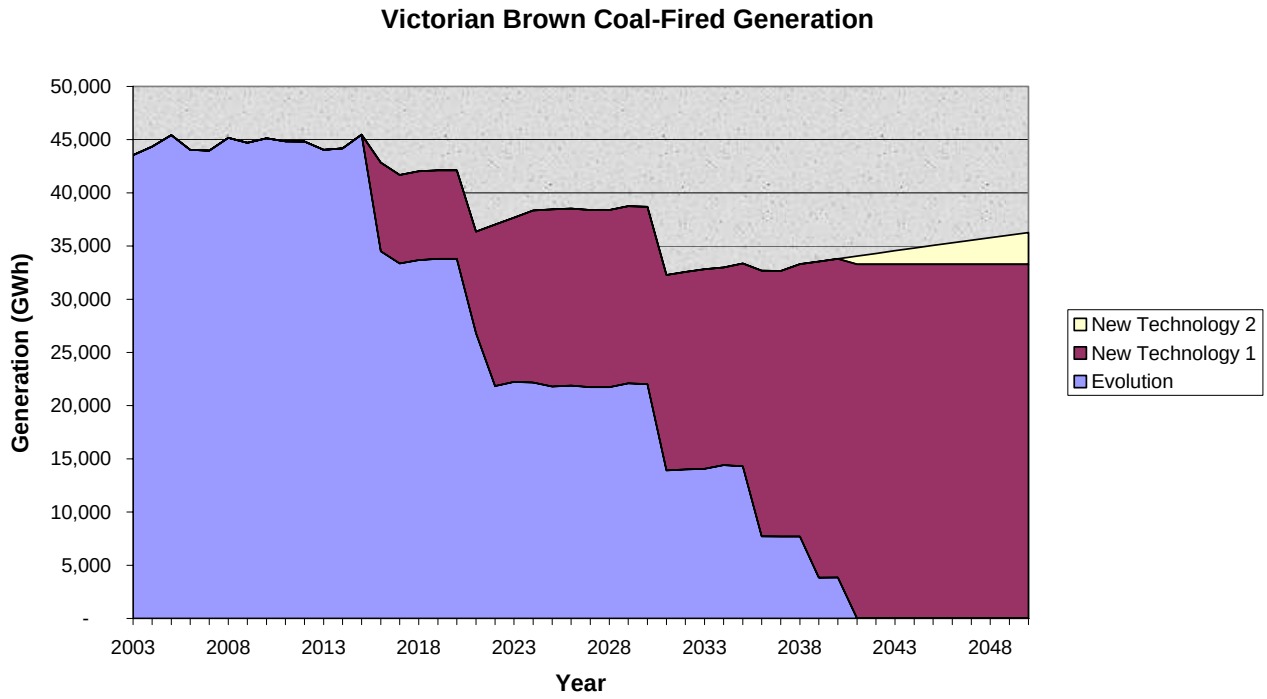


Figure D5 Scenario 1 - Coal Fired Generation (GWh)

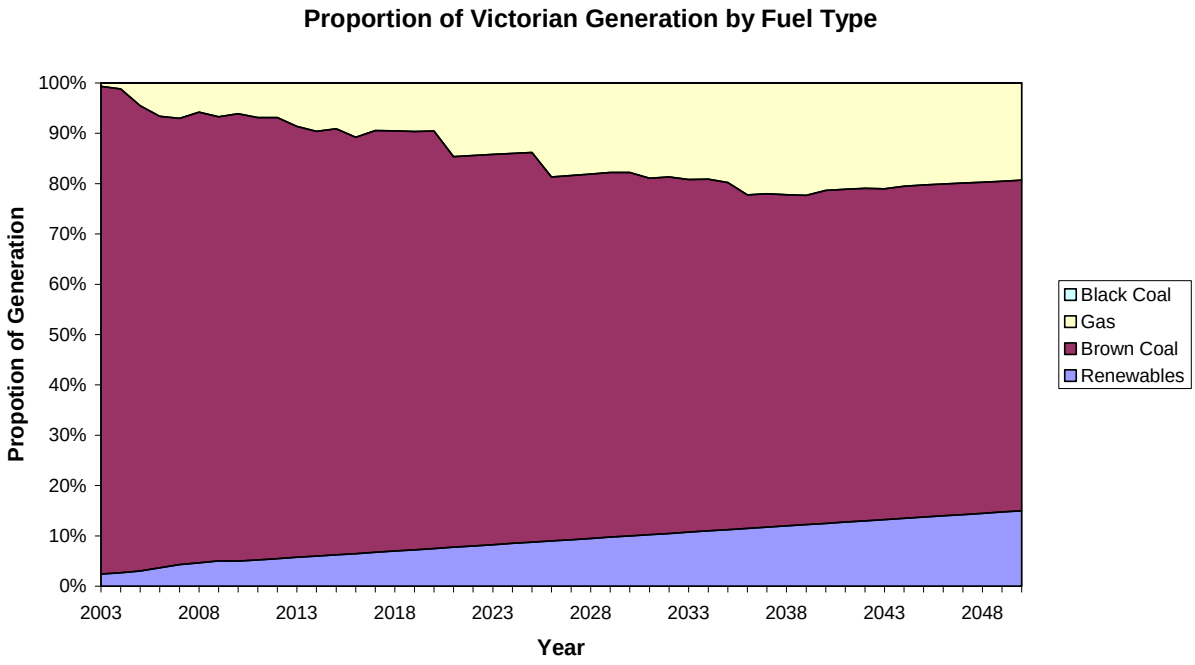


Figure D6 Scenario 2 – Energy Sources for Power Generation

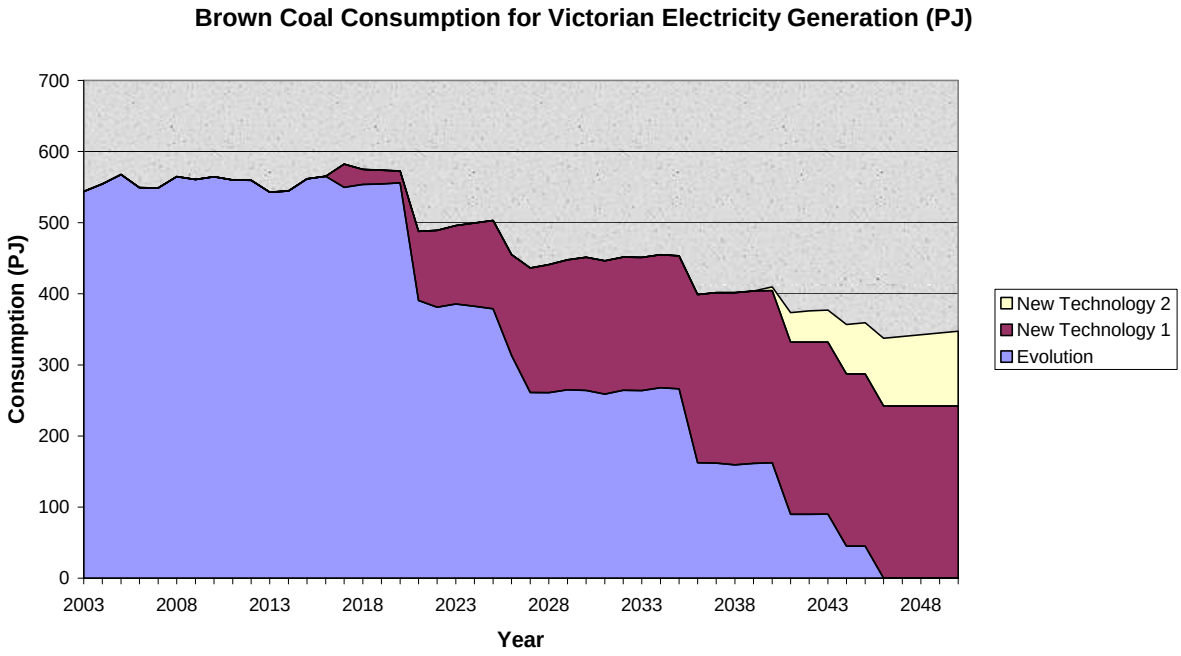


Figure D7 Scenario 2 - Coal Use for Power in PJ

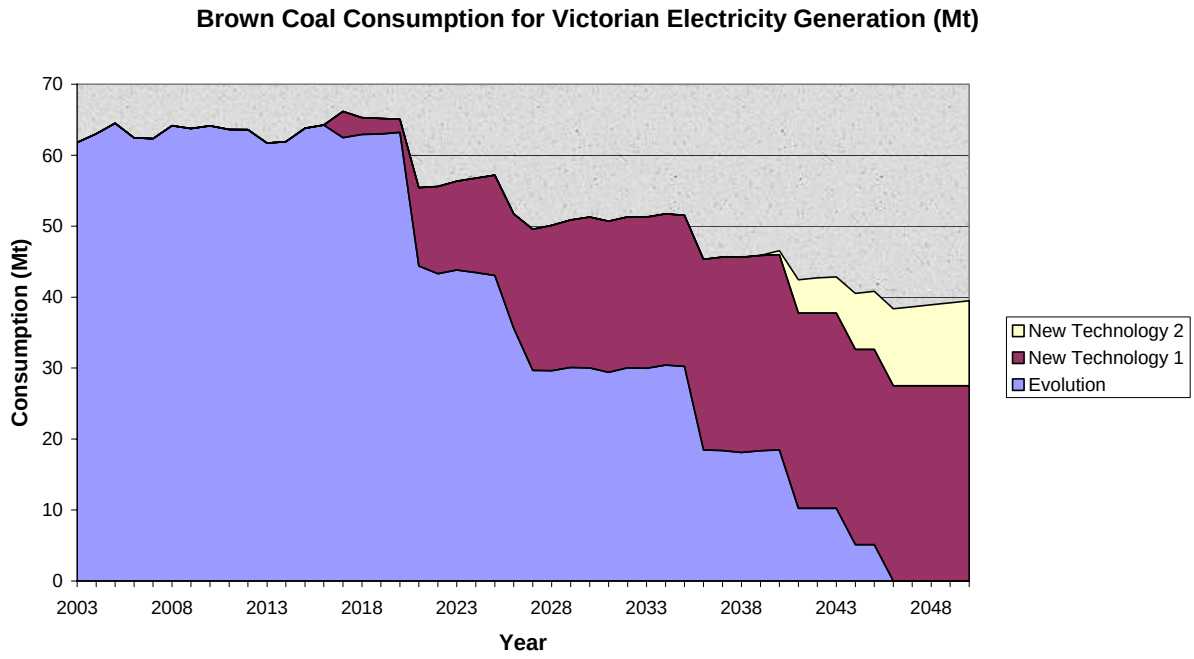


Figure D8 Scenario 2 – Coal Demand for Power (Mt)

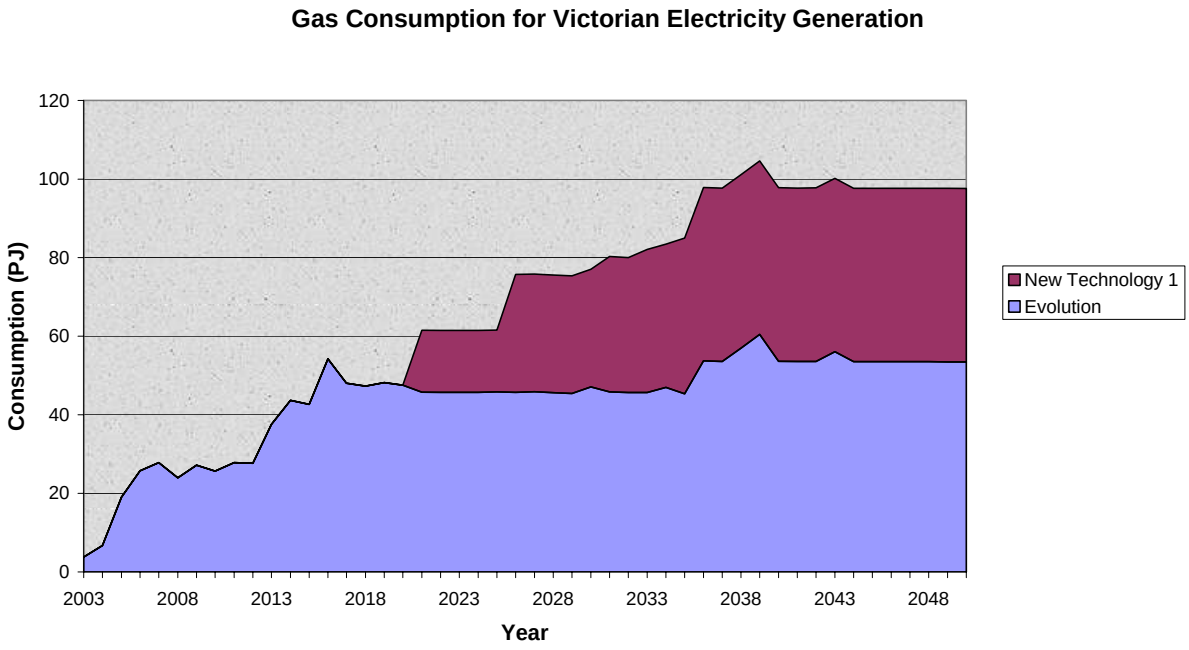


Figure D9 Scenario 2 – Gas Demand for Power (PJ)

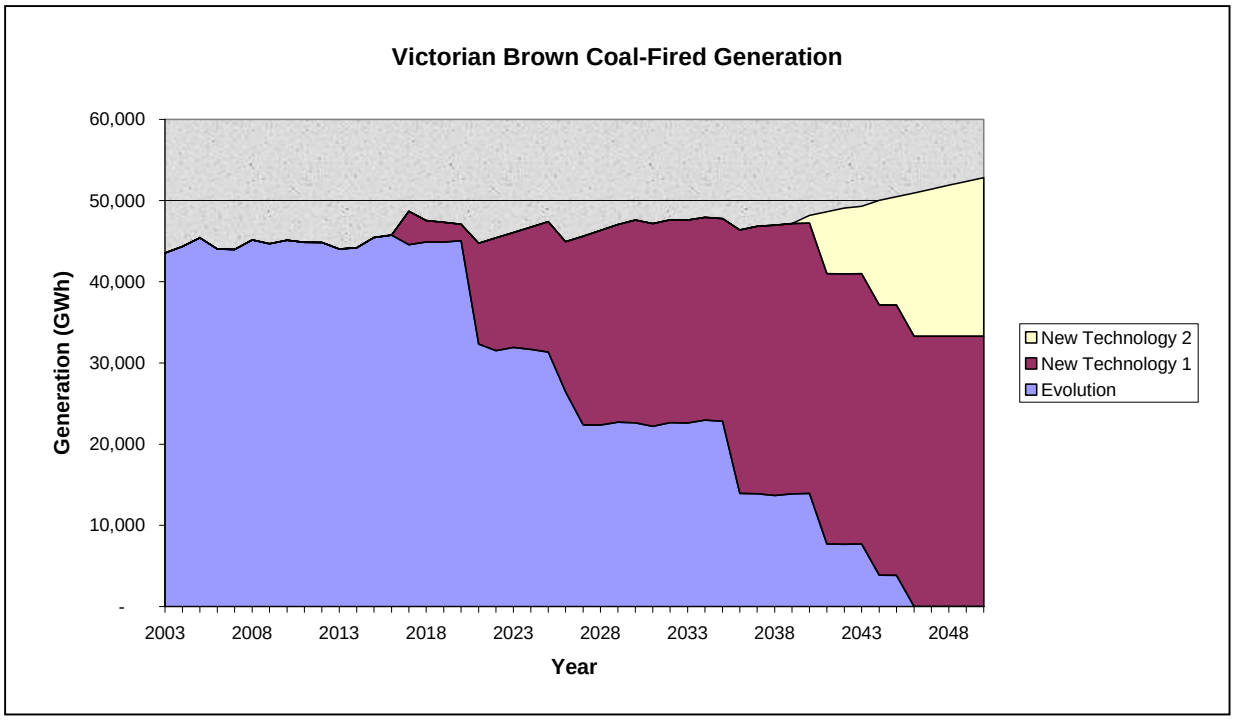


Figure D10 Scenario 2 - Coal Fired Generation (GWh)

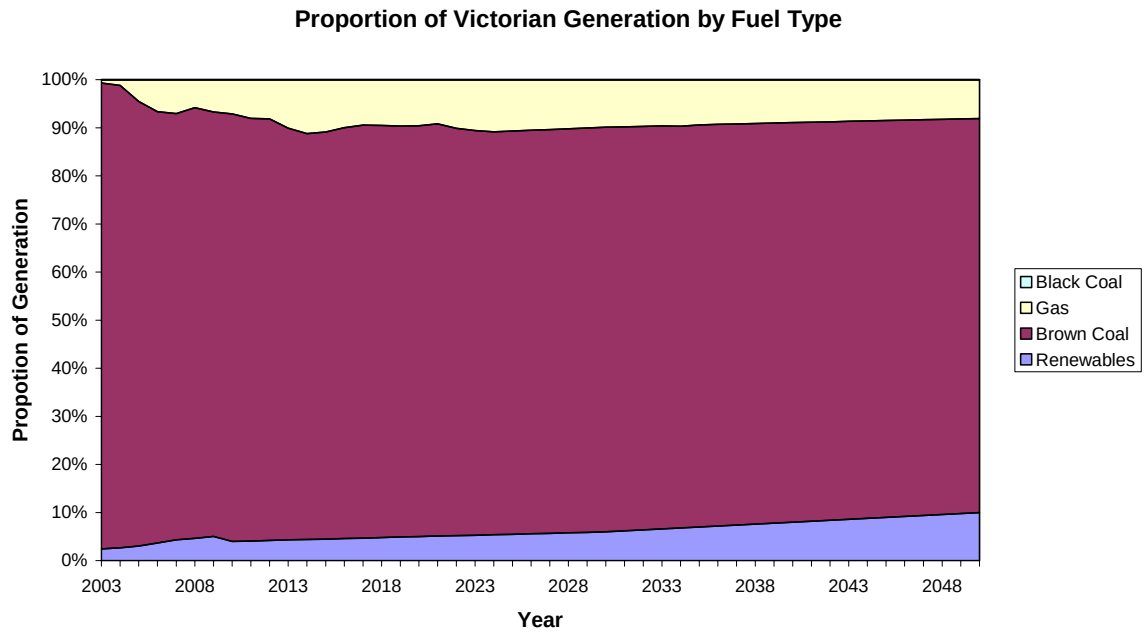


Figure D11 Scenario 3 - Energy Sources for Power Generation

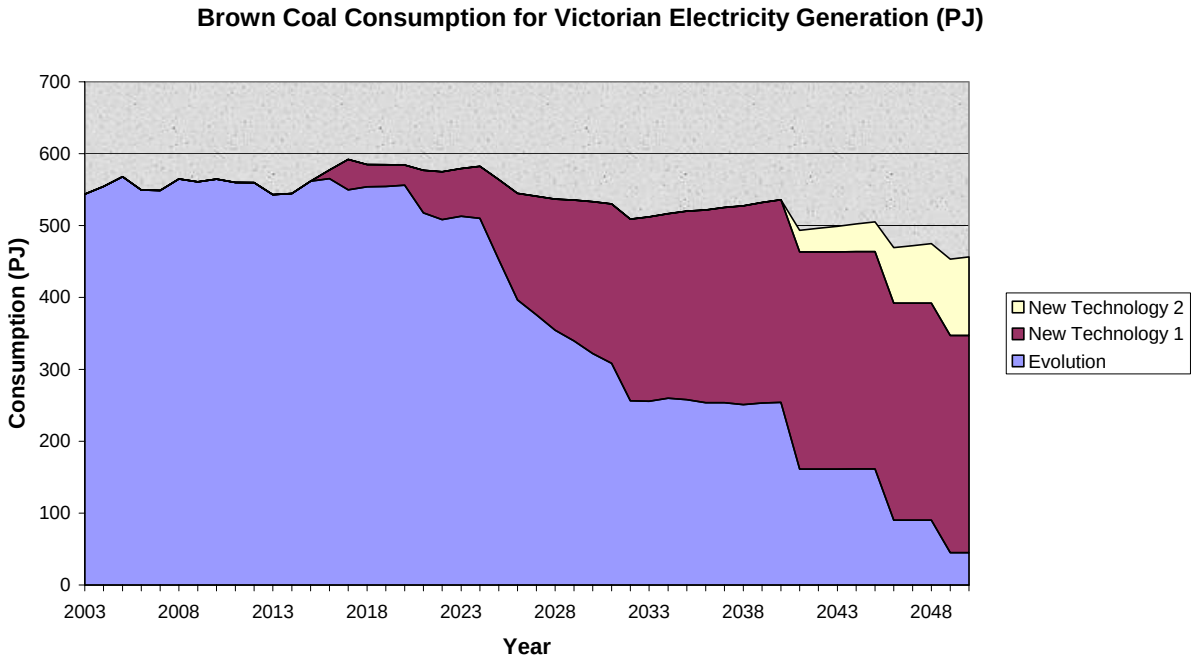


Figure D12 Scenario 3 - Coal Use for Power in PJ

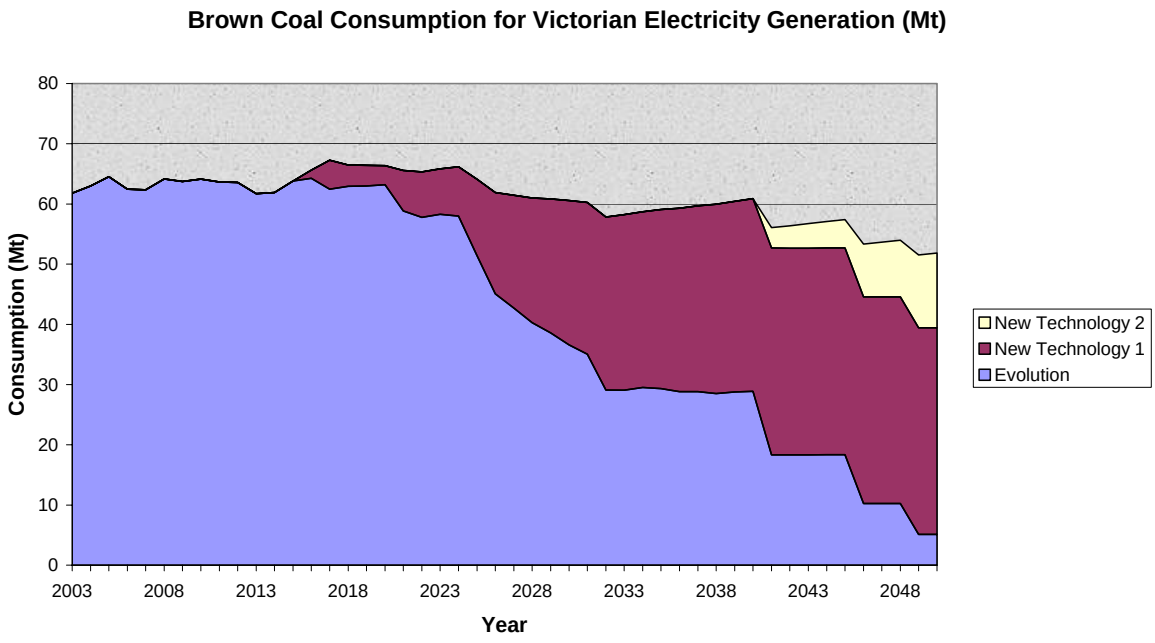


Figure D13 Scenario 3 – Coal Demand for Power (Mt)

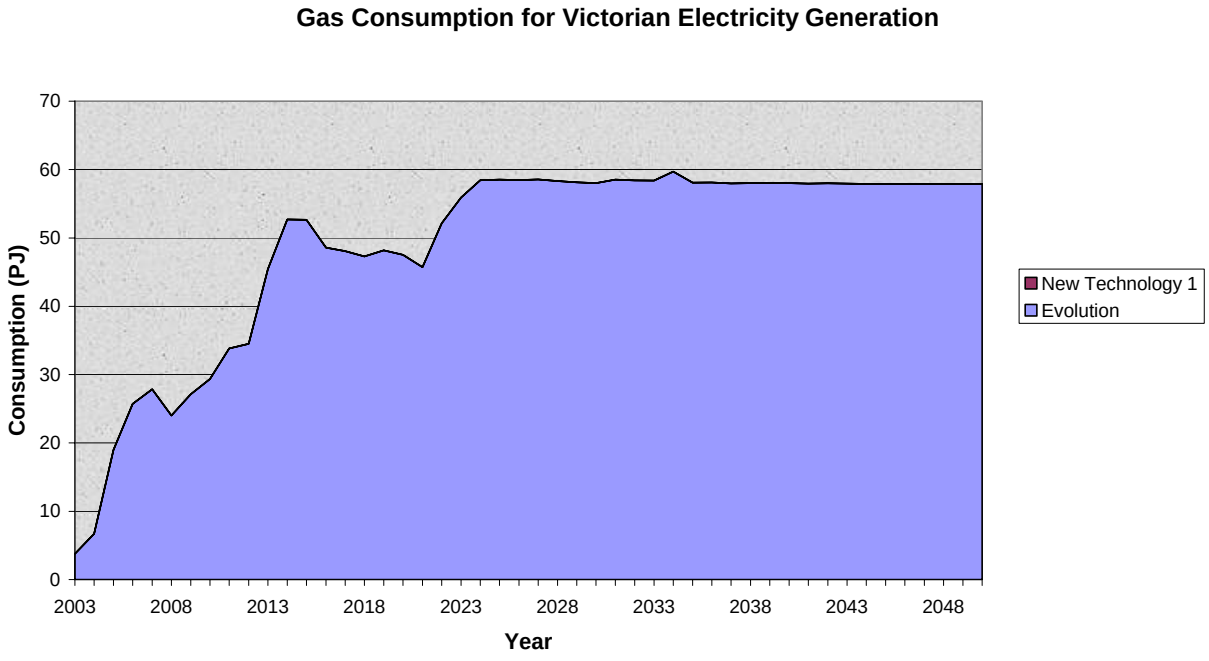


Figure D14 Scenario 3 – Gas Demand for Power (PJ)

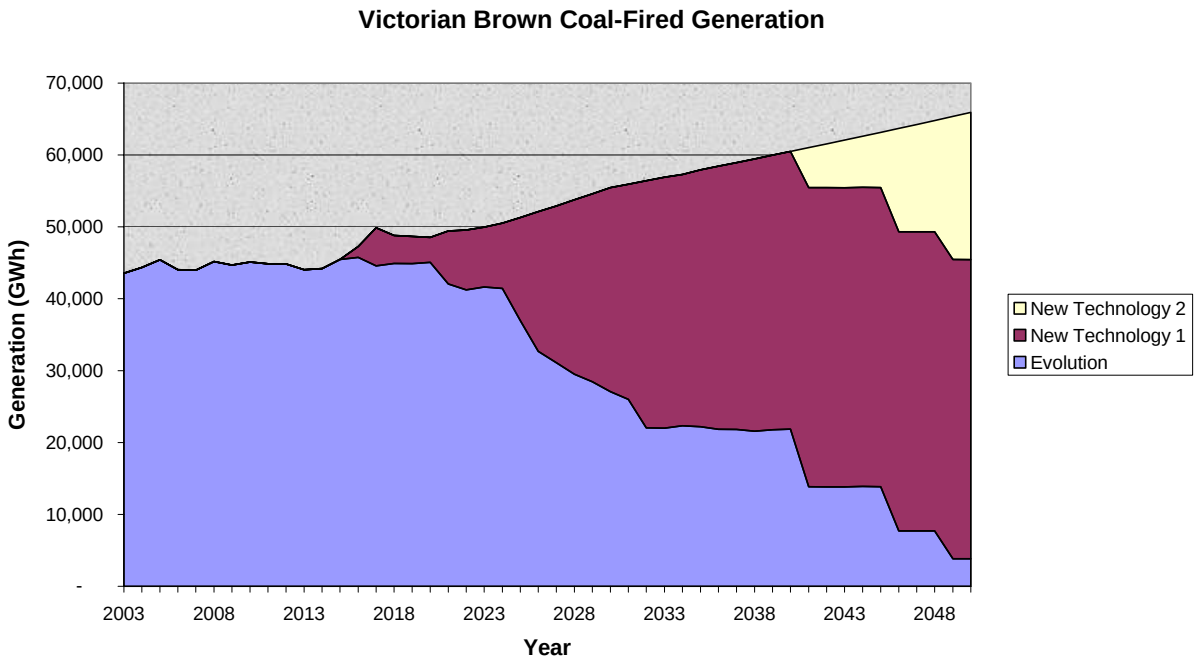


Figure D15 Scenario 3 - Coal Fired Generation (GWh)

Appendix E

Ranking of Future Coal Mining Areas

Latrobe Valley 2100 Coal Project
Qualitative Comparison of Coal Prospects - Geology/Mining

Coal Resource Area	Location	Strip Ratio 2:1	Strip Ratio 3:1	Resources 500 Mt	Resources 1500 Mt	Resources 3000 Mt	TOTAL SCORE	Geological Situation	Resource Definitioan	Project Desinated Number
		1	2	1	2	3	Max 5			
		< 1:1 = 0;		< 250 Mt = 0						
A	Corridor Field west of Morwell		2		2.5		4.5	Y, M1 and M2 seams, minor dip	well drilled, adjacent mines increase geological knowledge	A
B	Area between the Hazelwood Mine and potential Driffield Mine.		2	1			3	M1 & M2 seams, flat lying	well drilled, adjacent mines increase geological knowledge	B
C	Western side of the Hazelwood Cooling Pond and down to Yinnar		2		2		4	Multiple seams, eastern edge along Morwell Monocline, dipping strata	a number of geological gaps in knowledge base	C
D	Under Morwell Township		2			3	5	Y, M1 and M2 seams, minor dips. Yallourn seam high moisture content	well drilled, adjacent to Hazelwood mine increases geological knowledge.	D
E	East of Maryvale Field and north of Morwell township	1			2.5		3.5	Mainly Yallourn seam (also M1 and M2); score lowered 0.5 to discount deep coals which may not be economic close to Morwell	well drilled, adjacent to Yallourn mine increases geological knowledge.	E
F	Beneath APM	1				3	4	extension of western coalfield to the Morwell Monocline; dipping.	drilled but plenty of geological uncertainties	F
G	Under the Latrobe River		2	1			3	Yallourn seam.	infered	G
H	West of Loy Yang mine	1				3.5	4.5	All seams to M2B. Similar geology to Loy Yang. Massive 5 bn coal resources gains 0.5 score.	reasonably well defined	H
I	Between Loy Yang mine and Traralgon	1			2		3	Coal seams dipping and at considerable depth.	adequate drilling	I
J	Fernbank Field - south-east of Loy Yang	1			2		3	To T1 seam.	needs further drilling	J
K	north of the Rosedale Monocline and east to Rosedale	1			2		3	Coal seams close to the surface associated with the Rosedae Monocline. Seams steeply dipping.	further drilling required to fully define sub crop	K
L	Adjacent to Gormandale	1			2		3	Traralgon seams are present but additional work required to understand seaming across area.	a deal of uncertainty in resource assessment	L
M	south west of area H		1.5	0			1.5	Yallourn seam, small area probably an extension of coal depocentre at H; rating discounted by 0.5 due to likely impact of batters on strip ratio	not well defined	M
N	adjacent to Churchill		2	0			2	M1B seam, small area not well defined	not well defined	N
O	Coal between current Loy Yang Mining Licence Area and the APEL Exploration Area (Loy Yang have		2		2		4	multiple coal seams; moderately dipping; becoming quite deep on northern side; mining assumes development from Loy Yang or Flynn.	well drilled and known especially as adjacent to the Loy Yang mine.	O
P	Flynn Field (APEL have been granted an Exploration Licence		2			3	5	Yallourn to M1B seams; moderatley dipping	resource well defined	P
Q	Driffield (HRL have been granted an Exploration Licence		2	1			3	main coal resources within the M1 seam; steeply dipping on western side against the Yallourn Monocline.	resource well defined	Q
X	Deep coal beneath a possible Driffield mine	0		0			0	Mowell M2A seam but few resources	sufficient drilling	X
Y	Deep coal beneath planned Hazelwood mine	0.5		1			1.5	Morwell M2 seam, strip ratio ~1:1	sufficient drilling	Y
Z	deep coal beneath planned Loy Yang mine	0.5		1			1.5	M2 seam; but quite deep	sufficient drilling	Z
							0			

Discussion The coal deposit has a number of characterisitcs which impact its utilisation

These include: -

coal quality	moisture, ash, energy, fouling content all impact utilisation
strip ratio	coal : waste ratio [t : BCM]
	the higher the strip ratio the less waste needs to be mined per tonne of coal
coal depth	there might be an economic maximum depth of the mine

Latrobe Valley 2100 Coal Project
Qualitative Comparison of Coal Prospects - Environment (assuming Greenhouse gas emission meets Government Targets)

Coal Resource Area	Location	Major issues 1	2	Issues can be overcome 3	4	Few issues 5	TOTAL SCORE Max 5	Environmental issues envisaged	Project Desinated Number
		a project seen to have unacceptable environmental isses = 0							
A	Corridor Field west of Morwell			3			3	Morwell river relocation	A
B	Area between the Hazelwood Mine and potential Driffield Mine.			3			3	Morwell river relocation	B
C	Western side of the Hazelwood Cooling Pond and down to Yinnar			3			3	removal of Hazelwood cooling pond	C
D	Under Morwell Township	1					1	Environmental issues in relocation of part of Morwell township; proximity to remainder of Morwell township	D
E	East of Maryvale Field and north of Morwell township				4		4	close to Morwell, similar to Yallourn mine	E
F	Beneath APM					5	5	Assumed impact on Latrobe river minimised; envisaged no large environmental issues associated with removal of APM.	F
G	Under the Latrobe River	0					0	Latrobe river relocation	G
H	West of Loy Yang mine				4		4	need for groundwater reduction similar to Loy Yang	H
I	Between Loy Yang mine and Traralgon			3			3	high groundwater reduction and issues relating to avoiding settlement in town of Traralgon; close to Traralgon	I
J	Fernbank Field - south-east of Loy Yang			3			3	Flynn's Creek relocation	J
K	north of the Rosedale Monocline and east to Rosedale					5	5		K
L	Adjacent to Gormandale			3			3	Merrimans Creek; close to Gormandale	L
M	south west of area H					5	5		M
N	adjacent to Churchill		2				2	close to Churchill	N
O	Coal between current Loy Yang Mining Licence Area and the APEL Exploration Area (Loy Yang have				4.5		4.5	need for groundwater reduction similar to Loy Yang	O
P	Flynn Field (APEL have been granted an Exploration Licence				4.5		4.5	need for groundwater reduction similar to Loy Yang; minor diversion of Flynn's Creek	P
Q	Driffield (HRL have been granted an Exploration Licence					5	5		Q
X	Deep coal beneath a possible Driffield mine			3			3	moderate groundwater reduction and affects Morwell river	X
Y	Deep coal beneath planned Hazelwood mine			3.5			3.5	high groundwater reduction and issues relating to avoiding settlement in town of Morwell	Y
Z	deep coal beneath planned Loy Yang mine			3.5			3.5	high groundwater reduction and issues relating to avoiding settlement in town of Traralgon	Z

Discussion Environmetal issues: -

assumed greenhouse gas emissions meet government targets
assumed all projects achieve acceptable environmental standards in air, land and water

local issues

river diversions
culteral and heritage
closeness to community population centres requiring special controls for movement, noise, vibration, dust etc.

Latrobe Valley 2100 Coal Project
Qualitative Comparison of Coal Prospects - Community (assumes all projects give similar economic benefits from the coal development)

Coal Resource Area	Location	Major issues 1	2	Issues can be overcome 3	4	Few issues 5	TOTAL SCORE Max 5	Envisaged Community Issues	Comments	Project Desinated Number
		unacceptable projects from a community perspective = 0								
A	Corridor Field west of Morwell			3			3	Main Melbourne LV road and rail transport corridor will need relocating; mining close to Morwell	Transport corridors can be relocated but expect some community disadvantages and changes affect total LV population	A
B	Area between the Hazelwood Mine and potential Driffield Mine.					5	5		little impact on community foreseen	B
C	Western side of the Hazelwood Cooling Pond and down to Yinnar			3			3	Yinnar - Brodrib road, Hazelwood Cooling Pond	easy engineering solutions with limited community impact	C
D	Under Morwell Township	0					0	Morwell Township	10,000 people would need relocating	D
E	East of Maryvale Field and north of Morwell township				4		4	Southern part of resource - 5 acre housing; mining near to Morwell		E
F	Beneath APM	1					1	Australian Paper Mill - A major paper making facility important for employment	could be a future resource beyond life of paper mill	F
G	Under the Latrobe River				4		4	Heritage issues associated with Latrobe River		G
H	West of Loy Yang mine				4.5		4.5	A number of houses and secondary roads		H
I	Between Loy Yang mine and Traralgon	1					1	Crosses Traralgon By-Pass route and encroaches on Traralgon Buffer	Road not yet constructed but alignment in this area nearly "fixed". This would need relocation with some community impact. Encroaching on the Traralgon buffer zone impacts say 2000 people	I
J	Fernbank Field - south-east of Loy Yang					5	5			J
K	north of the Rosedale Monocline and east to Rosedale					5	5			K
L	Adjacent to Gormandale			3			3	Adjacent to Gormandale, farms, minor roads etc	relocation of housing or setting up buffers will be required	L
M	south west of area H					4.5	4.5	small landholdings		M
N	adjacent to Churchill	1					1	Adjacent to Churchill township	would have a significant impact on Churchill and the area to the north of the university precinct.	N
O	Coal between current Loy Yang Mining Licence Area and the APEL Exploration Area (Loy Yang have application pending)					5	5			O
P	Flynn Field (APEL have been granted an Exploration Licence					5	5		few community issues envisaged	P
Q	Driffield (HRL have been granted an Exploration Licence				4		4	a few houses		Q
X	Deep coal beneath a possible Driffield mine					5	5		mining into the base of exisiting mine	X
Y	Deep coal beneath planned Hazelwood mine				4		4	concern of settlement in town of Morwell	mining into the base of exisiting mine	Y
Z	deep coal beneath planned Loy Yang mine				4		4	concern of settlement in town of Traralgon	mining into the base of exisiting mine	Z

Discussion Community issues: -

acceptable minimum distance from community centres (bigger buffers are better)
changes to local and regional roads and other community facilities (no lessening is assumed)
projects which minimise the use of land, avoids relocation of people and retains country aspect considered best
projects that enhance community values (especially visual, dust, noise, rehabilitation etc.)

Latrobe Valley 2100 Coal Project
Qualitative Comparison of Coal Prospects - Economic Assessment (assumes all projects reach similar, acceptable standards)

Coal Resource Area	Location	mining costs high 0	mining costs medium 1	mining costs low 2	infrastructure costs low 1	environment costs low 1	community costs low 1	TOTAL SCORE Max 5	Comments on Mining Costs	Envisaged high cost for other issues	Project Desinated Number
		excessive costs = -1			excessive costs = -1; high costs = 0						
A	Corridor Field west of Morwell			2	0	0	1	3	low due to adjacent mines for starting operations and overburden dumping	Main Melbourne - LV road and rail transport corridor relocation; Morwell river relocation	A
B	Area between the Hazelwood Mine and potential Driffield Mine.		1.5		1	0	1	3.5	mining cost with extension from future mines. More expensive if taken earlier.	Morwell river relocation	B
C	Western side of the Hazelwood Cooling Pond and down to Yinnar		1		0	0	1	2	narrow mining area	Removal of Hazelwood Cooling Pond; relocation of Yinnar road and of main HV Transmission Lines.	C
D	Under Morwell Township			2	-1	0	-1	0	low due to adjacent mines for starting operations and overburden dumping	moving Morwell township and relocation of transport corridor	D
E	East of Maryvale Field and north of Morwell township			2	0.5	1	0.5	4	low due to adjacent mine for starting operations and overburden dumping	roads to north of Morwell; moving houses on north outskirts of Morwell	E
F	Beneath APM		1		-1	1	0.5	1.5	assumed to follow E. Mining to the Morwell Monocline;	moving APM; roads and local housing	F
G	Under the Latrobe River		1		1	-1	1	2		relocating Latrobe river	G
H	West of Loy Yang mine			2	1	0	1	4	low due to large area and good strip ratio	some realignement of Traralgon Creek may be necessary	H
I	Between Loy Yang mine and Traralgon		1		0	0	0	1	mining costs get more expensive as mine moves down dip towards north	moving Traralgon by-pass; and a number of houses	I
J	Fernbank Field - south-east of Loy Yang		1		1	1	1	4	assumed mining can be carried out for medium costs		J
K	north of the Rosedale Monocline and east to Rosedale		1		1	1	1	4	thin mine, need to get to low strip ratio to get sufficient coal		K
L	Adjacent to Gormandale		1		1	0	0	2		Merrimans Creek relocation; protecting Gormandale from affect of mining	L
M	south west of area H	-1			1	1	1	2	mining costs high unless part of H		M
N	adjacent to Churchill	-1			1	1	0	1	small area - mining costs high	need to relocate housing; minimise impact on Churchill. Unknown impact on University Precinct	N
O	Coal between current Loy Yang Mining Licence Area and the APEL Exploration Area (Loy Yang have application pending)		1.5		1	1	1	4.5	medium to low mining cost with extension from future mines. More expensive if taken earlier.		O
P	Flynn Field (APEL have been granted an Exploration Licence			2	1	0	1	4	large area, good strip ratio, low mining costs.	minor realignment of Flynn's Creek	P
Q	Driffield (HRL have been granted an Exploration Licence			2	1	1	1	5	medium resource, good strip ratio, low mining costs	assumed mine has no impact on planned Morwell river alignment	Q
X	Deep coal beneath a possible Driffield mine	0			1	1	1	3	deep mining costs, especially with little availble resource. Not avaialble for 30 years		X
Y	Deep coal beneath planned Hazelwood mine	0.5			1	1	1	3.5	deep mining costs, with addition dewatering requirement.		Y
Z	deep coal beneath planned Loy Yang mine	0.5			1	1	1	3.5	deep mining costs, with additional dewatering requirement. Not avaialble for 30 years		Z

Discussion The economics of a project: -

access to cheap coal
coal is suited to conversion process to electricity, hydrocarbons and other products
few costs associated with infrasructure, community or environmetal rectification measures

Appendix F

National Electricity Market

Paper supplied by MMA.

1 Development of the National Electricity Market

The electricity industry in the eastern states of Australia has been disaggregated both vertically and horizontally. An objective of deregulation was to promote competition in the electricity industry by breaking up the monopoly elements and creating two competitive markets:

- The Wholesale Market in which energy is generated, sold and traded on the spot market between the market participants; and
- the Retail Market where participants buy from the pool, enter hedging contracts with generators and other market participants to manage their price and volume risks and on-sell to retail customers under supply contracts that bundle together energy, ancillary services, network services and customer service.

While Victorian and South Australian electricity companies have been sold or their assets leased to private interests, the electricity industry in NSW and Queensland is still mainly in the hands of government owned corporations. Since deregulation, however, private companies such as Intergen and Origin have established substantial generation businesses in Queensland.

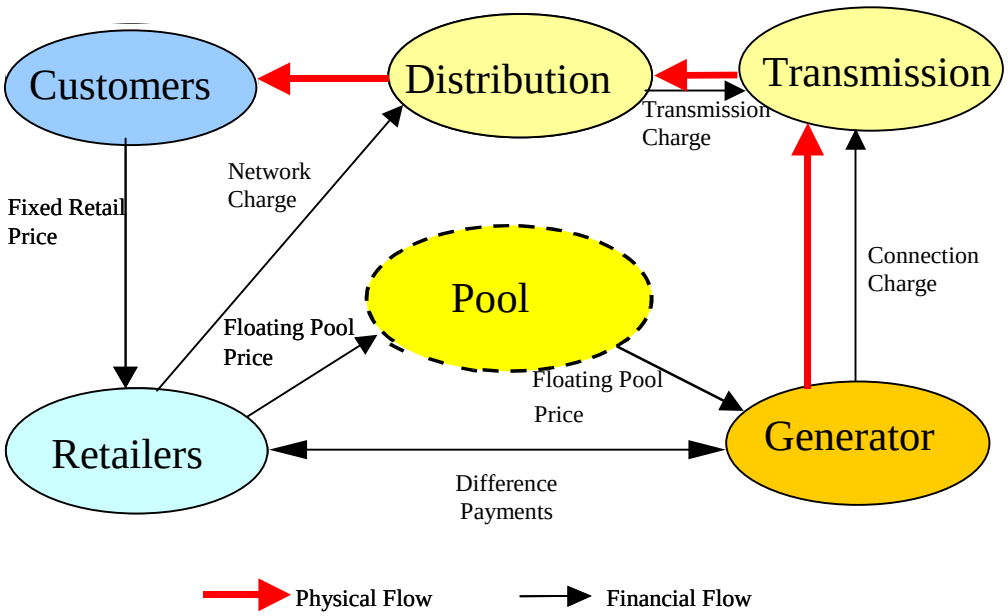
The NEM operates through an interconnected transmission system that joins electricity grids in Queensland, NSW, Victoria and South Australia under the auspices of the National Electricity Market Management Company (NEMMCO).

NEMMCO operates the centralised dispatch process of the pool by receiving price and volume offers from the generators and dispatching the units according to their merit order to meet market demand. The market price is set by the market clearing engine based on the dispatch volumes and prices offered by the generators. NEMMCO issues control instructions to market participants in accordance with the clearing of their bids and publishes the half-hour market price as the average of the 5 minute dispatch interval marginal prices during the half-hour settlement period. The dispatch prices are set by the marginal unit that is load following in each dispatch cycle. Inflexible generation does not set the market price.

The NEM evolved with the creation of a contract market to manage participants' risk associated with volume and price. Financial instruments have been developed to allow retailers and generators manage their risk of trading in the electricity pool. Through contracts which pay the difference between the spot price and a negotiated contract strike price, buyers and sellers are effectively able to fix the price of a fixed volume of electricity and remove the price risk on that volume of energy under the contract. Wholesale pool prices have been volatile which led to more liquidity in the contract market especially in trading short term contracts to cover peak periods.

Figure F1 shows the electricity market physical and financial flows:

Figure F1 NEM Physical and Financial Flows



2 Electricity Market Structure

2.1 Wholesale

The wholesale spot market is based on the physical system in the NEM regions. The supply and demand characteristics of each NEM region determine NEMMCO's dispatch instructions that ultimately set the wholesale pool price. Table F1 summarises the existing supply and demand conditions of the various NEM regions.

Table F1: Demand and Capacity (2003/04)

Region	Peak Demand (MW)	Capacity (MW)
New South Wales	12,476	12,349
Victoria	8,574	8,496
Queensland	7,103	9,835
South Australia	2,604	3,448
Tasmania**	1,684	2,508
Snowy		3,676

The principles for the operation of the wholesale spot market are:

- Supply demand balance - ensure that supply and demand are balanced at all times, otherwise load shedding of customers is instructed which may lead prices to reach the Value of Lost Load (VoLL) cap of $10,000/MWh
- Economic efficiency - achieve economic efficiency at a "clearing price" at which supply offered will meet demand quantity
- Centralised pool - instantaneous supply/demand balance across all regions
- Dispatch - scheduling "least cost" combination of options to balance supply and demand including inter-regional flows having regard to transmission losses
- Pool price – to set market price = marginal price = bid price of highest price resource dispatched to follow the load variation

2.1 Retail

Retailers purchase their electricity from the wholesale pool to meet customer demand. Prior to full contestability, retailers were assigned vesting contracts with the generators for the franchised customer segment which helped retailers and generators in managing their overall risks. Under Full Retail Contestablity (FRC), all Victorian customers including residential customers can purchase electricity from the retailer of their choice.

2.2 Transmission and Distribution Network

While the retail and wholesale sectors of the NEM are open to competition and the market sets prices, transmission and distribution networks remain monopolies in their local areas. Distribution businesses own and operate the low and medium voltage distribution networks. These networks connect all customers (except the very largest, e.g. smelters) and retailers in return for distribution use of system charges. State based regulators regulate these monopoly charges.

The transmission function is separated into two or three different entities (depending on the state). NEMMCO, besides operating the wholesale market is also the transmission system operator for the whole NEM. State based transmission network companies connect distributors, large customers and generators to the grid and levy transmission use of system and connection charges for this function. In the main, these transmission network companies also undertake the network planning, pricing and new transmission investments roles except in Victoria where a separate company (VENCorp) has responsibility for these functions.

2.3 Embedded generation

Locating a generator away from generation rich areas (like Central Queensland and the Latrobe Valley in Victoria) to areas where loads exist may bring benefits in the form of reducing the costs of transmission. These benefits may in reduced transmission losses, reduction in transmission use of system charges and deferral of transmission system augmentation. In addition, system benefits may be available from the establishment of an embedded generator through improvements in the quality and reliability of supply and the ability to provide voltage support.

Embedded generators may also provide some ancillary benefits in terms of voltage support during peak usage periods by supplying reactive power in high load areas. Such support may be crucial during peak periods in preventing voltage collapse in the entire network. While embedded generation will generally bring locational benefits if it is embedded in a load rich area, the Victorian Latrobe Valley is a generation rich area. As a result, some of these potential benefits of embedded generation may be lost (eg deferral of transmission system augmentation).

2.4 Regulation

Regulatory oversight in the NEM is provided at three levels. At an operation and administrative level, participants have to observe the requirements of the National Electricity Code. The National Electricity Code Administrator (NECA) ensures that participants do not breach Code provisions. NECA evaluates and recommends Code changes and administers the Code change process in response to market developments. The final decision on Code changes rests with the ACCC.

Pricing regulation of networks takes place at two levels; the ACCC regulates transmission prices, while state based regulators perform the same role for distribution prices. Transmission and distribution prices are reset every 5 years with regulators performing a price review. These reviews determine the average prices that network service providers may charge their customers and also determine the annual price path (usually on a CPI-X basis) until the next price review.

With the start of full retail competition, state regulators also advise Governments on maximum retail tariffs which provide a cap on retail tariffs charged to residential and other small customers. Retailers are free to strike prices below these caps. Retail prices to large and medium size customers remain fully open to market forces and no caps are in place for such

customers. Wholesale prices are not regulated subject to the maximum price of VoLL currently set at $10,000/MWh. There is also an administered price cap which may be applied by NEMMCO during adverse conditions arising from market failure.

In a recent development, COAG has agreed to establish the Australian Energy Regulator (AER). The AER is to be independent in its decision making, but through its close links to the ACCC is to take an approach consistent with competition law. The current situation of multiple (state based) regulators has led to a situation where regulatory inconsistencies have arisen. The AER will aim to achieve national consistency in regulating electricity and gas transmission and distribution.

The AER will initially assume the regulatory and monitoring roles of NECA and the ACCC in regulating the transmission network service providers and providing an oversight on generation competition. NECA's role in administering and setting the rules of the National Electricity Code will be transferred to the Australian Energy Market Commission (AEMC) which will also have responsibilities over the Gas Code. The transfer of the regulatory functions to the AER and AEMC is expected to occur before the end of 2004 for the transmission system and the operations of the wholesale market. When a framework for regulating distribution and retail is established, the AER will assume responsibility for electricity distributors and retailers from the state based regulators. This is expected to be in 2006.

3 Market Operation

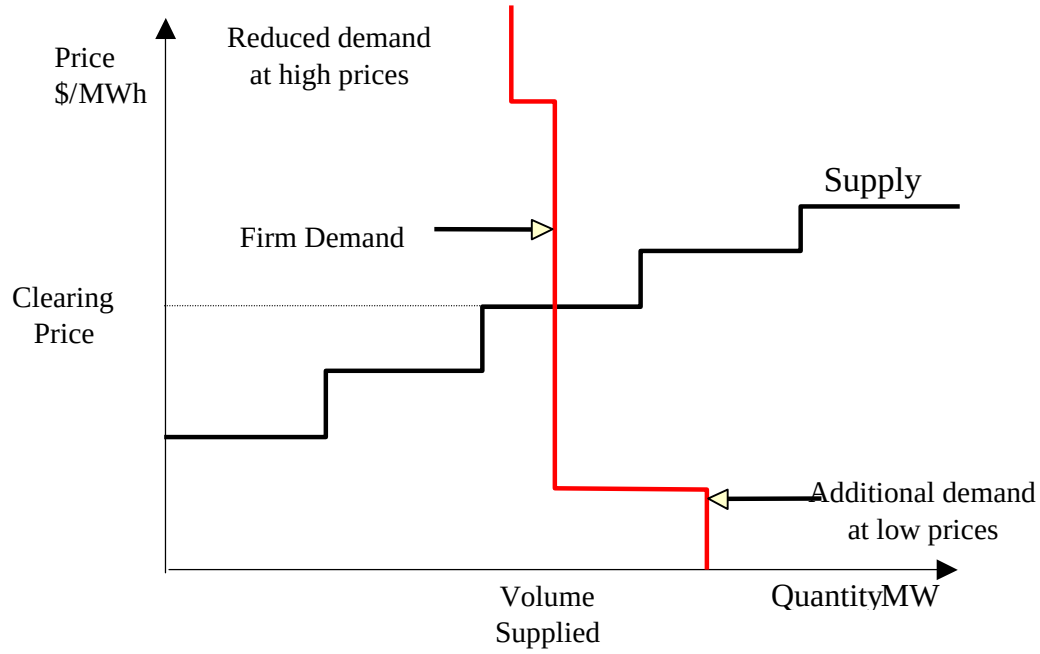
Prices in the electricity spot market are a result of the balance of supply and demand. The key features of this are:

- A spot market price is based the balance of supply and demand over each five minute dispatch interval.
- Electricity generators offer to sell power for each generating unit up to 10 segments of price versus volume with prices increasing as volume increases. The rising stepped line in Figure F2 illustrates how a set of generator offers might be understood as a mathematical relation between price and volume. The volumes in each segment may be varied during the day based on such factors as generating plant availability or fuel supply constraints. Generators are free to offer a wide range of prices up to VoLL, currently set at $10,000 per MWh.
- Customers may submit bids to buy electricity which by default are treated as priced at VoLL unless otherwise stated. Blocks of load may be bid at lower prices so that they are withdrawn if spot prices exceed the bid price level. Customers may also offer blocks of

load that are normally disconnected, to be connected whenever the spot market price falls below the offer price. This provides the opportunity to limit low value uses of electricity to periods of low prices and spare capacity. The combined effect of demand-side bids in principle appears as the downward sloping stepped function shown in Figure F2.

- Each five minutes, a spot market price is set by the intersection of the supply and demand bid/offer stacks as shown in Figure F2. The last accepted offer for supply to meet the demand sets the market price. Any supply segment or demand-side bid which is inflexible and cannot respond to changes in supply and demand cannot set the market price.

Figure F2: Supply and Demand for Electricity



- All electricity is traded through the spot market and is cleared at the spot price. Generators sell and customers buy at the spot price in a particular region. The settlement price is calculated for each half-hour as the average of the six prices established for the 5-minute dispatch intervals in that half-hour. The same price applies to all energy in that half hour in the applicable region.

- Prices received and paid are referred to a Regional Reference Node by Marginal Loss Factors (MLF) so that pricing and dispatch of generation is economically efficient. Thus a generator would be paid 97% of the price at the Queensland South Pine node for its sent-out electricity if it is located in a Queensland region that has an assessed MLF of 0.97.

Similarly, a Queensland load with an MLF of 1.06 would pay 106% of the South Pine price for its electricity consumption.

- Energy flows between NEM regions are dispatched so that the bid and offer stack is cleared in each region consistently with Inter-Regional Marginal Loss Factors. These are defined according to marginal losses in the transmission networks connecting the adjacent Regions. If lower priced electricity is available in NSW or Victoria than the current spot price in Queensland, dispatch would be adjusted so that the lowest priced electricity across the whole NEM would be used first having regard to the marginal cost of transmission between regions. The inter-regional marginal loss factors are set every five minutes based on inter-regional power flow and regional demands and generation patterns.

Whilst this process is very efficient at managing the dispatch of diverse sources of electricity, it does not enable buyers and sellers to manage the risk of spot price volatility. Due to changes in weather affecting electricity demand, disturbances affecting the performance of generation and transmission plant, the participants' risk appetite and competitive behaviour, and the dynamic interactions between parties attempting to optimise the extraction of value from the electricity market, the electricity price can be very volatile and uncertain. Participants protect their positions in the market through financial Hedge Contracts. Hedge Contracts are a mechanism to offset the spot price volatility by exchanging a cash flow based on the spot market price with a cash flow based on a fixed price. Parties who have opposite exposures to the spot price can both reduce their net exposure to the spot market. Contracts can be as short as a few hours in a day or as long as participants decide.

4 Supply and Demand Situation for Each Region

The following sections provide a very brief summary of the supply demand balance in each region.

4.1 New South Wales

The NSW market has been oversupplied since the late 1980s when Bayswater Power Station was completed. Deregulation and the development of a competitive market has also helped to improve the availability of large coal fired stations from 60-70% up to 90-95% thus reducing the need for reserve capacity from 30% above peak demand , down to 18% above peak demand. Other causes of oversupply are

- The development of the Queensland NSW Interconnection (QNI) has resulted in additional surplus power being delivered to NSW.

- The Australian Governments 9500 GWh Renewable Energy Target has stimulated small scale distributed generation such as wind and biomass which has contributed to meeting growth in demand.

As a result, the NSW market is expected to have sufficient capacity until about 2011 although some peaking plant or demand side response may be needed sooner to manage extreme weather demand risk.

4.2 Victoria

The Victorian region has been well served by the improved performance of its brown coal power stations under competitive market operation and private ownership. Despite their age, the large brown coal units in the Latrobe Valley have been successfully refurbished based on life-cycle maintenance principles. With the development of the proposed 320MW Laverton North gas fired plant and Basslink with a peaking capacity of 540 MW[10] by summer 2005/06, we expect that committed and nearly committed projects will be sufficient to provide reliable supply to the Victorian region till 2013. Again, some additional demand side response will be needed to manage extreme events that could not be economically supplied by open cycle gas turbine generating capacity.

We can also expect some development of small scale projects such as wind farms and other renewable energy projects. There is further potential to upgrade the Snowy to Melbourne transmission by another 400 MW on a relatively short lead time, so with NSW having spare capacity for high growth until 2011, there is a reasonable prospect that unexpected changes in demand can be managed.

In the event of higher than expected growth, there are a number of additional projects in the pipeline to meet additional demand. These include:

- As stated above, a further 400 MW regulated upgrade of the interconnection between Snowy and Melbourne
- a potential 500 MW combined cycle plant near Colac (was proposed recently by Origin Energy)
- a 200 MW cogeneration project proposed by Duke Energy at Maryvale in the Latrobe Valley and
- several smaller cogeneration projects in the 10 MW – 120 MW size.

[10] Basslink will have a peak capacity of 600 MW for up to 8 hours but it is expected that optimal utilisation and capacity limits in Tasmania will result in an average support level of about 540 MW to Victoria.

4.3 Queensland

Queensland is the fastest growing state in Australia due to industrial development and tourism playing a significant part in the state's economy. Hot and humid summers in the last few years have stimulated growth in air-conditioning demand. With the new capacity at Millmerran, Swanbank E and Tarong North, Queensland will have adequate capacity until 2007 even for high growth. This however does not include allowance for the proposed Aldoga aluminium smelter near Gladstone or other prospective major load developments in Queensland.

The 700 MW Kogan Creek project has been approved and together with the proposed combined cycle plant at Townsville would provide capacity to meet likely additional load to about 2010.

4.4 South Australia

Until the completion of Pelican Point, the South Australian region has experienced supply constraints on extremely hot summer afternoons. This potential capacity shortage has recently been alleviated by several developments which should provide sufficient capacity until about 2009. These include:

- The completion of the 487 MW Pelican Point in April 2001
- The 96 MW Quarantine open cycle plant in March 2002
- The development of 180 MW capacity at Hallett.
- The refurbishment with improved performance and reliability of Playford Power Station in 2003/04

4.5 Tasmania

Supply to Tasmania will be influenced by energy balancing issues rather than peak capacity. Basslink will enable the energy reserves in the Hydro system to be managed more efficiently. The BassGas pipeline will enable competitive fuel supply to be provided to Bell Bay Power Station to supplement energy reserves and cover for a long-term outage of Basslink due to cable damage. The development of wind energy in Tasmania will also supplement the energy reserves by enabling the hydropower to be turned down when the wind is strong.

Overall we expect that Tasmania will have adequate capacity to about 2015 following completion of Basslink.

4.6 Snowy Hydro

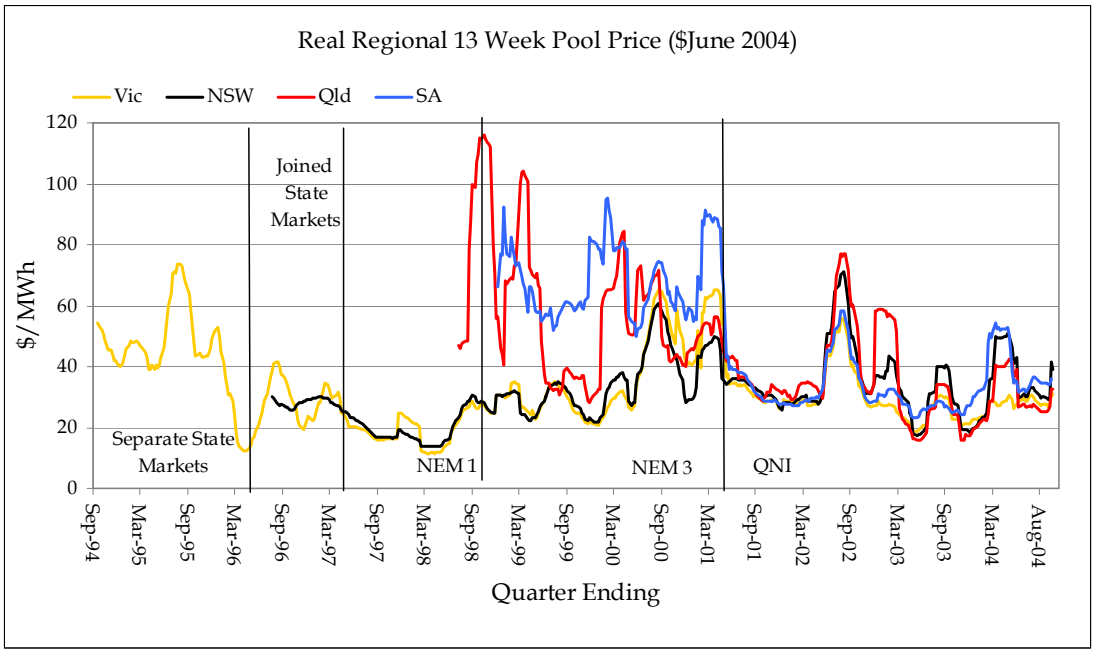
The Snowy Mountains Hydro-Electric Authority has been corporatised and is now known as Snowy Hydro Ltd. The scheme's electricity production is mainly used to meet the peak daily and shoulder demands although the scheme will generate outside of peak times to prevent dam spillage. A pump storage facility at Lower Tumut is available to increase the peak generation capacity by use of low cost electricity to pump water during the night for release back through the generators during daily peak periods. The Scheme is nationally important as the fast response generators can be called upon to correct system disturbances such as failure of a base-load generator, or, in the event of a total system failure, to restart generation in NSW and Victoria by providing the external power source required to bring thermal generators back into operation.

5 Pool Prices by Regions

Figure F3 shows the historical quarterly pool prices for each of the regions. The electricity market commenced in Victoria in 1994 as VicPool and was joined by other states in 1996, 1997 and 1998. When NSW joined the wholesale market prices trended downwards due to competition between generators to increase their share of the market. This was followed by the introduction of NEM1 to allow the other states to join the market under the National Electricity Code.

Prices increased as Queensland and South Australia joined the NEM. The increase in Victorian and NSW prices was helped by high prices in Qld after Directlink commenced operation and the exports from Victoria to SA. The interconnection between NSW and Qld via Directlink and QNI caused prices in all four regions to collapse to averages around $30/MWh. This was assisted by the commissioning of Pelican Point in SA and Callide Power followed by Millmerran in Queensland.

Figure F3: Quarterly Historical Pool Prices 1996- 2004



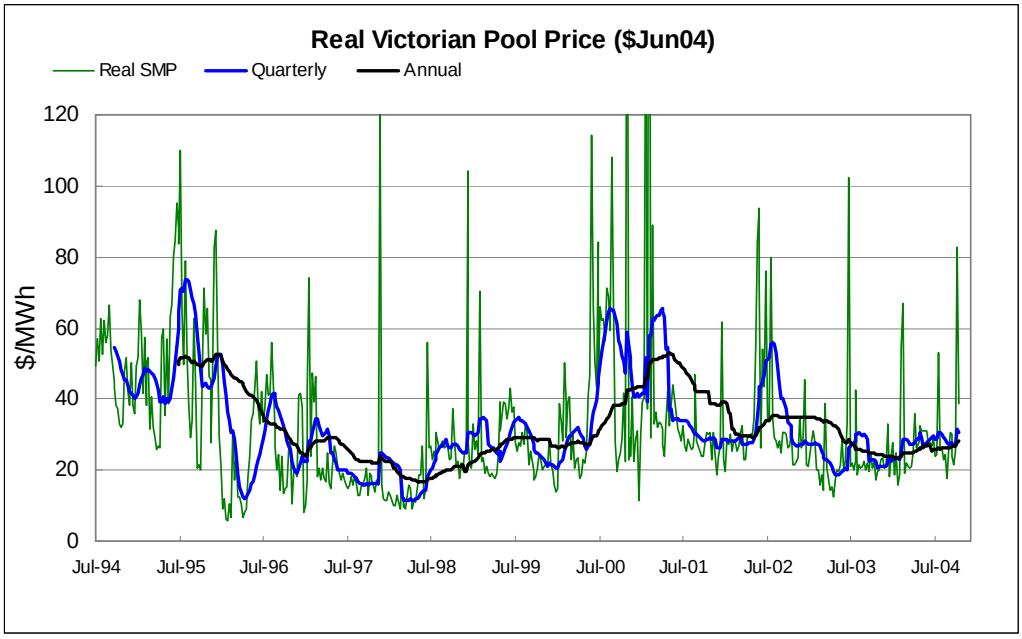
With the commissioning of QNI, the prices across the NEM have aligned and this is expected to continue for several years before SA or Queensland become constrained.

Victorian pool prices are affected by developments in NSW and South Australia as well as developments within Victoria. Victorian prices are shown Figure F4.

Historical Victorian pool prices are characterised by:

- High level of competition in 1997/98 when the Victorian and NSW markets were joined and vesting contracts dominated the market
- High prices during the early market phase due to immature market trading and lack of competition prior to disaggregation of the generation sector
- Price rises during May/June each year associated with contracting rounds commencing on 1 July. Often additional volatility was achieved at non-critical times such as weekends to signal the need for higher contract prices
- High prices in winter 2000 associated with a long-term outage of a Loy Yang B unit in Victoria. This shows the strong inter-regional prices effects
- High prices in summer 2000/01 with extreme weather conditions.
- A very mild summer in 2001/02 together with the development of Pelican Point and additional peaking capacity in Victoria and SA has markedly reduced price levels and volatility.

Figure F4: Victorian Historical Pool Prices



6 Greenhouse Gas Abatement Policy

Australia is not a signatory to the Kyoto Protocol and the recently re-elected Commonwealth (national) Government has reaffirmed its decision pursue other policies to mitigate greenhouse gas emissions.

6.1 Mandatory Renewable Energy Target (MRET)

The Commonwealth Government legislated a mandatory target of an additional 9500GWh of renewable energy by 2010. The mandatory renewable energy scheme imposes an obligation on electricity retailers and large consumers to "purchase" an increasing percentage of their power requirements from renewable sources. To realise the target, qualifying renewable energy generators are permitted to create tradable Renewable Energy Certificates (RECs) for each MWh of renewable electricity generated.

Liable parties, retailers and large customers, who fail to acquire and submit the required number of certificates in each accounting period will be have to pay a penalty for the shortfall of $40/MWh. This penalty is not indexed to CPI. The penalty is also not tax deductible; meaning that under current company tax rates a liable party would be indifferent between paying the penalty or purchasing certificates at a price of $57/MWh. Whilst a ramp-up target schedule has been developed for each calendar year by the Government as shown in Table F2, a credits banking regime will stimulate earlier development of such projects.

Without the MRET scheme, few of the wind and biomass generation projects that have been committed would be economically viable. Victoria, in coastal areas, has a wind regime which is reasonably favourable – given the additional revenue from RECs. In some of these areas, there has been considerable opposition to wind based generation projects due to the visual and noise impacts.

Table F2: Renewable Energy Targets

Year	Energy for Calendar Year (GWh – Target)
2002	1100
2003	1800
2004	2600
2005	3400
2006	4500
2007	5600
2008	6800
2009	8100
2010 and later years	9500

6.2 NSW Greenhouse Gas Abatement Certificate (NGAC) Scheme

The NSW mandatory emission abatement scheme obliges electricity retailers and large electricity users to meet emission targets for CO_2 equivalents as shown in Table F3. The objective of the scheme is to force retailers and large users in NSW to lower the carbon intensity of their electricity purchases. The target is, however, expressed on a per capita basis. This makes an allowance for population growth.

The scheme requires retailers to support emission abatement by means of purchasing NSW Greenhouse Gas Abatement Certificates (NGACs) which are produced by means of:

- Relatively low emission sources of generation throughout the NEM that were commissioned after 1997 when the earlier, optional, scheme commenced
- Improved efficiency of existing thermal power stations throughout the NEM
- Demand side management that results in reduced consumption in NSW and
- Carbon sequestration in NSW forests.

Large users can themselves introduce abatement measures and thereby reduce the obligation of their retailers to purchase NGACs. Eligible measures qualify for Large User Abatement Certificates but they cannot be traded, as can NGACs.

Power stations commissioned between 1997 and 2001 will have a baseline defined and can produce NGACs for production levels above this baseline where the intensity of GHG emission is less than a pool of generation defined for power stations in NSW. Power stations that implement measures to reduce their GHG emissions can register NGACs for all the associated emission abatement. The transfer of electricity between NSW, Victoria and Queensland is included in the determination of the carbon intensity of the NSW generation pool. Generators in other states are allowed to contribute to meeting the retailers NGAC requirements.

Table F3: NSW Retailers Emission Abatement Scheme Targets

Calendar Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Emission Intensity t/year/head	**8.65**	**8.31**	**7.96**	**7.62**	**7.27**	**7.27**	**7.27**	**7.27**	**7.27**	**7.27**
Pop Forecast	**6.72**	**6.83**	**6.91**	**6.98**	**7.05**	**7.13**	**7.20**	**7.27**	**7.35**	**7.43**
Aggregate Emission (Mt)	**58.13**	**56.72**	**54.97**	**53.17**	**51.26**	**51.81**	**52.34**	**52.87**	**53.45**	**54.01**

6.3 Gas Electricity Certificate (GEC) Scheme in Queensland

As of 1 January 2005 the GEC scheme will come into effect. This scheme requires electricity retailers and other liable parties to source at least 13% of their electricity from gas-fired generation.

The 13% Gas Scheme is a certificate based scheme consisting of:

- Accredited Parties – eligible gas-fired generators who can create GECs, which can be traded separately from the electricity to which they relate; and
- Liable Parties (large users and electricity retailers) who are required to surrender GECs to the Regulator to acquit a liability.

To be accredited to create GECs, power stations must generate electricity:

- from an eligible fuel source;
- above their baseline;
- which supports electricity load in Queensland and a specially calculated Queensland Usage Factor (QUF) is assigned to each power station.

Only additional or new gas-fired generation beyond that which was generated at the baseline date of 24 May 2000 is eligible to create GECs.

While Victorian generators are eligible to participate in the scheme, the imposition of the QUF on imports from Victorian generators would mean that Victorian gas generators would be substantially better off creating NGACs than GECs.

Appendix G

Advanced Fossil Fuel Technologies

Paper supplied by Mr David Lea of David Lea Consulting Pty Ltd.

Advanced Fossil Fuel Technologies

A key option for reducing carbon dioxide emissions in the electricity sector is to improve the efficiency of existing power generation technologies. Improvements in the efficiency of existing plants can be achieved through refurbishment or retrofitting, as well as through changes in operating practices. The major types of current and emerging coal fired and natural gas based electricity generation technologies that could provide efficiency improvements over established technologies are described in this section[11].

Technology descriptions

Pulverised coal (PC): At present, PC electricity generation plants dominate global electricity generation, and account for more than 90 per cent of coal fired electricity generation capacity[12]. PC plants have been used throughout the world for more than sixty years and are suitable for a wide variety of coal types. In PC plants, coal is pulverised and blown into a furnace where it is combusted at high temperature. This process raises high pressure steam that is used to drive a steam turbine and generate electricity.

PC plants can be either subcritical (SUC) or supercritical (SC) units depending on the temperature and pressure of the steam in the turbine. Supercritical plants achieve higher efficiencies than subcritical plants by operating at higher temperatures and pressures.

Supercritical units have efficiencies of around 45 per cent compared with 36 per cent for subcritical units. Supercritical units are now the standard for new plants in many parts of the world[13]. However, the average efficiency of coal fired generation in developing countries and the OECD is about 30 per cent and 36 per cent respectively[14]. Ultra supercritical (USC) units, which can operate at efficiencies of up to 55 percent, are being developed in Europe and Japan.

The existing Latrobe Valley generation facilities are all subcritical PC plants with varying efficiencies depending upon the age of the plant. Brown coal or lignite plants will always operate at a lower efficiency than an equivalent technology black coal plant because of the need to provide energy to evaporate the water in the coal.

Integrated gasification combined cycle (IGCC) plants: IGCC plants are a relatively new technology for power generation although several demonstration plants are in place in Europe, Japan and the United States. In IGCC plants, coal is not burned directly, but is reacted with oxygen and steam in a gasifier to produce a syngas consisting predominantly of carbon monoxide

[11] This section has been substantially based upon the excellent summary contained in Near Zero Emissions Technologies, abare ***e*Report** 05.1 Anna Matysek, Melanie Ford, Guy Jakeman, Robert Curtotti, Karen Schneider, Helal Ahammad and Brian S. Fisher, January 2005

[12] IEA Clean Coal Centre 2002

[13] Coal21 2004

[14] IEA2004d

and hydrogen. The syngas is cleaned of impurities and used to drive a gas turbine, generating electricity. The exhaust heat is also used in a steam cycle, producing additional electricity.

IGCC plants can generate electricity at high levels of efficiency (approximately 50 per cent). The flue gases also contain a more concentrated, high pressure stream of carbon dioxide than in PC plants, potentially making carbon dioxide capture more efficient and less expensive. IGCC plants can also be used for the co-production of hydrogen for commercial uses such as in the manufacture of chemicals, fertilisers, lubricants and liquid fuels. The sale of hydrogen or syngas to produce these products has the potential to offset some of the cost of electricity generation using IGCC plants[15].

While currently IGCC is regarded as more expensive than PC plants for power production this is expected to reduce over time as the technology matures. The potential to produce a broad range of products essential to our modern society from the world's abundant coal resources, combined with its ability to facilitate geosequestration, are the reasons for the current high level of interest in this technology. The Shell Company are currently in joint ventures with local companies to build up to seven coal gasification plants in China. These plants will provide syngas for fertiliser and chemical production.

Brown coal dewatering: Lignite dewatering reduces the water content of brown coal for use in IGCC plants and existing brown coal plant technologies. This results in an increase in efficiency and reduces greenhouse intensity to a level that can be similar to black coal plants.

A number of different technologies are currently at various stags of availability, including HRL's integrated drying gasification combined cycle (IDGCC) plants, which use hot waste gases from the gasifier to dry the coal. A Cooperative Research Centre in Melbourne is developing a process for squeezing water from Latrobe Valley coal (Mechanical Thermal Expression (MTE)). In Germany a major power company is about to commence building a commercial scale high efficiency steam fluidised bed drier with energy recovery following the successful operation of a demonstration plant. Australian Power and Energy Limited is currently arranging for the drying of Latrobe Valley coal to be tested in this demonstration plant. Additional research and development is required to further reduce costs[16].

Fluidised bed combustion (FBC) based plants: FBC plants currently account for 2 per cent of coal fired capacity worldwide and have been used on a small scale since the 1960s[17]. In fluidised beds, coal is burned in a reactor in a bed of heated particles suspended in a gas flow. The turbulent state of the gas improves combustion, heat transfer and recovery of waste products. FBC plants have efficiency levels similar to PC plants but produce less nitrogen and sulphur oxides. FBC plants are particularly suited to clean burning of low grade coals and may also be used to fire some other low quality fuels, including biomass. The investment and generation costs of FBC plants are similar to advanced PC plants.

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[15] Coal 21 2004

[16] Ibid.

[17] IEA Clean Coal Centre 2003c

Ultra clean coal and direct fired coal combined cycle (DFCCC) turbines: Ultra clean coals contain less than 1 per cent ash and have had virtually all mineral impurities chemically removed. Ultra clean coals are not considered substitutes for conventional coal in traditional power generating systems and are instead used as alternatives in heavy fuel oil and gas turbines. Ultra clean coals are cost competitive with these fuels on an energy equivalent basis[18]. Ultra clean coal can be pulverised and fed into a DFCCC turbine, reaching efficiencies greater than 52 per cent[19]. The high efficiency rate compared with conventional coal plants provides an opportunity for reducing carbon dioxide emissions.

Natural gas combined cycle (NGCC) plants: In an NGCC plant, natural gas is used to drive a gas turbine to generate electricity. The waste gases in the turbine are recovered and burned to raise steam, which drives a steam turbine generating additional electricity. NGCC plants have efficiencies of around 60 per cent and improvements in gas turbine design are expected to raise this efficiency over time[20].

NGCC is an established technology that now accounts for more than 50 per cent of the market for new generating capacity[21]. NGCC plants produce lower greenhouse gas emissions than conventional coal fired power plants without capture equipment because of higher generation efficiency levels and the lower carbon content of natural gas compared with coal.

However, the economics of NGCC are dependent upon the availability of low priced natural gas. Reliance on this technology in some countries (e.g. USA) has seen gas resources severely depleted leading to high gas prices and consequently high electricity prices.

Carbon capture and geological storage

Carbon capture technologies can be used to capture carbon dioxide produced from the combustion of fossil fuels in power plants and can typically reduce electricity plant emissions by between 65 and 95 per cent. The carbon dioxide can then be transported to a permanent storage site in gaseous or liquid form[22]. The three main approaches or technologies used to capture carbon dioxide are described below.

Flue gas or post combustion capture: After combusting fossil fuels, carbon dioxide can be separated and captured from the resulting flue gas. Flue gas capture methods include: absorption of carbon dioxide after contact with solvents; adsorption of carbon dioxide on activated carbon or other materials; cryogenic separation of carbon dioxide from other gases using temperature and pressure; and membrane separation of carbon dioxide.

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[18] Australian Coal Association 2004

[19] Coal21 2004

[20] IEA Clean Coal Centre 2003b

[21] Ibid.

[22] DTI 2003a

Post combustion capture techniques require a significant amount of energy to operate and hence result in reduced plant efficiency. Post combustion capture has yet to be optimised on a commercial scale for electricity generation, although it is envisaged that it will be most effectively used in conjunction with PC and NGCC plants. Potential advances in materials technology are likely to improve the prospects for this technique[23].

Oxygen combustion: Using the oxygen combustion approach, carbon dioxide concentrations in flue gases are increased to between 55 and 60 per cent by raising the level of oxygen and reducing the nitrogen content in the combustion air. If the flue gas is then recycled in an oxygen rich environment, the concentration of carbon dioxide in the flue gas can be as high as 90 per cent[24].

Oxygen combustion is at present an inefficient approach because of high capital and oxygen costs and losses in energy efficiency when this technique is applied. However all the components of this technology are regarded as essentially proven. Research and development is needed to make this a lower cost technology.

Pre-Combustion Capture: The pre-combustion (hydrogen or syngas) approach is a capture technique that reduces the carbon content of fossil fuels and produces a carbon dioxide rich by product. The fuel is first reacted (gasified) with oxygen, air or, in some cases, steam to produce a gas consisting mainly of carbon monoxide and hydrogen. The carbon monoxide is reacted with steam in a catalytic shift converter to produce carbon dioxide and more hydrogen. The carbon dioxide is separated using adsorption or absorption methods and can be used for industrial or beverage production processes. Once carbon capture and storage infrastructure is available the excess carbon dioxide can be locked away securely in deep underground geological sites. The hydrogen can be used as a feedstock (see IGCC above) or used to fire a gas turbine to generate electricity. The hydrogen or syngas approach can be used for coal, oil and natural gas, but use with coal and oil requires greater gas purification.

Pre-combustion capture is a promising technology that results in a small volume of highly concentrated carbon dioxide with lower energy requirements than some other capture methods[25]. The production of syngas containing hydrogen is also seen as an added advantage as hydrogen can be used in other industrial processes and may potentially become important as a transport fuel[26]. As with other capture technologies, further research and development is required to increase energy efficiency and bring down costs.

Effect of fuel type

[23] IEA 2002a

[24] Ibid.

[25] DTI 2003a

[26] IEA 2002b

The type of fuel and generation technology used will determine the type of capture technology that is most suitable. Within these basic capture approaches, there are several techniques that may be used in conjunction with different fuel types and technologies. In this report it is assumed that, typically, post combustion capture is most efficient for pulverised coal (including PC, SC and USC) and NGCC plants, while pre-combustion capture is best for use with IGCC technology.

Retrofitting versus new plant application

Carbon capture technologies can, in principle, be retrofitted to existing plants or installed in new plants. However, retrofitted capture technologies are generally not as efficient as those installed in new plants. The application of carbon capture and storage technology to a new plant is typically associated with higher efficiency and longer life expectancy than application as a retrofitted technology.

Local conditions will, to a large extent, determine the viability of retrofit application. The IEA[27] has reported that refurbishing existing plants in the United States has extended the lifespan of plants and has also generated significant improvements in efficiency. As such, retrofits cannot be ruled out in all cases. However, the difficulties associated with retrofitting existing power stations suggest that when constructing new plants, there are benefits to designing them so they are 'carbon capture ready' as this may substantially reduce the costs of retrofitting if it is required in the future.

Carbon Transport and Storage Transport

Carbon dioxide transport technologies using high pressure land based pipelines are already well established. There are more than 3100 kilometres of carbon dioxide pipelines globally, primarily in north America, that have been used to transport carbon dioxide since the 1980s, typically for use in enhanced oil recovery projects[28].

Carbon dioxide can also be transported in tankers using carriers that are similar in design to current LPG carriers. Considerable offshore oil and pipeline infrastructure also exists that may have the potential to support offshore storage of carbon dioxide in geological sites[29].

The cost of transporting carbon dioxide to the point of storage depends on the pressure and volume of the carbon dioxide to be transported, the distance between the carbon dioxide source and storage site, the method of transport and the geology through which the pipelines are built. Transport costs are site specific and will vary within and between regions as a result of differing geography, infrastructure and capital and labour costs.

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[27] IEA 2004a

[28] IEA Clean Coal Centre 2003a

[29] IEA 2002a

Carbon storage and utilisation options

Captured carbon dioxide can be stored in a variety of geological or ocean sites including active and depleted oil and gas reservoirs, deep and un-minable coal seams and saline aquifers.

Depleted oil reservoirs and enhanced oil recovery

Depleted oil reservoirs represent attractive storage structures for captured carbon dioxide because of their well known geology, proven ability to store hydrocarbons over very long timeframes, and the potential to use established infrastructure for carbon dioxide transport and injection. Carbon dioxide can also be used in enhanced oil recovery (EOR) by injecting it into operational oil fields after primary and secondary production. Enhanced oil recovery is an established technology that is used commercially, primarily in the United States, although it can only be used in some oil fields of a certain geology and oil type[30].

Using carbon dioxide to enhance oil recovery can increase total oil recovery by 33–50 per cent. This is associated with an estimated increase in income of about US$25–35/t CO2 injected, which has the potential to offset part or possibly all capture costs. Enhanced oil recovery using carbon dioxide can result in net storage of 2.4–3.0 tonnes of carbon dioxide per tonne of oil produced. The cumulative global carbon dioxide storage capacity of enhanced oil recovery is expected to increase with time as more oil fields are depleted[31].

Enhanced gas recovery

Unlike enhanced oil recovery, enhanced gas recovery (EGR) is yet to be commercially proven. It is expected that enhanced gas recovery could occur in a manner similar to enhanced oil recovery with the injection of carbon dioxide into natural gas fields, displacing further supplies of gas and increasing production. Enhanced gas recovery using carbon dioxide is expected to increase gas recovery by approximately 10–15 per cent, resulting in an increase in income of about US$1–10/t CO2 injected[32]. The estimated global cumulative storage capacity of gas reservoirs is more than that of depleted oil reservoirs. However, the benefits derived from using enhanced gas recovery techniques are smaller.

Enhanced coal bed methane recovery

Carbon dioxide can be injected into coal seams to enhance the recovery of coal bed methane, a naturally occurring gas, which can be used as a fuel. A large proportion of the injected carbon dioxide will be adsorbed onto the coal, sequestering it permanently provided the coal is never mined. A demonstration project exists in New Mexico, United States where more than 100 000 tonnes of carbon dioxide has been injected over three years. Enhanced coal bed methane recovery

[30] Gielen 2003a

[31] Ibid

[32] Gielen 2003b

using carbon dioxide can increase to around 90–100 per cent, from 40–50 per cent using conventional techniques. This has the potential to increase income by around US$3–20/t CO2 injected. The most attractive coal beds for methane recovery (shallow coal reserves with thick coal layers) are the least attractive from a carbon dioxide storage perspective since carbon dioxide adsorption generally increases with depth and pressure[33].

The cost of obtaining and using carbon dioxide, the benefits of increased production and the cost of carbon constraints are the major determining factors of the economic viability of enhanced oil, gas and coal bed methane recovery.

Saline aquifers

Deep saline aquifers provide the largest potential for storage of all the geological options and are widely distributed below the continents and ocean floor[34]. Once injected, carbon dioxide will either partially dissolve in water or slowly react with other minerals, forming carbonates that essentially sequester carbon dioxide permanently. Injecting carbon dioxide into deep saline aquifers uses technology similar to that used for EOR and has been commercially proven in the Sleipner project.

The Sleipner carbon dioxide capture and storage project is the first commercial scale demonstration of carbon dioxide injection and storage in an aquifer. Since 1996, approximately 1 million tonnes of carbon dioxide a year has been removed from a natural gas stream in the Sleipner oil and gas field in the North Sea and injected into a saline aquifer located about 1000 metres below the North Sea floor.

The incentive to capture and store carbon dioxide in Norway is provided by a tax on carbon dioxide emissions. This tax was initially about US$50 a tonne of carbon dioxide. The Statoil company found that it was cost effective to invest about US$80 million in a carbon dioxide capture and injection facility in order to gain tax savings of approximately US$50 million a year. Although the tax has since been reduced to US$38 a tonne of carbon dioxide, thereby reducing the annual tax savings, it remains economic for the company to capture and sequester the carbon dioxide.

Since 1997, the Saline Aquifer CO2 Storage (SACS) project has monitored the reliability, environmental acceptability, movement and safety of carbon dioxide stored at this site. The monitoring project has concluded that to date there are no adverse environmental impacts of carbon dioxide storage at Sleipner on the surrounding environment.

Carbon capture and geological storage issues

The possibility of widespread geological storage of carbon dioxide raises a number of long term storage and regulatory issues. The design and implementation of appropriate regulatory, legislative and administrative frameworks are in the early stages of development and will increase in

[33] Ibid

[34] DTI 2003a

importance if sequestration projects become more prevalent. Monitoring verification of sequestration activities will be required to assess the safety and long term permanence of carbon dioxide storage. These issues are only briefly discussed in this report as they are outside the main scope of the analysis.

Legal and regulatory framework

The capture, transport and subsequent injection of carbon dioxide into geological storage raises a number of domestic and international regulatory and legislative issues on appropriate standards and regulations. An effective legal and regulatory framework would ideally encourage good sequestration practices without forming unintended barriers to its development.

Responsiveness and flexibility to improved understanding of climate and sequestration risk would also be desirable characteristics[35]. It is envisaged that some form of regulation will exist to cover all stages of a sequestration project, including initial project siting, carbon dioxide capture, injection, and long term monitoring of sequestered emissions[36].

A number of countries, including the United States, Australia, Canada, Japan and Norway, are already in the early stages of assessing the applicability of existing legislation to sequestration projects or designing new frameworks (CSLF 2004). Experience in the development of suitable legislation for sequestration differs between countries as a result of varying experiences with similar activities such as natural gas storage, carbon dioxide and gas transport and waste disposal in geological formations.

Although existing conventions such as the London Convention on marine pollution and the Basel Convention on trans-boundary movements of hazardous wastes do not make specific mention of carbon dioxide sequestration since they were drafted before such technology was envisaged, these conventions may still apply to sequestration and could possibly be used to determine the permissibility of carbon dioxide sequestration under international law[37].

Long term storage issues

For geological storage of carbon dioxide to be a politically viable proposition, the public must perceive that the risks of storing carbon dioxide in geological formations are less than the risks of impacts from climate change. The continued monitoring of carbon sequestration sites to determine storage capabilities, carbon dioxide migration patterns and changes in the amount and form of carbon dioxide stored will help to verify carbon dioxide safety and permanence.

Natural geological formations have stored oil and gas for millions of years and experience to date at carbon dioxide storage sites such as Sleipner and Weyburn suggests that carbon dioxide can be

[35] IPIECA 2003

[36] CSLF 2004; Forbes 2002

[37] Purdy and Macrory 2004

stored safely without major leaks or environmental damage. However, storage of carbon dioxide in geological formations is site specific and appropriate analysis and risk assessment of geosequestration projects would need to be conducted.

Applicability to the Latrobe Valley Region

The Latrobe Valley has the potential to be one of the foremost global sites for the application of these new technologies. The combination of an abundant low cost, high quality (ash, sulphur) energy source adjacent to a large sink for carbon dioxide (the depleted oil & gas fields and deep saline aquifers in the offshore Gippsland Basin) create this potential. A number of companies are currently working on detailed studies to bring this potential to reality. The same emerging technologies which will be required around the globe to reduce carbon dioxide emissions can be applied in the Latrobe Valley to create wealth and employment in an environmentally acceptable way.

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