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Research study in relation to a proposed coal rejects/industrial waste emplacement at Wongawilli.

RESEARCH STUDY IN RELATION TO A PROPOSED COAL REJECTS/INDUSTRIAL WASTE EMPLACEMENT AT WONGAWILLI

CITY OF WOLLONGONG

AUGUST 1984

SINCLAIR KNIGHT & PARTNERS PTY.LTD. CONSULTING ENGINEERS

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SINCLAIR KNIGHT & PARTNERS PTY LTD CONSULTING ENGINEERS
Chandos Street St Leonards, New South Wales 2065 Australia Telex: AA26462 Phone: (02) 436 7222

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1. INTRODUCTION

1.1 TERMS OF REFERENCE FOR THE STUDY

Wollongong City Council commissioned this study in response to a Development Application from Australian Iron and Steel Pty Ltd (AIS) to establish a large landfill emplacement for coal washery discard (CWD) and industrial wastes at Wongawilli, West Dapto. Council expressed concern about the proposal in a submission presented to the Minister for Planning and Environment on 4 June, 1984, a copy of which is contained in **Appendix 1** to this report. The major issues highlighted in that submission were as follows:

". the implications for land availability for the efficient future development of the urban area of Wollongong and in particular the implications for the adequacy of future residential land availability;

. the paramount need for a sound research basis in the form of a Regional Study leading to the preparation of a regional long-term strategy for disposal and utilisation of industrial waste materials in the Wollongong region and which represents a full evaluation of alternative methods, strategies and locations for such disposal and/or utilisation and of the associated public and private costs and benefits;

. adverse environmental effects - air, water, noise and visual pollution;

. the extent to which alternative technologies and methods of utilisation or other alternatives such as off-shore dumping etc can alleviate the pressures for landfill industrial waste emplacement in the Wollongong Region."

To further evaluate these concerns, Council elected to commission consultants to investigate certain engineering and environmental matters in connection with the proposal. Sinclair Knight and Partners Pty Ltd (SKP) were selected to carry out the work. The particular Terms of Reference for this study are also contained in **Appendix 1** to this report. In essence, the brief required the consultant to:

. identify alternative sites in the Wollongong region to accommodate, individually or in combination, the quantities of waste proposed for emplacement at Wongawilli, and to evaluate the physical, environmental, social, and economic constraints of potentially suitable sites, and

. to investigate currently established and potential future disposal and utilization techniques,

The objective of the study is to assist Council in the preparation of its submission to the forthcoming Commission of Inquiry into AIS's Development Application. The Terms of Reference for this Inquiry is set out in Council's brief.

1.2 STATEMENT OF THE PROBLEM

AIS currently produces approximately 3.2 million tonnes annually of steel products at its Port Kembla Steelworks. Solid wastes produced from the overall steelmaking operation are principally coal washery discard (CWD) from a coal washery adjacent to the steelworks, and blast furnace/steelmaking slag. While a substantial proportion of the blast furnace slag is used productively as construction fill in the Wollongong region, all of the steelmaking slag and virtually all of the CWD is disposed of in a landfill emplacement at Kembla Grange.

This emplacement is approaching the limits of its capacity, and AIS has lodged a development application to permit the establishment of a new landfill emplacement on land it owns at Wongawilli, West Dapto. With an ultimate volume of 18-20 million cubic metres (mcm) this emplacement would satisfy the company's forecast solid waste disposal requirements for the next 20 years. This proposal is the second put forward by AIS. In 1979, the company lodged a development application for a much smaller emplacement (3.6 mcm) at Cringila, close to the Steelworks. There was a strong public reaction to this proposal since the Cringila site is adjacent to residential areas. The proposal was never determined and the development application is still current.

The proposed Wongawilli development will also have an impact on some residences in the township of Wongawilli and adjacent to Bong Bong Road. However, although the number of people directly affected would be less than for the Cringila development the impacts of the development would still be significant. In addition, Council has estimated that the Wongawilli proposal would also sterilise between 15 and 20 percent of the potential residential land stock in West Dapto which would be of major importance to the growth and development potential of Wollongong City.

The problem to be addressed in this study can be summarised simply as being to establish whether there is a better way of meeting AIS's industrial waste disposal requirements than those already proposed by the company. For such a solution to be better, it would have to be more acceptable environmentally and have less impact on regional planning concerns.

The findings of this study are presented sequentially in the following chapters as follows:

- a review of the current status of existing alternative disposal techniques and an assessment of the role that some or all of them could play in AIS's waste disposal strategy over the next 20 years,
- assessment of alternative landfill sites,
- recommendations arising from the findings in the form of alternative disposal strategies for both the short and longer term which satisfy both Council's objectives and which represent a practical and economic alternative for the common.

It should be pointed out however that this study is only a first step in what should ultimately be a study to devise a broad-based regional waste disposal strategy which, bearing in mind the significant shortages of available land within the region, takes into account not only the requirements of industry but also the significant planning constraints which are operable. Longer term strategies identified in this study must be

the subject of more intensive evaluation. To this end, Council is seeking support from the National Energy Research Development and Demonstration Council (NERDDEC) to fund such a study.

1.3 STUDY APPROACH

1.3.1 Alternative Disposal Techniques

Although the proposed Wongawilli emplacement has been designed to accommodate several forms of solid waste, the greater proportion of its ultimate volume (66%) will comprise CWD **(Reference 1.1).** Clearly, if there is any significant change in the technology or economic viability of alternative disposal methods for CWD, the scale of AIS's landfill disposal requirement could be altered.

The current state of alternative disposal techniques is reviewed in **Chapter 2** of this report. The problem of CWD is one for the coal industry as a whole and all indications are that the scale of the problem will grow in the future. Hence, the attractiveness of alternatives or at least, the pressure to evaluate them in more detail, may grow in parallel.

1.3.2 Alternative Emplacement Sites

There have already been two studies of possible CWD disposal sites in the Illawarra region: one by a joint government/industry committee **(Reference 1.2),** and one by AIS's consultants as background to the Wongawilli EIS **(Reference 1.1).** Although the former considered the industry-wide problem, the study report essentially related to AIS's problem since this company is the only CWD producer in the region which did not have sufficient long term land fill disposal capacity to meet its anticipated requirements.

A range of environmental, social and economic criteria were used in these studies to rank alternative sites prior to deciding on a preferred site. As is inevitable in such studies, the findings are strongly influenced by the priorities of the assessor. Since the preferred site in both studies was the Wongawilli site, which as previously noted has been identified by Council as a potential residential land resource of significance to the future growth of the city, it is clear that neither study considered residential land sterilisation as an overriding assessment criterion.

This assessment, in the first instance, takes the opposite approach by assuming that any site which sterilises potential residential land will not be acceptable. This criterion, along with a range of other criteria which are discussed in **Chapter 3** of this report, has been used to re-evaluate all sites in the two previous studies to produce an interim list of sites which satisfy all of these preliminary criteria.

To this list were added additional sites selected by ourselves and which also satisfied all the previously mentioned criteria. All of these sites were then re-assessed taking into account their potential environmental and social impacts as well as practical engineering and economic considerations, to define a short list of sites which, theoretically, could provide a solution to AIS's problem.

Finally, these sites were evaluated within the context of existing legislative requirements to see which, if any, provide a realistic alternative.

1.3.3 Summary and Recommendations - Future Strategies

In **Chapter 4** of this report, the findings of the two components of this study are summarised and a series of options are recommended.

REFERENCES - CHAPTER 1

1.1 Longworth and McKenzie Pty Ltd (1984) EIS for Steelworks Industrial Waste Emplacement, Wongawilli, NSW Prepared for AIS, Pty Ltd

1.2 Coal Reject Disposal Subcommittee (1983) Coal Reject Disposal in the Southern Coal Fields Report to the Coal Resource Development Committee.

2. ALTERNATIVE WASTE DISPOSAL TECHNIQUES

2.1 INTRODUCTION

This Chapter reviews the range of options available for the disposal or utilisation of CWD as they may apply in the Wollongong region and to the particular problem faced by AIS. This subject has been the focus of a previous review **(Ref 2.1)** while the topic in general has been exhaustively addressed in a recent review by Australian Coal Industry Research Laboratories Pty Ltd (ACIRL) **(Reference 2.2).**

In discussing the disposal options available, the following nomenclature, which primarily distinguishes between disposal and utilization options, has been adopted:

Disposal Options:

- unproductive landfill (where reject is placed with no planned productive or useful end land use),
- underground disposal (stowage in old mine workings),
- ocean dumping.

Utilisation Options:

- productive landfill (where reject is emplaced in order to improve the environmental or commerical value of the land, for example, the creation of sportsfields on land of previously low value, reclamation of flood prone areas for urban or recreational development etc),
- engineering applications (where reject is used as a structural fill or subgrade for various civil engineering works, including roads, residential, commercial and industrial projects),
- energy recovery, (where reject is used as a fuel to raise heat, steam and/or generate electricity),
- other uses (a general category covering any other known uses),

To date, landfill, both productive and unproductive, has been the principal means of disposal/utilisation in countries like Australia where land is not generally at a premium **(Ref 2.2).** There is no doubt that recent advances in management of landfill emplacements can make this an environmentally and relatively cost efficient option. Nevertheless, it is also clear that in countries, or regions such as the Wollongong sub-plain, where land availability is limiting and is likely to become more so in the future that "... utilisation schemes or alternative disposal methods (are likely to become) more attractive propositions for long term disposal" **(Ref 2.2, p 80).** In other words, the feasibility or desirability of adopting an alternative disposal strategy will be determined, not only by technical considerations and economics, but also by the social setting in the particular areas. It is considered that the changing social setting is likely to have an increasingly important influence on CWD disposal strategy in NSW over the next 20 years and for this reason, it would be unwise to

assume without question that today's optimum disposal strategy will necessarily be tomorrow's. Accordingly, there is value in considering briefly the history of CWD disposal in NSW to see what evidence there might be to suggest the course of future events.

2.2 HISTORICAL PERSPECTIVE

Landfill disposal is a very basic form of solid waste management. It has a historical momentum which has only started to be questioned in recent times as the competition for land, particularly in and near urban areas, and the general concern about environmental issues have increased.

CWD has been produced on the south coast since the first washery was commissioned by AIS at Port Kembla in 1948. For the first 20 years of operation (until 1968) the CWD produced from this washery was largely disposed of in an ad hoc, although controlled, manner throughout the region **(Ref 2.4),** with the major portion being used for land reclamation in and around the steelworks. In places up to 12 metres of fill is believed to have been placed **(Ref 2.5)** .

As far as can be determined, AIS's first off-site CWD emplacement was only established in 1968 at Cringila while the second, which is still operational, was established at Kembla Grange in 1977. So in the last 36 years, the major portion of AIS's CWD and slag output has been put to productive landfill purposes on its own land and elsewhere in the region. It is notable that the two latest attempts by AIS to establish new emplacements have encountered significant opposition.

The experience of the coal industry as a whole has been somewhat different. As far as can be determined, the principal disposal method has been unproductive landfill dumping, initially in a virtually uncontrolled manner and subsequently by more acceptably controlled methods. However, the dimensions of the disposal problem only started to increase after entry to the export steaming coal market in the mid to late 1960's. Coal had to be washed to be saleable on this market and as the market has grown, so has washery throughput. Over the last 10 to 15 years the scale of the CWD disposal problem has grown faster than washery input for a variety of reasons including: increased mechanisation, declining raw coal quality, and more stringent market demands **(Ref 2.6).** As a result, a 200 percent increase in raw coal production in NSW over the last 10 years has coincided with a 350 percent increase in CWD production **(Ref 2.9).**

Therefore, for different reasons, the magnitude of both AIS's and the coal industry's disposal problem in the 1980's bears no relationship to any historical situation. The prospects are for a further deterioration of the situation in the future, not only because of the increased quantities requiring disposal but also because of the growing environmental awareness of the public.

This problem has been highlighted on a number of occasions **(Ref 2.1, 2.7, 2.8),** but commonly, the reaction has been that in view of the lack of suitable alternatives to landfill disposal, long term sites must be reserved now and land rezoned accordingly to avoid future conflict. An alternative interpretation however, is that the scale of the conflict and the attendant increasing cost of landfill disposal will be such as to force the industry to adopt less contentious alternatives and accordingly, the long term reservation of landfill sites will do nothing but forestall this inevitable development.

2.3 ALTERNATIVE REJECT DISPOSAL STRATEGIES

2.3.1 Land Emplacement

Unproductive Landfill
Although this discussion is primarily concerned with alternatives to unproductive landfill emplacement of CWD, there are a number of alternatives within this disposal category which are worthy of some consideration.

For the land emplacement method of disposal, there are three basic alternatives for improving the acceptability of the method and these are; (in comparison to Wongawilli):

- locating land emplacement sites at alternative locations on the Wollongong sub-plain which have less environmental impact and less significant regional planning implications,
- change the location at which the waste is generated so that disposal sites out of the Wollongong sub-plain becomes an economic alternative and,
- change the design of the emplacement to permit more productive final land uses.

The first of these alternatives is the subject of the alternative site assessment which is discussed in **Chapter 3.** The second and third are discussed below.

Change the Source of Waste Generation
Raw coal is supplied to AIS's central washery from eight collieries: Nebo, Kemira, Wongawilli, Corrimal, Bulli, Cordeaux, Tower and Appin. It has been suggested that since an average of 17 percent of the raw coal taken to Port Kembla is waste material **(Ref 2.9),** economics should favour the washing of the coal at source. If this were done then CWD emplacements could be located to the west of the escarpment where, in general, (MWSDB land aside), land use conflicts are not as great.

Unfortunately, this argument has several faults, as listed below:

- of the 8 mines supplying the central washery 5 have pitheads located east of the escarpment,
- according to AIS estimates **(Ref 2.5),** 80 percent of the total CWD produced from the central washery is due to the coal from these 5 mines and only 20% for the mines from west of the escarpment (Appin, Tower, and Cordeaux), which mine the relatively low ash Bulli seam.
- apart from locational considerations, the capital cost of building 8 washeries to replace the existing one would be prohibitive.

Further AIS has advised that the nominal life of 6 of the 8 mines is 20 of years with the remaining 2, Nebo and Corrimal, having life expectancies of 10 years each. Consequently, it it can be concluded that there will be no significant change in the pattern of production and processing of AIS coal over the next 10 to 20 years. Therefore, no potential is seen in this strategy for modifying the CWD disposal problem in the short to medium term future.

An alternative consideration is that, in view of BHP's recent acquisition of extensive coking coal deposits in Queensland, there is a possibility of the phasing down of coal operations in NSW in favour of the lower cost Queensland mines. While economic factors might favour such a move, it is considered unlikely that it would be politically acceptable.

Change the Method of Emplacement

Environmental impacts aside, one principal source of conflict in AIS's Wongawilli emplacement proposal is that it sterilizes potential residential land . One way to resolve this conflict would be to construct the emplacement so that residences could be built on it.

There is a considerable body of both overseas and local experience to suggest that there would be no significant engineering obstacles to such a proposal. There is a substantial body of local engineering experience relating to foundation design for unstable fills such as in-filled quarries and sanitary landfill emplacements **(Ref 2.11, 2.12).** In addition there is considerable local experience available in establishing structures, including flats and residences, on CWD fill. For instance:

. Thirroul Plaza was built on CWD fill **(Ref 2.1),**

. a two storey block of home units was built on CWD fill at Thirroul 5 years ago **(Ref 2.29),**

. a residential development at Russel Vale has been established on up to 15 metres of CWD fill **(Ref 2.29).**

. a substantial part of the Port Kembla Steelworks was developed on CWD and blast furnace/steelmaking slag up to 12 metres thick **(Ref 2.5),**

. at Avon Colliery, a 30 metre high 330 kV transmission line tower has been established on an emplacement.

In short, there is no reason to suggest that there are any serious engineering impediments to developing residential areas on CWD emplacements.

However, there must be some concern with the potential for spontaneous combustion (sponcom) in such emplacements. As a general observation, surveys of CWD emplacements **(Ref 2.15),** theoretical opinions **(Ref 2.16),** laboratory tests **(Ref 2.29),** and overseas experience **(Ref 2.30)** suggest that provided acceptable compaction methods are utilised, the risk of sponcom is low. Nevertheless, the risk would have to be carefully assessed before a recommendation in favour of such a development could be made. (Furthermore, even if a residential final land use was currently acceptable for the Wongawilli emplacement there would still remain significant noise and dust impacts to be addressed).

Consequently, adopting a residential final land use for the Wongawilli emplacement cannot be recommended at this stage. Nevertheless, in respect of the coal industry at large, it is considered that there would be considerable merit in pursuing research into the subject.

2.3.2 Underground Disposal

Underground stowage of CWD has been reviewed on at least three occasions **(Ref 2.1, 2.7, and 2.10)** and on each occasion it was assessed as being economically and, in most cases, physically impractical. In addition, the most recent review **(Ref 2.1)** concluded that because of the longwall mining methods being adopted in many south coast mines, the method will become even less practicable in the future.

Nevertheless, the principal practical difficulty identified was in handling the coarse component rather than the fines, or 'tailings' which, being in a slurry form, are amenable to pumping and will flow under suitable conditions. In fact, underground stowage of fine CWD is already practised in NSW to a limited extent **(Ref 2.16, p.32).** Clearly, if the coarse fraction could be rendered into a similar condition, at least one significant practical difficulty could be overcome.

At the present time, a pilot project jointly financed by BHP and BP Australia, is underway in the Hunter Valley to investigate the feasibility of a new coal washing system which produces slurry-form coal product at a very high yield. The total system incorporates a pipeline coal transport system and is referred to as the Integrated Pipeline Transportation and Coal Cleaning System (IPTACCS).

The corollary to this form of coal washing is that the CWD produced has a very high ash content (low energy value) and, like the coal product, is in a slurry form. Consequently, this system would simultaneously overcome both a significant philosophical objection to underground stowage (permanent loss of an energy resource), and the major practical impediment to its adoption (the solid coarse CWD fraction).

Nevertheless, there are still a number of remaining significant impediments to be overcome before the combination of an IPTACCS washing system and underground stowage could have any influence on the coal industry's CWD disposal problem generally or AIS's problem in particular.

In terms of the coal industry at large, the IPTACCS system is still in the pilot plant stage, and it is unlikely that its feasibility or otherwise will be demonstrated in the short term. In addition, even if it does prove to be feasible, its adoption is likely to be slow in view of large capital committments made in recent years to conventional coal washing systems; ($118M in 1982/3 compared to $7.6M in 1978/9 **(Ref 2.9)).**

In the specific case of AIS, AIS advice **(Ref 2.5)** indicates that the existing void space in their east escarpment mines measures in the hundreds of thousands of cubic metres rather than the tens of millions of cubic metres which would be needed to provide a capacity sufficient to justify the potentially large capital committment necessary to introduce such a system. In addition, practical problems can be foreseen in pumping the slurry to the nearest mine entry and in getting the material to flow once placed in the mine (or mines) given the very shallow dip of the Wongawilli seam.

Accordingly, underground stowage, with or without the IPTACCS system is assessed as having minimal potential for CWD disposal in the foreseeable future.

2.3.3 Ocean Dumping

Ocean dumping of solid wastes including CWD is a long established practice both in Australia and overseas. In the UK, ocean dumping of CWD by a variety of means is still practised **(Ref 2.17)** while in the USA, flyash and scrubber sludge from coal fired power stations has successfully been used in lime or cement stabilised form to construct artificial reefs **(Ref 2.18)**

In NSW, for some years, fine reject from a colliery in the southern coalfields was disposed of via a pipeline into the sea **(Ref 2.10)** but this has since been discontinued. On the other hand, ocean dumping of spoil other than CWD (principally port dredgings) has been carried out on a very large scale for decades. As examples, the following are noted:

. in the late 1970's, the NSW Maritime Services Board dumped 10 million cubic metres (mcm) of rock and sand from Newcastle Harbour 3 kilometres offshore from the harbour entrance **(Ref 2.20).** The site had earlier been used for a similar dumping exercise in the late 1960's.

. between 1973 and 1980, 4.5 mcm of spoil from Port Kembla Harbour was dumped near the islands, a few kilometres outside the harbour,

. in 1980, 2.2 mcm of spoil was dumped 3 kilometres offshore from Port Kembla,

. research is currently underway to locate yet another site off Port Kembla to take more dredgings associated with the proposed Grain Terminal development.

These dumping activities were largely undocumented but a study of the effects of the 1980 operation **(Ref 2.21)** found that while short term effects on epi-benthic communities were significant, recovery was well under way within 9 months of the cessation of dumping. Similar studies in the UK (reported in **Ref 2.1)** suggest broadly similar results for both CWD and fly ash dumping operations.

The suggestion of disposing of CWD and even blast furnace/steelmaking slag at sea will inevitably lead to an immediate response from many sections of the community and this may be why the coal industry has been reluctant to seriously entertain the possibility. <u>However, in view of the growing conflict over land based emplacement methods it is considered that serious consideration must be given to this option.</u>

In general terms, it is considered most unlikely that ocean dumping of CWD would produce any adverse chemical impacts (due to saline nature of sea water and its limitless chemical buffering capacity). Any impacts would be physical and could be expressed as:

. discolouration of water due to sediment suspension,

. displacement of bottom dwelling communities, or,

. interference with fisherman trawling the sea floor.

All of these issues could be objectively studied and, in fact, such studies are already being carried out in relation to proposed dumping operations off Sydney Harbour.

Discussions with the SPCC **(Ref 2.23)** and with the NSW Public Works Department **(Ref 2.22)** in relation to these research programmes suggests that there is every reason to believe the ocean dumping of CWD could be carried out in an environmentally acceptable way, provided:

. bottom depth at the dumping site was greater than 150 metres so that wave and current action is reduced,

. the site was within the Eastern Australian current, (approximately 20 kilometres offshore from Port Kembla).

Environmental, engineering, and economic studies would have to be carried out prior to approval of any such operation. However ocean dumping of CWD from AIS's central washery would appear to have sufficient potential to warrant serious evaluation.

In **Ref 2.1** it was stated that AIS investigated the ocean dumping concept but rejected it on the basis of cost and enviromental grounds. Recent advice **(Ref 2.5)** suggests that the emphasis in this assessment was on potential environmental problems rather than economics. As previously stated, it is considered that while the potential public reaction to such a proposal may be daunting it is unlikely that these concerns could not be adequately addressed given a suitable research programme. This leaves the question of economics to be addressed.

To evaluate the economic feasibility of ocean dumping, a conceptual design and cost exercise has been carried out as part of this study. Details of the study assumptions, cost estimates, and conclusions are set out in **Appendix 2** to this report. The study concluded that the cost of dumping approximately 1.5 million tonnes per annum of solid wastes 20 kilometres east of Port Kembla for a period of 20 years would be of the order of $5 per tonne. This cost must be considered very approximate but would compare favourably with the long term emplacement cost at Wongawilli. The barging cost has not been estimated rather, estimates were obtained from barging contractors and a final rate of $4/tonne adopted. Three to four barges would be required for 24 hour per day operation.

In view of the comments made above, it is concluded that ocean dumping is potentially a cost effective and environmentally acceptable alternative to landfill emplacement. Studies, including detailed oceanographic and marine biological studies, could be completed and documented in 3 to 5 years study period and as such this alternative must rank highly as a possible ultimate solution to AIS's problem for the medium to long term.

It is would be appropriate that AIS be required to carry out the necessary ocean dumping feasibility studies possibly in conjunction with the appropriate authorities.

2.4 ALTERNATIVE UTILISATION OPTIONS

2.4.1 Engineering Applications

There is a very broad range of potential engineering applications for CWD including:

. construction of sportsgrounds, playing fields, parks and trotting tracks,

. reclamation of flood prone or swampy lowlands,

. construction of levies for flood mitigation,

. as a cover for sanitary landfill operations,

. as a fill for road or other embankments,

. as a subgrade for various residential, commercial and industrial projects such as tennis courts and shopping plazas, and

. as a sub-base for road construction.

The scale of usage is as surprisingly high as the range is broad. A few examples serve to make the point:

. it has been estimated that approximately 25 parks and ovals in the Newcastle and Wollongong areas have been built on CWD fill **(Ref 2.10),**

. it has been estimated that between 2 000 tonnes per week **(Ref 2.10)** and 4 500 tonnes per week **(Ref 2.24)** of CWD is used in the Illawarra region alone for engineering applications,

. a substantial proportion of the Port Kembla steelworks stands on land reclaimed using slag and CWD (see **Section 2.2),**

. Thirroul Plaza was developed on a CWD fill **(Ref 2.24),**

. lime stablised CWD was used by the NSW Department of Main Roads in various applications on the Appin Road, on MR 259, and for temporary roads in association with construction of the F6 Freeway at North Wollongong **(Ref 2.1).**

The questions of relevance to this assessment are: how much of the CWD used in the Illawarra region is sourced from AIS, what is the potential for increasing the quantity, and what impact will this have on the nature of AIS's landfill disposal problem?

As far as can be determined, the greater proportion of CWD currently used for engineering purposes in the Wollongong region comes from washeries in the North Wollongong area rather than from AIS's central washery. There appear to be two reasons for this. The favoured washeries produce a higher ash reject which has more desirable engineering properties, and, AIS also produces and makes available free of charge, blast furnace slag which, in general terms, is considered competitive with and superior to AIS's CWD.

Because AIS is washing coal for coking purposes while the North Wollongong washeries produce higher ash steaming coals, the only way of overcoming the quality problem would appear to be reprocessing central washery CWD. As is discussed later in this chapter, in connection with fluidised bed combustion technology, there is a way of doing this but the purpose would not primarily be to increase the marketability of the material as fill. Alternatively, it has been suggested by a local engineering consultant who is an advocate of increased usage of CWD and has extensive relevant experience **(Ref 2.24)** that the failure to make more use of central washery CWD is reflective of a lack of knowledge amongst potential users of the specific applications for which CWD is preferable to slag. It has been suggested that slag can produce leachate problems if not properly

emplaced **(Ref 2.25),** and that where trenching of the fill is required, CWD is a better material, as it is when an impermeable fill is required. This would suggest that there may be a benefit to AIS in treating its CWD as a marketable product and promoting demand by increasing awareness amongst potential users of the specific applications to which it is best suited.

The possibility that increased usage of CWD may cut into AIS's slag disposal was a concern expressed by AIS **(Ref 2.5).** However, in view of the comments made above, there at least appears to be a way around this problem. An aggressive CWD marketing approach might also take account of the fact that a tonne of CWD at the steelworks has an effective negative value to AIS equivalent to the cost of hauling it to and placing it in an emplacement. Nominally, it is estimated that this value is in the order of $3.00 to $4.50 for the Wongawilli emplacement. Conceptually at least, there may be a cost benefit to the Company in paying consumers to take the material. There are certain obvious problems with such an approach particularly if unscrupulous operators take the material and dump it illegally. Nevertheless, it is considered that in view of the many problems associated with the Company's current disposal strategy, any tactic that offers potential to reduce the scale of the problem ought to be investigated.

The next question raised related to the likely market for AIS CWD and slag in the foreseeable future. Since it is difficult to estimate what the current usage is, there are obvious problems with forecasting future demands. However, in discussions with both the Wollongong City Council **(Reference 2.26),** the Department of Main Roads and others the following possible major fill requirements have been identified:

. Mullett Creek flood detention basins may consume several hundred thousand tonnes,

. the new sanitary landfill operation at Whytes Gully may utilise 45 000 to 60 000 tonnes per annum (tpa) for cover,

. sundry road projects may consume 10 000 to 50 000 tpa,

. a major single develoment in the Illawarra region with the requirement for substantial fill volumes. Two projects have been mentioned:

  - subsequent stages of the Port Kembla coal loader with additional land area being created by a major seaward reclamation,
  - second Sydney airport, with sites being discussed at Darkes Forest and Wilton.

Regarding recurring demands (Whytes Gully and road projects) these could conceivably account for up to 110 000 tpa which would account for less than 10 percent of AIS's forecast annual production and hence would have no significant impact on the basic disposal problem. Similarly, the Mullett Creek detention basins would, at best account for some 30 percent of annual production and represent a once only requirement.

Regarding the major fill requirements; the airport development is speculative at this stage and for the purposes of this study cannot be considered to offer any significant opportunity. The coal loading reclamation proposal has been looked at briefly by the Public Works Department as part of the initial studies for the loader in the 1970's. Studies (and EIS) for Stage 2A and 2B of the loader have been carried out and would not require any further reclamation. The Maritime Services Board which owns this area of land cannot see a need ever developing for reclamation of this area and considers the costs of armouring the fill area to be prohibitive.

In conclusion the use of slag and CWD in engineering applications is unlikely to significantly influence the nature of AIS's disposal problem.

2.4.2 Energy Recovery

The use of coal reject as a source of energy has been a subject of research and development by the CSIRO Division of Fossil Fuels for more than 11 years and a pilot scale fluidised bed combustion (FBC) plant jointly funded by the CSIRO, Joint Coal Board, and Clutha Development Pty Ltd, has been in operation at the Glenlee washery, near Picton since 1977 **(Ref 2.2).** The solid wastes produced from combustion, namely coarse bed material and fly ash, are virtually inert. Unfortunately, since the FCB feedstock already has a relatively high mineral content, the volume of the wastes is only reduced, on average, by 30%, although weight reductions of up to 50 percent for fine CWD can be achieved **(Ref 2.27).** The principal objective of the pilot plant is to deal with the problem of fine CWD (tailings) which were considered to present the more significant environmental problem **(Ref 2.28).**

Based on the early results of the pilot plant, a study of a full scale FBC plant burning fine tailings only showed that the system could cover capital costs by generating electricity for sale and on that basis, appeared to be more cost effective than conventional tailings disposal **(Ref 2.29).** The study report was less specific about the economics of burning both coarse and fine CWD (a significantly larger plant would be required) but implied that this too would be competitive on an opportunity cost basis. More work remains to be done on maintenance aspects of FCB plants but the consensus appears to be that the system has potential.

The thrust of CSIRO's published thinking on the value of FCB appears to centre on its potential to de-activate CWD, with attendant pollution control benefits, and marginally reduce the volumes requiring landfill emplacement.

From the perspective of this study, rather more value is seen in its potential to:

- produce wastes which have wider application for purposes such as construction aggregate, light weight aggregate, cement filler, "grog" in the manufacture of ceramics, tiles, and bricks, and as a soil conditioner in agricultural applications, and/or,

- produce a less reactive waste which might be more suited to, for instance, ocean dumping should research show that 'raw' CWD is not acceptable due to its chemical properties.

In view of comments made earlier in this Section about the massive scale of AIS's rejects disposal problem and the limited effect even the most optimistically high CWD construction fill requirements would have on it, it is difficult to see even total development of markets for FCB wastes having very much effect either. Regarding the potential value of an FCB plant in reducing the reactivity of CWD prior to ocean dumping, comments made earlier in this report suggest that chemical pollution is unlikely to be a problem with ocean dumping. Accordingly, FCB technoogy is assessed as being of value to AIS only as a potentially low cost power generation technique which will have no real bearing on the waste disposal problem.

2.4.3 Other Options

Other possible uses for CWD canvassed in, for instance, **Ref 2.1** include a source of alumina, a material for brick making and as a fuel for SYNGAS production. None of these options is considered to have any real potential for consumption of a significant proportion of the material.

2.5 CONCLUSIONS

This review of CWD disposal options has suggested, in contrast to some other recent studies, that there are two options which are worthy of more detailed consideration.

The first option takes into account the fact that the one significant problem posed by AIS's Wongawilli emplacement proposal is that it will sterilise a significant proportion of Wollongong's potential residential land stock. This conflict would not arise, or at least, would not be so severe, if this emplacement was designed to allow residential development. As discussed there is every reason to believe that the engineering skills necessary to cope with the particular problems posed are already available. However, there are still some questions relating to spontaneous combustion which need to be addressed and for this reason, this option cannot be recommended at this stage. In addition, for the Wongawilli proposal, the significant noise impacts which could arise from the development would still exist.

The second option, ocean dumping, provides a means by which a complete change could be made in AIS's approach to CWD disposal. It has been shown in this report that, conceptually, ocean dumping could be cost competitive and similarly there is some evidence that such a system could be environmentally acceptable. Certainly, it would not be unprecedented. Since an extensive study period would be required to complete the necessary research to support such a proposal, this option clearly does not hold any short term potential. Nevertheless, it is strongly recommended that any development consent issued pursuant to the various development applications from AIS consider the need for these studies to be carried out within a specified time frame.

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3. LANDFILL EMPLACEMENT SITE ASSESSMENT

The objective of this assessment is to reassess whether there exist other landfill emplacement site(s) within the Wollongong region which could be viable alternatives to AIS's proposed Wongawilli site and which will not sterilise potential residential land or have unacceptable environmental impacts.

There is a substantial number of alternative sites available and accordingly, as discussed in **Section 1.3** of this report, a three staged assessment approach was adopted to narrow down the number of sites for detailed assessment. The criteria adopted in the assessment process were broadly in accordance with:

. Council's stated policies in respect of environmental control or regional strategic planning, and,

. generally accepted standards of engineering feasibility.

The specific criteria adopted in each assessment stage are discussed in **Section 3.1** below.

3.1 Decision Making Criteria

3.1.1 First Stage

For the first stage of the evaluation process, the re-evaluation of sites previously considered in other studies and new sites, seven constraints were defined all of which had to be complied with. The constraints adopted were basically of a regional planning nature and had been adequately defined by Council's forward planning group. The seven constraints were as follows:

. potential residential land,

. land designated in the relevant Local Environment Plan (LEP) for flora protection **(Ref 3.1),**

. land designated in the LEP for landscape conservation,

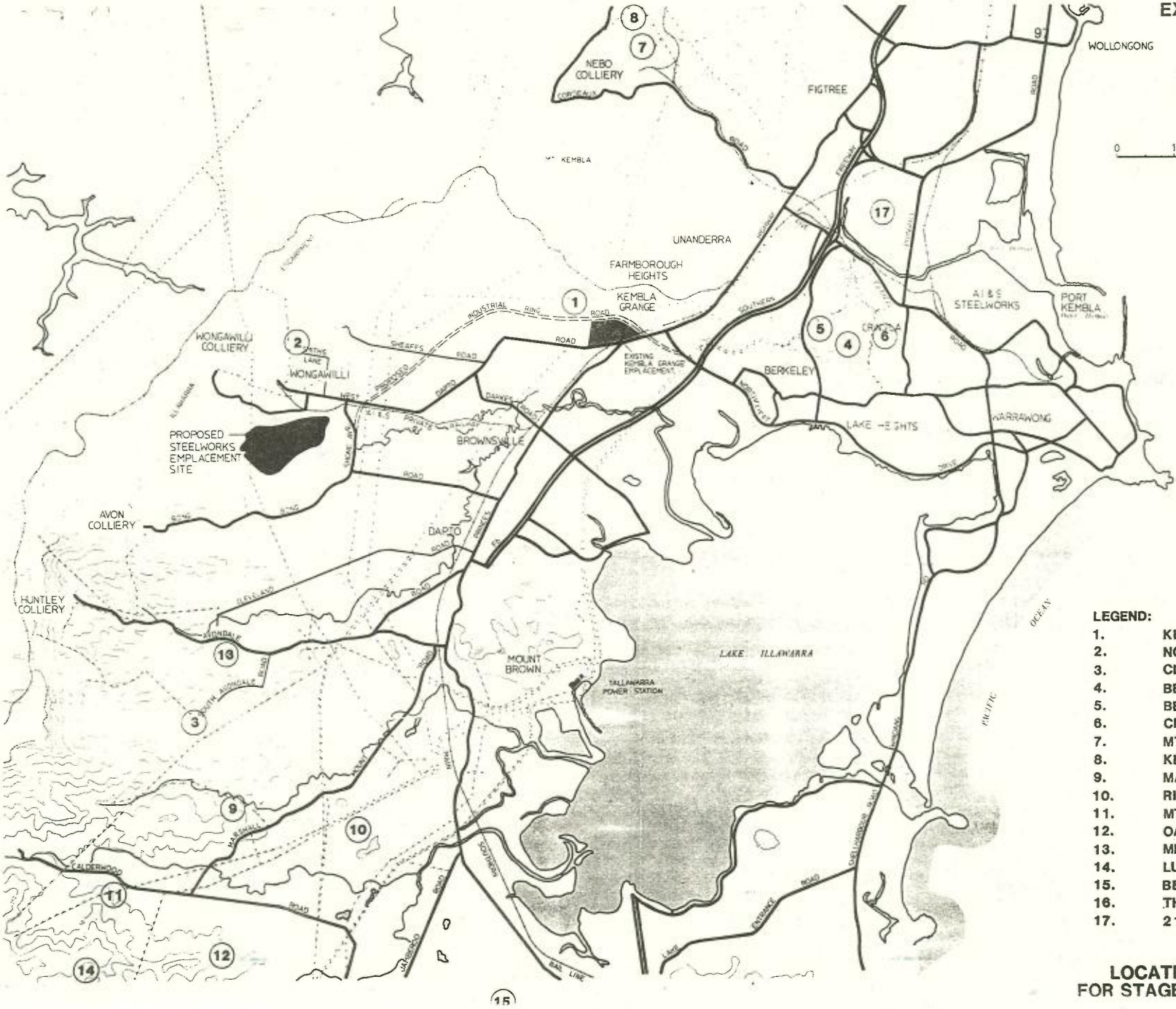
. land designated by Council as having potential or actual heritage conservation value,

. land below the level of the 1 in 100 year flood,

. land within areas proclaimed as Catchment Area under Section 55 of the MWS & DB Act, 1924,

. land which is physically inaccessible or on preliminary assessment appears to be too steep to satisfactorily accommodate an emplacement, (generally, land steeper than 1in 4).

EXHIBIT 1



LEGEND:

1.	KEMBLA GRANGE EXTENDED
2.	NORTH WONGAWILLI
3.	CLOVER HILL
4.	BERKELEY RESERVOIR
5.	BERKELEY HILL
6.	CRINGILA
7.	MT. KEMBLA
8.	KEMIRA
9.	MARSHALL MOUNT
10.	RIVERDALE
11.	MT. JOHNSON
12.	OAK FARM
13.	MILLER VALE
14.	LUCKWARRA
15.	BEAVER LODGE
16.	THE HILL
17.	21 DUMP

LOCATION OF SITES FOR STAGE II ASSESSMENT

3/N4175/8-1984

TABLE 3.1 - STAGE I RE-EVALUATION OF CRDS SITES

Site No	Name	Accept/Reject	Principal Reason for Rejection	Comments
1.	North Kemira Valley	Reject	Located within Escarpment Protection Zone	
2.	Kembla Grange Extended	Accept		
3.	Sheaff's Road West Dapto	Reject	Sterilises potential residential land residential land	Also partly flood prone
4.	North Wongawilli	Accept with qualification		The site intrudes into potential residential land only to a minor extent.
5.*	South Wongawilli (AIS's proposed site)	Reject	Sterilises potential residential land	
6.	Avon Emplacement extended	Reject	Sterilises potential residential land	Other factors against include possible flood liability of parts of the site.
7.	Calderwood Valley	Reject	Sterilises potential residential land	The site also intrudes into land zoned for escarpment protection
8.	Duck Creek Valley	Reject	Intrudes into escarpment protection protection zone	
9.	Clover Hill	Accept with qualification		Only minor intrusion into landscape protection zone, plus minor intrusion into "Linbrook", property with possible local heritage value
10.	Glenidle	Reject	Sterilises potential residential land	
11.	South Avondale	Reject	Sterilises potential residential land	Also covers the property "Avondale" which is designated as having environmental heritage value
12.	Yallah	Reject	Flood prone land	
13.	Yallah Bush	Reject	Flora conservation area	
14.	Yellow Rock Valley	Reject	Sterilises potential residential land	

***Note:** The site assessed is the "maximum possible emplacement," see **Reference 3.2**

TABLE 3.2 - STAGE I RE-EVALUATION OF AIS SITES

Site No *	Name	Accept/Reject	Principal Reason for Rejection	Comments
1.	Berkeley Reservoir	Accept		
2.	Berkeley Hill	Accept with Qualification		Part of this site is zoned for Environmental Protection (Scenic), and part Industrial under the LEP. Against this has to be weighed excellent access, proximity to source, and excellent volume potential
3.	Warrawong	Reject	Zoned residential	
4.	Port Kembla District Hospital	Reject	Presently being subdivided for residential	
6.	Reddalls Road	Reject	Land zoned for environmental protection	Parts of this site supports rainforest communities
9.	Cringila	Accept with qualification	Scenic Protection under the LEP	
11.	Cleveland Road	Reject	Potential residential	
13.	Kanahooka	Reject	Zoned Scenic Protection	
14.	Farmborough Heights	Reject	Zoned residential	
15.	Staff Road	Reject	Being developed as residential	
16.	Unanderra Heights	Reject	Potential residential	
17.	Mt Kembla	Accept		
18.	Kemira	Accept		
19.	Nareena Hills	Reject	Partially zoned Environmental Protection	

Note: * Site numbering is identical with **Reference 3.3,** and only those sites not considered in the CRDS study are detailed.

The first four criteria are consistent both with Council's planning priorities and the requirements of the LEP. The 1 in 100 year flood constraint is included because of a possible conflict with regional flood storage requirements. The exclusion of catchment areas is consistant with the past attitude of the Board while the last criterion is a reasonable practical consideration.

3.1.2 Second Stage

The second stage of the evaluation process was applied to those previously identified sites which passed through the first stage. Some 10 additional sites that were located independently from desk and field assessments associated with this study are also included. The assessment criteria adopted for this stage included:

- potential capacity,
- visual accessibility,
- number of houses directly and indirectly affected,
- potential noise/dust impacts,
- delivery options, access, and haul distance,
- requirements to relocate site services,
- difficulty of water management,
- site stability, and,
- any other obvious constraints on the successful establishment and management of a landfill emplacement.

In contrast to the Stage I assessment criteria these criteria are not absolute and hence are only suitable for ranking sites.

3.1.3 Third Stage

In this stage, the most promising sites from Stage II were considered, individually or in combination, in terms of their practicability from the environmental, engineering, and statutory points of view.

The latter requirement places a particular constraint on the available options. To meet short term disposal needs, AIS need an early development consent which virtually requires that any strategy developed must incorporate a site presently owned by the Company, (and ideally which is also the subject of an existing development application). The full implications of this are discussed in more detail in **Section 3.5.2.**

3.2 STAGE I ASSESSMENT

As discussed in **Section 1.3.1** there have been two previous studies of emplacement sites for AIS reject disposal. The first was carried out by the Coal Rejects Disposal Sub Committee (CRDS) of the Coal Resources Development Committee **(Ref 3.2),** and the second by AIS specifically for the Wongawilli proposal **(Reference 3.3).**

3.2.1 CRDS Study Sites

A total of 14 potential sites were considered in this study of which four were "short listed" and studied in considerable detail. The recommendation for a preferred site, referred to as Site B, was essentially the Wongawilli site as subsequently proposed by AIS.

The results of the Stage I re-evaluation of these sites are shown in **Table 3.1.** As shown, only 3 sites; Kembla Grange extended, North Wongawilli, and Clover Hill, satisfy the criteria and of these, the last two have potential to conflict with the adopted constraints depending on the final limits of the emplacement.

3.2.2 AIS Study Sites

A total of 21 alternative sites were considered by AIS of which nine were common, in whole or part, with the CRDS sites. Of the 21 sites, five were short listed and only 2 (Wongawilli and Cringila) satisfied all of AIS's assessment criteria.

The **Stage I** reassessment of these sites is shown in **Table 3.2.** As shown, five of the 12 additional sites considered satisfied the Stage I criteria although two (Berkeley Hill and Cringila) were qualified acceptances since they intruded into potential landscape protection areas. However, these areas are not related to the visual quality of the escarpement and hence, some compromise was considered acceptable.

3.2.3 New Sites

In addition to the 8 sites from the CRDS/AIS studies which satisfied the first stage assessment criteria nine additional sites were located which also satisfy these criteria. Details of the sites are contained in **Appendix 2.**

Accordingly, at the completion of the Stage I assessment, 17 of the total 35 possible sites proved suitable for more specific assessment under Stage II. These sites are located on **Exhibit 1.**

3.3 STAGE II ASSESSMENT

A summary of the principal characteristics of the 17 sites is set out in **Table 3.3.** As previously discussed, there can no clear cut decision on sites in this stage; they can only be ranked in order of utility, environmental impact, or whatever other assessment criteria are adopted.

A preliminary review of **Table 3.3** shows that some sites can be eliminated immediately from further consideration, as follows:

- **Site 7 (Mt Kembla)** - primarily due to site instability but contributing factors include proximity to Mt Kembla Village, the condition and alignment of Cordeaux Road, the access route through residential areas, and the limited area available for the installation of water management structures.

- **Site 8 (Kemira)** as for Site 7.

- **Site 9 (Marshal Mount)** - the volume (1.0 mcm) and haul distance (18 km) make it unacceptable.

- **Site 13 (Miller Vale)** - again, the small capacity (2.0 mcm) and the long haul distance make it an unattractive proposition particularly with Site 3 (Clover Hill) nearby offering 7 to 8 times the volume with no extra environmental problems or haul cost penalty.

This leaves 13 sites for more detailed consideration. In carrying out this further analysis it was noted that virtually all sites have both positive and negative aspects and usually these are registered in different categories. (For example, Site 6 (Cringila) rates highly in terms of cost, and engineering considerations but badly in terms of environmental impacts).

To resolve the problem of making the necessary comparisons the remaining sites have been ranked according to three criteria: potential environmental impacts due to site activities, potential impacts due to transport, and notional cost/engineering considerations.

3.3.1 Impacts Due to Site Activities

It was considered that the impact potential of the different sites would be determined primarily by factors relating to potential noise, dust, and visual impacts which in turn will be influenced by factors such as ambient environmental conditions, proximity of houses, exposure to prevailing winds, opportunities for screening, and so on. The objective of the exercise is to group sites into low, medium, or high impact categories. However with such a wide range of factors to be taken into account it was found that, in the first instance, a numerical scoring system was useful. Scores were allocated for each site according to six criteria as follows:

Criterion	Score
1. Houses within 1 km	
Few (1-5)	1
Moderate (5-10)	3
Partly residential	5
Completely residential	10
2. Ambient conditions	
Industrial	1
Residential	5
Rural	10
3. Exposure	
Protected site	1
Partially exposed to W/SW wind or fully exposed but few (5 or less) receptors	5
Fully exposed to W/SW wind with more than 5 receptors	10
4. Height Relations	
Site above surrounding houses	1
Same level	3
Site below surrounding houses	5
5. Screening	
Limited opportunities for artificial screens	-1
Some opportunities	-5
Excellent opportunities	-10
6. Existing Coal/Steel Developments Nearby	
Another emplacement	1
Other Colliery/quarry nearby	5
No other Colliery/quarry nearby	10

TABLE 3.3 - SUMMARY OF STAGE II ASSESSMENT (PAGE 1)

Site No	1 Kembla Grange Extended	2 North Wongawilli	3 Clover Hill	4 Berkeley Reservoir	5 Berkeley Hill	6 Cringila	7 Mt Kembla	8 Kemira
1. Capacity (million cubic metres)	2.5	7.0	15.0 (max)	4.5 *	13.0 (max)	3.6	3.5	3.0
2. Visual Accessibility	High but no worse impact than existing	Restricted from short range, less so from long distance	Unrestricted to NW at short range but few houses affected	Restricted	From N and NW at intermediate range	Easy access from S, E, & NE	From S at short range, some tree screening	Limited
3. No of houses affected - directly	Nil	One	One	Nil	Two	Nil	Nil	Nil
- indirectly	Residential area within 500 m	Wongawilli Village 1 km south	10 houses within 2 km	One adjacent plus residential within 500 m	Nil	up to 200	Mt Kembla Village within 500 m	Mt Kembla Village within 1 km
4. Potential impact;								
- noise	Moderate	Moderate	Moderate	Mod-high	Low	High	High	Moderate
- dust	Low	Low	Low	Mod-high	Low	High	Moderate	Low
5. Transport								
- access	via West Dapto Rd	via West Dapto Rd	via Avondale/ S Avondale Rds	Off 5 Islands Rd or Berkeley Rd	Berkeley Rd	Off 5 Islands Rd	Cordeaux Rd	Cordeaux Rd
- mode	truck	truck	truck	truck	truck	truck	truck/rail	truck/rail
- distance	10 km	14 km	20 km	2 or 4 km	4 km	2 km	8 km	9 km
6. Relocation of Services	Cemetery, playing field	Nil	1 x 132 kV transmission line	Water Mains	2 x 132 kV transmission line	Nil	Nil	Nil
7. Water Management	Basic	Difficult	Moderate	Basic	Basic	Basic	Moderate to Difficult	Moderate to Difficult
8. Stability	Stable	Doubtful	Stable	Stable	Stable	Stable	Unstable	Unstable
9. Other	Adjacent to existing operation, all impacts are incremental	Significant road upgrading required for access	Intrudes onto parts of property with heritage value	Impacts depend on design and management	Very low impact potential	High adverse impact potential	Possible conflict with O'Brien's Drift operation	

Note: * This site was quoted in **Reference 3.3** as having a volume of only 1.9 mcm. Calculations suggest that RC 4.5 mcm could be accommodated if required.

With this system, the numerical value of the score increases as adverse impact potential increases. The results of the exercise are setout in **Table 3.4.**

TABLE 3.4 - IMPACTS DUE TO SITE ACTIVITIES

Site No	Criterion 1	2	3	4	5	6	Total
1	5	5	8	5	-5	1	19
2	3	10	4	1	-10	5	13
3	3	10	3	3	-10	4	13
4	5	5	7	3	-5	10	25
5	1	4	2	3	-5	10	15
6	10	5	10	5	-3	10	37
10	3	10	5	3	-3	10	28
11	3	10	10	3	-4	10	32
12	3	10	10	3	-3	10	33
14	3	10	5	4	-3	10	28
15	5	4	8	2	-5	6	20
16	2	10	8	1	-5	8	24
17	1	1	5	5	-3	1	10

The scores shown in **Table 3.4** were then used to group sites according to impact potential as follows:

Low Impact Potential (Score less than 20) - 21 Dump (Site 17)
North Wongawilli/Clover Hill (Sites 2/3)
Berkeley Hill (Site 5)
Kembla Grange extended (Site 1)

Medium Impact Potential (Score 20-29) - Beaver Lodge (Site 15)
The Hill (Site 16)
Berkeley Reservoir (Site 4)
Riversdale/Luckwarra (Site 10/14)

High Impact Potential (Score greater than 29) - Mount Johnson (Site 11)
Oak Farm (Site 12)
Cringila (Site 6)

3.3.2 Impacts Due to Transportation

The impacts considered under this category are noise and safety hazard, neither of which is suited to evaluation by a simple weighting system. However, it is possible to discern certain characteristics of the various transport routes which predispose them to differing levels of potential impact and hence, sites can be grouped accordingly.

Noise Impact Potential
The factors which will influence noise impact potential are:

. ambient noise conditions; (vehicle noise will have less of an impact in an industrial area than in a residential area),

TABLE 3.5 - POTENTIAL NOISE IMPACTS - TRANSPORT

Site No.	Site Name	Existing Land Use Pattern	Future Land Use Pattern	Noise Impact Potential	Comments
1.	Kembla Grange	All industrial or transport corridor	All industrial or transport corridor	Low	
2.	North Wongawilli	Industrial/transport corridor/ rural	Industrial, transport corridor/ residential/rural	Medium becoming high	Before completion of this emplacement some residential development should occur along West Dapto Road
3.	Clover Hill	Industrial/transport corridor/ residential/rural	As for existing	High	
4.	Berkeley Reservoir	Industrial/near residential	As for existing	Medium	
5.	Berkeley Hill	Industrial/semi-industrial	As for existing	Low	
6.	Cringila	Industrial/near-residential	As for existing	Medium	
10.	Riversdale	Industrial/transport corridor/ residential/rural	As for existing	Medium	The extent of residential area traversed is only small
11.	Mount Johnson	Industrial/transport corridor/ residential/rural	As for existing except extent of residential will increase	Medium becoming high	During the 20 year emplacement life, residential development along Marshal Mount Rd should become significant
12.	Oak Farm	As for 11	As for existing	Medium	With an emplacement life of approx 5 years this site will have no worse impact than at present
14.	Luckwarra	As for 11	As for 11	Medium becoming high	
15.	Beaver Lodge	Transport Corridor	Transport Corridor	Low	This Site is intended for all rail delivery
16.	The Hill	As for 15	As for 15	Low	
17.	21 Dump	Industrial	Industrial	Low	

. existing population density; (there are fewer people affected in a rural area than a residential area),

. likely future population density (during the life of the emplacement).

These factors are essentially determined by existing and likely future land use patterns along the route. In **Table 3.5,** the 13 sites are classified accordingly. It should be noted that Sites 15 and 16 would have rail delivery which justified a discounting of their noise impact potential.

Table 3.5 shows that the following sites have the lowest potential for noise impacts arising from transport operations:

. Kembla Grange extended (Site 1)
. Berkeley Hill (Site 5)
. Beaver Lodge (Site 15)
. The Hill (Site 16), and
. 21 Dump (Site 17).

Safety Hazard
Safety hazard is primarily a function of transport mode, road widths and road alignments. As shown in **Table 3.6,** sites have been assessed under four safety hazard categories with the lowest risk being associated with Sites 15 and 16 which would have rail delivery. The distinction between moderate and high risk routes arises from an assessment of the alignment of the southern end of Marshall Mount Road.

TABLE 3.6 - SAFETY HAZARD ASSESSMENT

Safety Hazard	Site No	Site Name	Comment
Very Low	15	Beaver Lodge	Rail delivery
	16	The Hill	Rail delivery
Low	1	Kembla Grange	Delivery to all of these sites is via major roads with good alignments and adequate traffic lighting
	4	Berkeley Reservoir	
	5	Berkeley Hill	
	6	Cringila	
	17	21 Dump	
Moderate	2	North Wongawilli	
	3	Clover Hill	
High	10	Riversdale	
	11	Mt Johnson	
	12	Oak Farm	
	14	Luckwarra	

3.3.2 Cost Considerations

In this analysis the principal concern is to distinguish between up front capital costs and operating costs. Discussions with AIS suggest that sites with lower initial outlay requirements are favoured by the Company even to the extent of incurring significantly higher operating costs.

In **Table 3.7** the sites are listed and classified according to assessments of the likely level of these two types of cost. In ranking sites according to capital cost requirements, account has been taken of whether costs will be incurred in:

. land purchase
. loading facilities
. unloading facilities
. rolling stock
. access roads and reconstruction costs
. removal of site infrastructure

Account has also been taken of the life of the emplacement and hence whether, for a twenty year period, the required capital investment would be a once only investment or whether it would have to be incurred again at some other site.

For annual operating costs, it has been assumed that the only variable will be haul cost which can generally be equated with haul distance. In the Table, the cost implication is expressed as a percentage change in the current haul distance to Kembla Grange.

To provide a baseline for comparison, AIS's preferred site at Wongawilli has been included in the Table. This site is characterised by a low establishment cost (it has been owned by AIS for a number of years) with a relatively high operating cost. The difficulty of making between-site cost comparisons is conceded and this form of assessment is at best notional. The question of the balance between capital and operating costs is discussed in more detail in **Section 3.4** of this report.

Bearing in mind the above qualification, **Table 3.7** suggests that for the short term, Sites 1, and 17 should be favoured. In the medium to long term Sites 2, 3 and 5 are likely to be most economically attractive.

3.4.4 Summary of Stage II Assessment

The results of the Stage II assessment are summarized in **Table 3.8.** The final line of the Table denotes the sites which were selected for more detailed consideration (Sites 1, 2, 3, 4, 5, and 17). The reasons for rejecting the remaining seven sites were as follows:

. **Site 6 (Cringila)** - this site has cost disadvantages, as well as an unacceptable adverse impact potential.

. **Site 10 (Riversdale)** - in most respects, this site was comparable to, say Site 2, but was disadvantaged by its lack of volume.

. **Site 11** (Mount Johnson) - this is the only site with virtually unlimited volume potential but transport implications (both distance and route) militated against it.

TABLE 3.7 - COST CONSIDERATIONS (PAGE 1)

Site No.	1	2	3	4	5	6	10
Site Name	Kembla Grange Extended	North Wongawilli	Clover Hill	Berkeley Reservoir	Berkeley Hill	Cringila	Riversdale
CAPITAL COST							
Land Purchase	Yes	Yes	Yes	Yes	Yes	No	Yes
Loading facility	No	No	No	No	No	No	No
Unloading facility	No	No	No	No	No	No	No
Rolling Stock	No	No	No	No	No	No	No
Road Upgrading and Access Roads	No	Yes	Extensive	Yes	Yes	Yes	Yes
Removal of Site Infrastructure	No	No	Yes	Water Mains	Power Lines	No	No
Capital Cost Classification	Very Low	Moderate	Moderately High	Moderately High	Moderately High	Moderate	Moderate
OPERATING COST							
Haul distance	10 km	14 km	20 km	2-4 km	4 km	2 km	20 km
Operating Cost Classification (change from existing)	No change	40% increase	100% increase	60-80% reduction	60% reduction	80% reduction	100% increase
Comments	This site requires a very low capital cost committment with no change in haul costs but it only offers four years life and so its total long term cost implications would depend on any site it was combined with.	Land purchase and access road installation costs would not be excessive but this site offers only 8 years of life so it would have to be considered in the context of a second site.	The principal capital cost item would be for access roads and upgrading of Cleveland Road but the site has a 16 year potential life.	This site offers overall cost efficiency at the expense of a high up front cost. Potential life would be a maximum 5 years.	Overall cost efficiency with medium to long term life expectancy. Power line relocation could be staged.	Very low operating cost but access road installation would be expensive	This site combines moderate up front costs with significantly higher haul costs and has only four years potential life
OVERALL COST ASSESSMENT	Low cost Short term site	Moderate to high cost medium term site	Moderate Cost Long term site	Moderate to high cost, Medium term site	Moderate cost Medium to Long term site	Moderate cost short term site	Moderate to high cost Short term site

TABLE 3.7 - COST CONSIDERATION (PAGE 2)

Site No.	11	12	14	15	16	17	AIS Preferred Site
Site Name	Mount Johnson	Oak Farm	Luckwarra	Beaver Lodge	The Hill	21 Dump	Wongawilli
CAPITAL COST							
Land Purchase	Yes	Yes	Yes	Yes	Yes	No	No
Loading facility	No	No	No	Yes	Yes	No	No
Unloading facility	No	No	No	Yes	Yes	No	No
Rolling Stock	No	No	No	Yes	Yes	No	No
Road Upgrading and Access Roads	Yes	Yes	Minor	No	No	No	Yes
Removal of Site Infrastructure	Power line	No	Power Lines	No	Yes	Minor	No
Capital Cost Classification	Moderately High	Low	Moderately High Cost	Very High Cost	Very High Cost	Very Low Cost	Moderately Low Cost
OPERATING COST							
Haul distance	23 km	24 km	30 km	22 km (rail)	24 km (rail	2 km	18 km
Operating Cost Classification (change from existing)	130% increase	140% increase	200% increase	120% increase	80% reduction	80% increse	80% increase
Comments	This site offers a complete solution at a cost somewhat higher than AIS's preferred site		High overall cost and offers only 9 years of potential life				
OVERALL COST ASSESSMENT	Moderateto high cost Long term site	Moderate to high cost Short term site	High cost Medium term site	Very high cost Short term site	Very high cost Short term site	Very low cost Short term to Medium term site	Moderate cost Long term site

TABLE 3.8 - SUMMARY OF STAGE II ASSESSMENT

Site No	1	2	3	4	5	6	10	11	12	14	15	16	17
Site Name	Kembla Grange Extended	North Wonga-willa	Clover Hil	Berkeley Reservoir	Berkeley Hill	Cringila	Riversdale	Mount Johnson	Oak Farm	Luckwarra	Beaver Lodge	The Hill	21 Dump
Environmental Impacts due to Site Activities	Low	Low	Low	Medium	Low	High	Medium	High	High	Medium	Medium	Medium	Low
Transport Impacts													
Noise -	Low	Med to High	High	Medium	Low	Medium	Medium	Medium to High	Medium	Medium to High	Low	Low	Low
Safety -	Low	Medium	Medium	Low	Low	Low	High	High	High	High	Very Low	Very Low	Low
Cost Implication	Low Cost	Moderate to High Cost	Moderate Cost	Moderate to High Cost	Moderate Cost	Moderate Cost	Moderate to High Cost	Moderate to High Cost	Moderate to High Cost	High cost	Very High Cost	Very High Cost	Very Low Cost
Suitable for Stage III Assessment	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	Yes

- **Site 12 (Oak Farm)** - this site had no outstanding cost or environmental attributes and lacked volume.

- **Site 14 (Luckwarra)** - this site was of comparable volume to Site 2 but had higher cost and adverse impact potential.

- **Sites 15 and 16 (Beaver Lodge and The Hill)** - neither site had the volume capacity necessary to offset the very high site establishment costs for the adoption of rail haulage.

Of the six sites to be considered in the **Stage III** assessment, only Site 3 (Clover Hill) with a potential volume of 15.0 mcm had any potential as a long term alternate to Wongawilli. Site 5 (Berkeley Hill) was the next most promising with a maximum potential capacity of 13 mcm while all other sites had capacities of 7.0 mcm or less and as such could only be useful in the shorter term.

3.5 STAGE III ASSESSMENT

In this final stage of the site assessment process the six short listed sites were evaluated individually or in combination to see which provided satisfactory alternatives to AIS's proposed Wongawilli emplacement.

The sites that have been shortlisted are considered to be comparable to or better than the Wongawilli site in terms of potential environmental impacts and are superior in terms of regional planning implications insofar as none of them sterilises potential residential land. The matters to be resolved in this stage of the assessment relate to the sites relative practicability in terms of engineering and statutory requirements. To do this, it is first necessary to understand the characteristics of the Wongawilli emplacement in relation to these matters.

3.5.1 Characteristics of the Wongawilli Site

While the Wongawilli site has certain adverse regional planning and environmental aspects which have previously been mentioned, it also has some desirable practical attributes including:

- the terrain presents no major design problems,

- access is simple,

- there is no infrastructure on-site requiring removal or relocation, so site establishment costs will be low,

- there is adequate room for the installation of pollution control systems,

- the land is owned by AIS which further reduces up-front costs; a development application is in place which further reduces the time required to secure a development consent.

- the site provides capacity to satisfy the Company's requirements for the longer term (20 years).

In short, the Wongawilli site provides a timely, long term answer to the Company's problem with minimal up front costs. However, transport costs will be higher than for the existing Kembla Grange site. In discussions with AIS, operating costs were considered less important than either development approval times or capital cost considerations, with the former being of the greatest concern.

Accordingly, before documenting the Stage III assessment of the remaining sites, it is considered essential to address the problem of **timing** since no alternative emplacement strategy will be acceptable if it fails to provide a means for accommodating AIS's disposal requirements in the short term.

3.5.2 The Problem of Timing

A recurring theme in the Wongawilli EIS **(Ref 3.4)** is the stringency of time constraints on the Company's emplacement strategy. The existing Kembla Grange emplacement is expected to be filled to capacity some time early in 1985; (the exact deadline is debatable but early to mid-1985 is a reasonable assumption). Consequently, a new site must be approved by the end of 1984 to allow 6 months of site establishment works prior to the commencement of operations.

The Company repeatedly stated in the EIS that, for sites not already owned by them, a period of 2 to 4 years would be required to buy the land and go through the necessary statutory approvals procedures. It is considered that this may overstate the problem.

It is not necessary for the lodgement of a Development Application (DA), for the affected land to be owned by the applicant. **Section 77 (1) (b)** of the Environmental Planning and Assessment Act, 1979 makes provision for land owner consent to the lodgement of a DA as an alternative to outright ownership. (Land purchase negotiations can proceed simultaneously with display and assessment procedures although clearly, this approach provides the land owner with a strong negotiating position).

The approval steps which normally result in the most delay and which are primarily outside the control of the proponent are the display, assessment, and appeal procedures set down in the Act and Regulation. For a new designated development or significant change to an existing development it would be unwise to assume that approval could be secured in less than 12 months from the commencement of the necessary supporting studies and an allowance of 2 years would be more pragmatic.

Consequently, whatever alternative strategy is developed, it is clear that it must incorporate a site into which the Company can move by early 1985 and, if this is not to be the medium to long term site, it must have the capacity to accommodate the Company's requirements for no less than two years to provide sufficient time to secure the necessary additional consents.

There are only four such short term sites available:

. the existing **Kembla Grange** site which is already subject to a consent,

. **Cringila,** which is subject to a DA **(Ref 3.5)** and could be approved before the end of 1984,

. **Wongawilli** which is also subject to a DA and could be approved by the end of 1984,

. **21 Dump,** which is currently used for sundry approval activities in connection with steelmaking including the dumping of industrial solid wastes.

As the Stage I and II assessments have shown, Cringila and Wongawilli are unacceptable sites according to the assessment criteria adopted. Kembla Grange has not been specifically assessed but the assessment of Kembla Grange Extended (Site 1), which satisfactorily passed Stages I and II, is relevant in all respects. Similarly, 21 Dump has also passed through Stages I and II.

It would appear possible to allow extension of dumping activities at either Kembla Grange or 21 Dump without the need for the preparation of a full environmental impact study, under the terms of the Act.

For minor extensions to existing developments an enviornmental impact study is not required to support the development application and the public display and assessment procedures do not have to be followed. The alteration or addition should not, to any significant extent, change the scale, size, or degree of the existing development.

The development consent for the existing **Kembla Grange** emplacement governs the dimensions of the emplacement by reference to a drawing of the final emplacement shape submitted by AIS in support of the original application **(Ref 3.5).** Calculations carried out in the course of this study show that by lifting the top of the emplacement 9 metres, a further 0.5 mcm could be accommodated without crossing the boundaries of Company-owned land. To do this, it would be necesary to dismantle infrastructure associated with a sporting field which has been established at the eastern end of the emplacement. The life of the emplacement would be extended by 6 months by adopting this strategy.

Alternatively, lifting only the southern end of the emplacement by 9 metres would provide an additional 0.31 mcm, equivalent to approximately 4 months of production.

It is considered unlikely that such an extension would be considered significant and hence, an EIS would not be necessary.

21 Dump has previously been used for the dumping of both CWD and slag and is currently used for various activities associated with steelmaking including the permanent dumping of certain types of solid waste from the steelworks. Council has no record of the original consent for this area however, since waste dumping is already occurring it is assumed that this is a permissible use. Accordingly, it can also be assumed that some additional dumping could be authorised without the need to prepare an EIS to support the application. No doubt a stage would be reached in such an operation where the extent of dumping on the site would be such as to significantly alter the mix of current uses and further development would require a new Development Application supported by an EIS. Exactly when such a requirement would arise would largely be up to the relevant authorities to decide but bearing in mind the potentially significant benefits which could accrue to both the community at large and AIS by allowing disposal operations to proceed at 21 Dump for a suitably long period, the decision to require an EIS could justifiably be forestalled as

long as possible. Consequently there would appear to be no reason why 21 Dump could not also be used to solve the short term problem of reject disposal. The use of 21 Dump, notwithstanding its proximity to the source of wastes, is not without some problems from AIS's point of view and these are discussed in more detail in **Section 3.5.8** below.

In view of the comments made above, it is considered that there is an alternative way of solving the problem of timing without making a committment to the proposed Wongawilli site. What remains to be determined is whether there are similarly defensible solutions to the medium to long term dumping requirement. In subsequent sections, the Stage III assessment of the six 'short listed' sites is presented.

3.5.3 Kembla Grange Extended (Site 1)

In comparison to the Wongawilli site, Kembla Grange extended has the following disadvantages:

- limited volume (2.5 mcm)
- marginally more complex water management requirements
- some resistance to the proposal could be anticipated from Farmborough Heights residents
- some additional land purchase would be required, and,
- there may be some restrictions on the design and operation of the emplacement due to proposals to establish the West Dapto Industrial Ring Road nearby.

The only real practical advantage with this site is that it is four kilometres closer to source than the Wongawilli site which would provide some operating cost savings. To provide some perspective on the level of saving which might be achieved, it has been estimated that it would be approximately $2.3 M cheaper to haul 2.5 mcm of reject to the Kembla Grange Extended site than to Wongawilli; (a tonne kilometre rate of $0.14 for distances between 10 and 20 kilometres was assumed; the rate has been pro-rated up to a maximum of $0.35 per tonne kilometre for a 2 km haul distance; a waste relative density of 1.66 tonnes/cubic metre has also been assumed). It is unlikely that the haul saving would offset the front end cost penalties inherent in the site; (land purchase, design and documentation costs, capital charges, and costs associated with securing another site).

Consequently, this site is assessed as being unsuitable as a component in an alternative placement strategy.

3.5.4 North Wongawilli (Site 2)

The only real advantage of this site in comparison to the Wongawilli site is in respect of the environmental criteria under which it has been assessed.

In practical terms if offers no real advantages over Wongawilli and in fact it has several disadvantages as follows:

- site establishment costs for land purchase, access road, and the installation of water management structures are likely to be significantly higher per unit volume of material placed than for Wongawilli, bearing in mind the more difficult terrain, the catchment area above the emplacement and the relatively shorter 'write-off' period (approximately 8 years).

- there is a possibility that significant earthworks would be required to establish suitable foundation conditions which would further increase establishment costs.

- there will be no relative haul cost saving to offset these increased up front costs.

Accordingly, this site is not considered to be a viable alternative to Wongawilli.

3.5.5 Clover Hill (Site 3)

This site has a maximum possible capacity of 15 mcm, is the largest alternative site and others the best long term potential solution to the problem.

The cost of dumping at this site would be higher for the following reasons:

- land purchase,
- slightly higher water management costs,
- relocation of a 132 kV power line,
- increased haul costs (20 km versus 14 km for Wongawilli).

However, it is not considered that the cost penalty would be excessive. Allowing a nominal $1M to $2M penalty for land purchase, power line relocation, and increased water management costs, and a nominal haul cost of $0.14 per tonne kilometre as previously discussed, the estimated cost penalty in using this site would be in the order of $1.50 per cubic metre of material emplaced. The cost of dumping at Wongawilli, has been estimated to be in the order of $5 to $7 per cubic metre so the total increase would be in the order of 25 percent. The significance of this would have to be assessed against the hidden community costs inherent in the Wongawilli site in the form of future losses in Council rate revenue due to the sterilisation of potential residential land and the resulting increased service charges for remaining lots. Such an assessment is beyond the scope of this study but subjectively, it is considered that such a penalty ought not to be unacceptable and accordingly, it is considered that the Clover Hill site is a realistic alternative to the Wongawilli site for both the medium and long term.

3.5.6 Berkeley Reservoir (Site 4)

AIS estimated **(Ref 3.4)** that a landform on this site 'compatible with adjacent surface levels' could accommodate 1.9 mcm; however the limits of this landform were not otherwise defined. Calculations carried out during this study suggest that the maximum possible landform on this site (filling to RL 130 metres, the level of the foundations of the MWS&DB reservoir on Berkeley Hill) would accommodate approximately 4.5 mcm or between 4 and 5 years of production.

This site has two clear advantages:

. firstly, the haul distance from source would be between 2 and 4 kilometres depending on the access route adopted with the longer route being via Berkeley Road (see **Section 3.5.7** below) and the shorter being as proposed in the Cringila proposal **(Ref 3.5).**

. secondly, from an engineering point of view, the site would be relatively easy to manage.

On the other hand, it has a number of disadvantages, as follows:

. there is some adverse noise and dust impact potential particularly for houses at the western end of Luckwarra Street and Jarvie Road.

. the site is zoned Environmental Protection (Scenic) under the relevant LEP which would not be consistant with waste, disposal operations,

. there would be certain up-front cost loadings on the development for relocation of water mains and access road construction,

. the site provides, at best, only a short to medium term solution.

On the question of potential adverse impacts, the risk has to be assessed in the light of operating conditions which could be applied, the comparative significance of impacts which would otherwise be registered at Wongawilli Village and adjacent to West Dapto Road, and the fact that once the development was completed (in 2 to 5 years) local environmental quality could actually be improved.

Regarding cost considerations, this site is a clear case where the haul cost benefit could completely outweigh the front end cost loading. Based on the previously quoted haul cost assumptions it would be between $1.14 and $2.06 per cubic metre cheaper (depending on access route) to haul material to Berkeley Reservoir than to Wongawilli. For a small emplacement (1.9 mcm) this would mean savings of between $2.2M and $3.9M over the life of the development, while for the maximum emplacement (4.5 mcm) the saving would be between $5.1M and $8.3 m depending on access route. The operating cost advantage could significantly offset and in some cases completely outweigh the capital cost disadvantages of the site.

The only significant remaining disadvantage to this site is that, at best, it only provides a 5 year solution. On this basis, it is considered that on its own, it is not an acceptable site. However, as is discussed in **Section 3.5.7.** below, it has significant potential when considered in association with an emplacement at Berkeley Hill.

3.5.7 Berkeley Hill (Site 5)

AIS has estimated that the maximum capacity of this site could be 13 mcm. During this study, this site was looked at in some detail in the context of an integrated development with Site 4. It was found that 4.6 mcm could be accommodated in a much more restricted development, so clearly, the site is flexible. An optimum design with a capacity of 8 mcm was prepared as part of this study as is shown on **Exhibit 2.**

The advantages and disadvantages of the site are broadly similar to those for Berkeley Reservoir although the adverse environmental impact potential of this site is greatly reduced (see **Table 3.4).**

The principal advantages are:

. access is available from Berkeley Road and haulage would not be through residential areas. The mean haul distance would be approximately 4 km,

. the site would be relatively easy to manage from an engineering point of view, and,

. the adverse impact potential of the site is negligible in comparison to Berkeley Reservoir. The only significant adverse potential impact is aesthetic but even then, visual access is only available from residences 2 km to the north-west across a foreground dominated by the F6 Freeway and sundry light industrial developments. In addition the emplacement could be staged so as to further reduce the impact.

The principal disadvantages are:

. capital cost penalties would be incurred in land acquisition and power line (2 x 132 kV) relocation,

. there is a land use zoning conflict as for Site 4.

Once again, it is considered that the cost penalties are not significant in view of the opportunity operating cost benefit due to the limited haul distance (the haul cost saving would be between $5.2M and $17.8M or between $1.13 and $1.36 per cubic metre depending on the volume of the emplacement). In addition, costs for power line relocation need not necessarily be incurred at the commencement of emplacement since the relocation could occur progressively as the emplacement develops and, in fact, they could be placed back on the emplacement surface (as has been done with a 330 kV tower at Austen and Butta Ltd's Avon emplacement).

The matter of land acquisition is seen as being a problem principally in terms of time. Five properties are involved, two of them having established residences. The cost of purchase of these properties would be unlikely to exceed $2M but the real problem would relate to the preparedness of the owners to sell. This matter is addressed further in **Section 4.2.**

A further advantage of this site is that the suggested development could be used to significantly reduce site establishment costs for a subsequent development (if required) at Berkeley Reservoir. In **Section 3.5.6** it was noted that one capital cost penalty at the Berkeley Reservoir site was due to the need to establish an access road. One way of significantly reducing this cost would be to bring the road in from Berkeley Road, then running at grade across the top of the developing emplacement at Berkeley Hill (which would have to be staged accordingly), to a low point in Berkeley Hill ridge west of Luckwarra Street and then accessing the Berkeley Reservoir site. In this way, one of the significant capital cost components of a development at Berkeley Reservoir would be virtually eliminated.

On the question of the zoning of the Berkeley Hill site (predominantly Environment Protection (Scenic)), the final landform would not be inconsistent with such a zoning and it is arguable that even during the operational phase the emplacement could be staged so as to register minimal visual impact on residences north west of the site (the nearest of which

are 2 km distant). It should be noted that the zoning of this area is primarily as a result of representations made to Council and the DEP by the South Coast Conservation Society. It is undertsood that the Society would not object to an implacement at Berkeley Hill in preference to one at Wongawilli.

In view of the above comments, it is considered that a development at Berkeley Hill, with a possible extension to Berkeley Reservoir offers significant potential as an alternative to the proposed Wongawilli site.

Ultimately, in combination with the Berkeley Reservoir Site, it has the potential to provide a long term solution to AIS's problem at a significantly reduced cost, while, in terms of land use planning considerations, it replaces the threat of a significant and permanent reduction in residential land availability with a somewhat less significant and transitory compromise of a scenic protection constraint.

3.5.8 21 Dump (Site 17)

On the face of it, 21 Dump is the most promising site of all from virtually all points of view. It is flat, has no catchment, it is very large (measuring approximately 1 km x 1.5 km) and, on the basis of air photographs, appears to be presently underutilised with the dominant uses being short term slag stockpiling, and on-ground spares storage. It is also believed to be used by AIS for disposal of solid wastes other than slag or CWD. The site is owned by AIS, is only 2 km away from the source of production and solid waste disposal is assumed to be permissible use as previously discussed.

The potential role of 21 Dump as a solution to AIS's immediate dumping problem was discussed in **Section 3.5.2** of this report. However, there is also an expectation that the site could accommodate quite large volumes. Based on leaving undisturbed the existing slag dump, stores area, and buildings identifiable on 1974 aerial photographs, it is estimated that approximately 8 mcm of waste could be placed on this area based on a very conservative design rising generally 10 metres above the existing surface and in the centre, 20 metres. There is no doubt that the quantity could be increased signficantly if all other activities on 21 Dump were area optimised - for instance the cost benefits which would accrue from using this site instead of Wongawilli are potentially so great that warehousing of spares, which currently occupy an area of approximately 7 hectares may well be justified.

The one obvious disadvantage of the site is that there is no topsoil available for rehabilitation purposes so that an off-site topsoil mining operation would be required which would partially off-set the obvious cost benefits.

The possibility of developing an emplacement at 21 Dump has been generally discussed with AIS representatives who raised the following objections:

- the site is needed for long term disposal of solid wastes which the Company would not wish to place elsewhere. The exact nature and quantities of these wastes were not specified.

- the site is the ony area available for future expansion of the steelworks, and,

. the site is needed for slag stockpiling and spares storage.

Regarding long term hazardous waste disposal, the development of a major emplacement on this site would not be contradictory to such a usage and in fact, a case could be made to suggest that the existing operation might be enhanced.

Regarding possible conflicts with other existing uses it is difficult to see why operation of an emplacement would jeopardise these activities. In the volume estimates the slag stockpile and stores area were excluded from the landform so placement of 8 mcm of rejects on the site would not interfere with these activities as far as can be determined. Of course there could be advantages in reducing the areas allocated to these functions so as to maximise emplacement volume and hence, opportunity cost benefits.

The question of reserving the land for future expansion is, of course, a more significant obstacle. We are not in a position to question the validity of this requirement or of the corollary need to maintain the top surface level of 21 Dump low enough to permit future rail access without exceeding maximum permissible grades. It is in fact this corollary requirement which appears to be the real limiting factor since it is understood that a substantial part of the existing steelworks is built on a CWD/slag foundation implying that structural considerations are not a constraint.

In summary, it is considered that 21 Dump is a most promising site but it is not possible to estimate the maximum possible capacity without further definition by AIS of the constraints applicable.

3.6 CONCLUSIONS

A total of 37 potential reject emplacement sites have been investigated and assessed in accordance with environmental, regional planning, and engineering constraints, as well as operating and cost considerations. The stated objective of the exercise was to find a site or sites which would have less impact on regional planning objectives and ambient environmental quality than the currently proposed site at Wongawilli. In view of the political realities attendant to the current proposal, it was also considered desirable to take into account the possible cost benefits to AIS which might arise from an emplacement strategy centred on a site or sites other than Wongawilli. Finally any alternative strategy must entail a short term proposal that can be started in 1985, and a medium term proposal that is acceptable in principle to all. Only then can longer term alternatives be considered with the necesssary lead times that they require.

The assessment has shown that there are, in fact, at least two alternative medium term sites available.

The superior alternative is for a development centred on Berkeley Hill, between Cringila and Unanderra. In the maximum possible development, a total of 17 to 18 million cubic metres could be placed in two substantially contiguous emplacements: the first at Berkeley Hill (Site 5) and the second at Berkeley Reservoir (Site 4). This ultimate development could accommodate all wastes likely to be produced over the next 15 to 16 years, although for reasons discussed in **Chapter 4** of this report, it is not considered necessary to make such a long term committment at this stage. The following comments relate to a more restricted develoment at Berkeley Hill with a capacity of 8 mcm as shown on **Exhibit 2.**

In terms of **potential environmental impacts** due to site activities, Berkeley Hill ranks in the top four of all sites considered (see **Table 3.4).** It is moderately well protected from south westerly winds, but less well protected from westerlies. In any event, there are no residences downwind and within one kilometre. The area is already semi-industrial, and there is no line of sight connection with any residence closer than two kilomtres so noise impact potential is low. The only potential adverse impact due to site activities is visual impact but the actual level of impact would be controllable given the foreground across which visual access would be available (dominated by the F6 freeway and sundry light industrial developments), and, providing that an uphill emplacement method was adopted to provide maximum visual impact control.

There are two residences on the site plus a group of industrial buildings, all of which would have to be demolished.

Regarding potential **off-site impacts,** transport via Five Islands Road/ Berkeley Road offers no significant increased hazard over existing deliveries to Kembla Grange.

In terms of **town planning** constraints, the site is zoned partly for Special Industrial but principally Environmental Protection (Scenic) under the LEP so that there is a zoning conflict. However, since the final landform would be suitable for scenic protection and adequate management controls are available to maintain visual quality during the operational phase, this is not considered to be a significant constraint.

Regarding **cost considerations** it is considered that an emplacement at this site would be significantly less expensive in the long term than the proposed development at Wongawilli and so offers clear economic benefits to the Company. It is believed that the achievement of significant long term waste disposal cost savings would be consistant with the Company's obligations and undertakings under the Federal Government/BHP Steel Industry Assistance Plan.

The second and less attractive option is centered on the site referred to as Clover Hill, located on the southern side of Avondale Road, West Dapto. This site, which was considered in two other regional emplacement strategies but rejected for different reasons, has a maximum possible capacity of 15 million cubic metres and would provide a satisfactory long term solution. In terms of **potential environmental impacts** due to site activities it is considered that this site would be superior to Wongawilli, principally due to the fewer residences directly affected by noise and dust. In terms of **planning** constraints, Clover Hill is clearly superior since it would not sterilise potential residential land. The site is less appealing when potential **off-site impacts** are considered. The access route via the F6 freeway, residential areas at Dapto, and future residential areas adjacent to Avondale Road would result in substantial noise impacts and increased safety hazard in the short term and these impacts could be expected to worsen during the life of the emplacement as urban development spreads along Avondale Road. It is considered that Clover Hill is marginally worse than Wongawilli in this respect.

In terms of **cost considerations,** there is little doubt that the sum of both capital and operating costs for Clover Hill could be between 20 and 30 percent higher than for Wongawilli and accordingly it is anticipated that AIS would resist strongly any suggestion to make use of this site. Nevertheless, it could be argued quite cogently that extra costs would also be incurred at Wongawilli where they would manifest themselves as opportunity costs payable by the community through: increased service charges on the remaining lots in the vicinity of Wongawilli village, and, potential rate revenue which will be lost to Council.

In other words, an emplacement at Clover Hill would allocate the true cost of waste disposal to the producer whereas an emplacement at Wongawilli splits the cost with the community at large.

In summary, **Berkeley Hill** is assessed as being the best available site for an emplacement with adequate capacity to cater for at least the medium term.

As is discussed in **Section 3.4.2** no alternative emplacement strategy will be of any practical value unless it provides for dumping in the immediate short term, that is, extending at least into 1986. Since neither the Berkeley Hill nor Clover Hill sites are owned by AIS and the relevant environmental studies have not yet been commenced, approval of the recommended development could not be secured before end 1986. Short of approving either of the development applications currently in place (for Cringila and Wongawilli), the only option available is for short term approvals to extend operations at either Kembla Grange or 21 Dump. On balance, it is considered that extension of operations at 21 Dump is the better option. Alternative strategies are developed in the following **Chapter 4.**

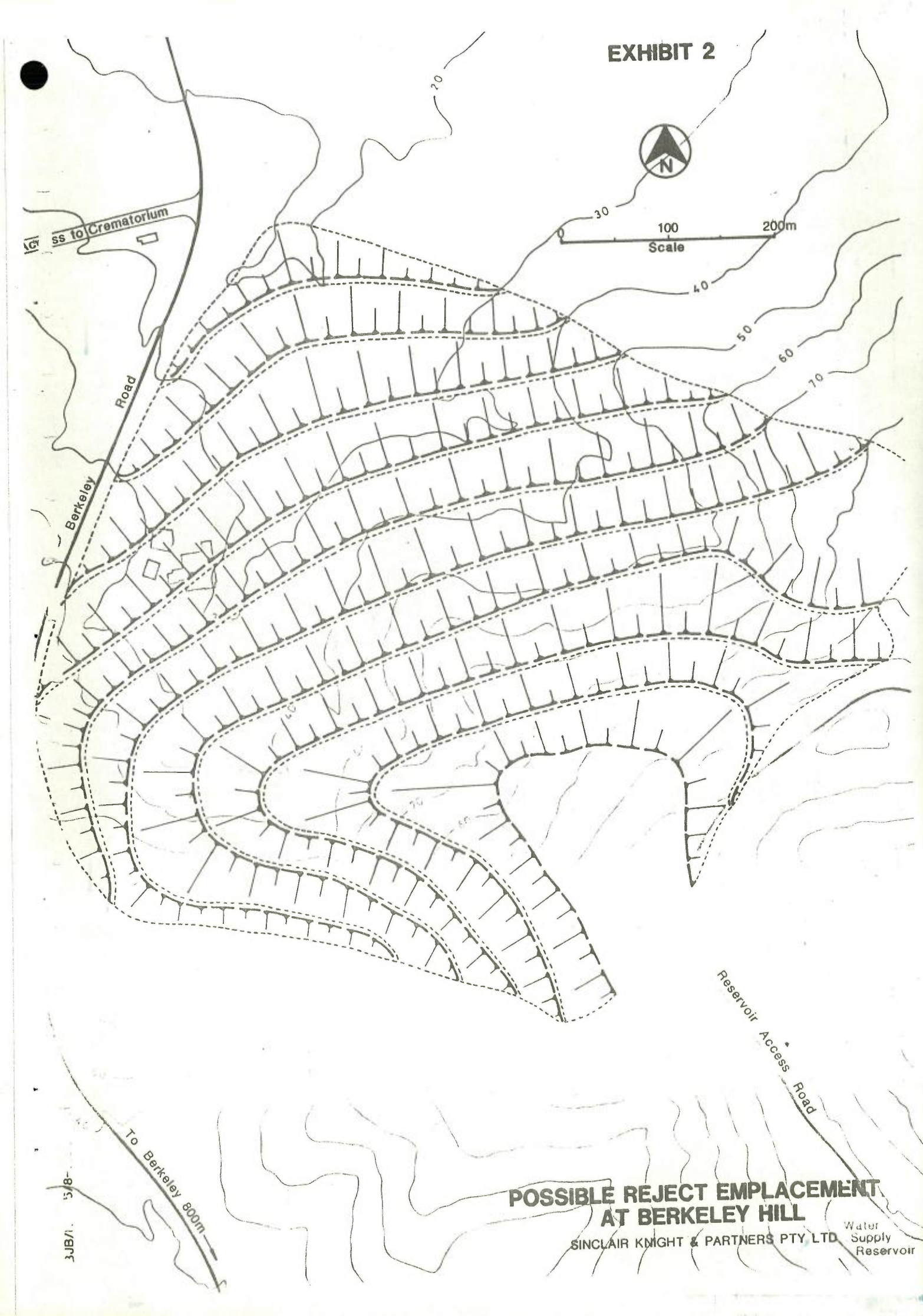


EXHIBIT 2
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ss to Crematorium
Berkeley Road
Reservoir Access Road
To Berkeley 800m
POSSIBLE REJECT EMPLACEMENT
AT BERKELEY HILL
SINCLAIR KNIGHT & PARTNERS PTY LTD
Water Supply Reservoir

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3.3 Longworth & McKenzie Pty Ltd (1984) EIS for Steelworks Industrial Waste Emplacement, Wongawilli, NSW Prepared for AIS Pty Ltd

3.4 Longworth & McKenzie Pty Ltd (1979) EIS for Coal Washery Discard, Blast Furnace Slag and Steelmaking Slag Emplacement Area at Cringila, NSW Prepared for AIS Pty Ltd.

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4. SUMMARY AND RECOMMENDATIONS

4.1 SUMMARY

4.1.1 Objectives of the Study

This study was commissioned by the Wollongong City Council to assist it in the preparation of a submission to a forthcoming Public Inquiry into an application by Australian Iron and Steel Pty Ltd (AIS) to develop a coal reject and industrial waste emplacement at Wongawilli, West Dapto. This proposal has the potential to register significant adverse environmental impacts and if approved, would sterilise a significant proportion of the potential residential land stock in the West Dapto area. In the long term, the spread of residential development along West Dapto Road, the access route to the proposed emplacement, could further increase adverse impact potential.

There were two specific objectives to this study:

- to investigate the implications of currently established and potential future technology for disposing of coal reject and industrial waste and to evaluate how the findings of this investigation may influence a disposal strategy, and,

- to identify alternative sites in the Wollongong region for a landfill emplacement with a view to developing an emplacement strategy with less significant regional planning and environmental implications than that currently proposed.

Council has recognised the magnitude of the problem in equating regional environmental and planning concerns with industrial waste disposal requirements and to help evaluate the problem, made approaches to NERDDEC to seek funding for the necessary studies. This study was not approved but alternatively the terms of reference for the Commission of Inquiry into the Wongawilli application were slightly broadened. Nevertheless, it is considered essential that such a regional study be carried out to ensure that these significant land use conflicts can be resolved equitably.

4.1.2 Alternative Disposal Methods

A review of other assessments of alternative disposal methods, of published literature, and discussions with others currently engaged in relevant investigations has shown that there are several promising alternative disposal techniques although none of these has been developed to a stage which would provide an immediate solution to AIS's problem.

Nevertheless, as a general observation, it is considered that it would be most unwise to discount the potential of some of these alternatives as an ultimate solution to waste disposal problems. Public opinion and land use demands are increasingly questionning the rationale of traditional landfill disposal methods.

This study has shown that the most promising disposal option is ocean dumping. The investigations showed that there is a long history of dumping substantial quantities of dredged spoil off the NSW coast line, generally, at very short distances offshore. The impacts of these activities generally remained unassessed although the NSW State Pollution Control Commission has been monitoring a spoil dump site near Port Kembla Harbour. This study showed that while short term water quality and biological impacts were significant, there was evidence of substantial recovery of epi-benthic communities within 9 months. Discussions with researchers working in this field have suggested that the impacts of dumping could be substantially reduced if dump sites were located in deeper water, further offshore, to reduce the effects of wave action and currents in re-suspending the dumped material.

The concept was considered sufficiently attractive to justify a preliminary assessment of the likely economics of such an operation. Accordingly a conceptual study was carried out and cost estimates were prepared. It was found that for a dump site 20 kilometres offshore (instead of the 2 to 4 kilometres which has been past practice with dredged spoil disposal), and delivery by self-propelled bottom dump barge, the cost would be in the order of $5 per tonne, comparing favourably with dumping costs at Wongawilli (estimated to be in the order of $3 to $4.00 per tonne). Clearly, the feasibility of such a system justifies evaluating it in more detail and it is strongly recommended that any decision reached in regard to AIS's present Development Applications should include provisions requiring the Company to initiate more detailed studies of this option.

It is recognised that notwithstanding the many precedents, a proposal to implement such a strategy could elicit a substantial reaction and it would be important to ensure that the environmental research and studies carried out to support such a proposal were comprehensive.

It is anticipated that between 3 and 5 years of background work would be required to satisfactorily evaluate an ocean dumping operation and, if it proved feasible, secure the necessary consents. Consequently, the alternative has no value in the immediate short term.

The other 'alternative' is related to landuse. There is some potential to remove or at least reduce a significant source of conflict arising from the Wongawilli proposal, namely sterilisation of potential residential land. The means for doing this would be by providing for residential development as a final land use for the completed emplacement. As far as can be determined there are no substantial impediments to such a strategy. Evidence is presented in this study indicating that:

- many industrial and some residential developments in the Wollongong region have already been established on compacted CWD fill, and,

- that experience has already been gained in Australia in structural design for potentially or actually unstable fill.

The major concerns with such a strategy would relate to the risk of spontaneous or induced combustion in the fill material and in addition some practical problems (such as the effect of tree plantings, developing safe procedures for the installation of below ground services, etc) would have to be resolved. Accordingly, this option could not be recommended confidently at this stage. Nevertheless, it is considered that further research into the matter would be beneficial to both the community and the industry and should be supported.

Finally, this study has shown that there is already a substantial local market for CWD and slag for various engineering and structural fill requirements. While a substantial proportion of AIS's blast furnace slag is directed to such use, the quantities of CWD so used are much less. There is some evidence to suggest that potential users of CWD may not appreciate that, for certain specific applications, CWD may be preferable to blast furnace slag. It is suggested that there may be some value in the Company making potential consumers aware of such specific applications. Similarly, the possibility of adopting aggressive pricing policies to increase market demand is discussed. Notwithstanding the above comments, there is no evidence that even the most optimistic forecasts for these demands would have any significant impact on the annual quantities of wastes to be otherwise disposed of.

4.1.3 Alternative Disposal Sites

A three staged assessment procedure was used to evaluate a total of 35 potential emplacement sites in this study. The assessment criteria adopted included environmental/regional planning constraints, engineering factors, and statutory considerations.

A total of six sites were isolated for detailed assessment of which three were assessed as having significant potential as alternatives to the Wongawilli emplacement.

Medium to Long Term Sites
The preferred alternative is for the development of an emplacement at Berkeley Hill which is approximately four kilometres south west of AIS's central washery. The site has the potential to comfortably accommodate 8 mcm although its ultimate volume could be as much as 13 mcm.

An emplacement at this site could therefore cater for between 8 and 14 years of waste production depending on the final landform design. There would be an option of using the progressive development of this emplacement to gain access in a cost efficient and environmentally acceptable way to an adjacent site at Berkeley Reservoir which has a potential capacity of between 2.0 and 4.5 million cubic metres.

The Berkeley Hill site is considered to have signficiant environmental and economic benefits. The noise and dust impact potential of the site is comparatively low, and delivery related impacts (via Five Islands Road and Berkeley Road) would also be low. There is a potential for some adverse visual impact but experience at the existing Kembla Grange emplacement shows that this would be controllable. Economically, it is considered that an emplacement at this site would offer cost savings in the long term although front end costs, primarily for land purchase, would be higher than for Wongawilli. There also could be potential problems with land purchase if any of the existing owners chose not to sell.

The other site considered in the final analysis is Clover Hill, located on the southern side of Avondale Road, approximately 20 kilometres south west of the steelworks. Impacts from site development activities would be low but road deliveries would result in adverse noise impacts and increased road safety hazard. Compared to deliveries to the Wongawilli site, these impacts would be at least as bad if not worse and could be expected to increase significantly over time. In terms of cost considerations, total costs over the life of the emplacement could be between 20 and 30 pecent higher than for the Wongawilli emplacement. This option is not recommended.

Short Term Options

The principal disadvantage with both the Berkeley Hill/Berkeley Reservoir and Clover Hill sites is that, since they are not presently owned by AIS, they provide no means for immediately replacing the existing Kembla Grange operation.

It was concluded that there are two options for providing for the period between completion of the Kembla Grange emplacement and a move into a longer term option.

It has been estimated that between 0.3 and 0.5 million cubic metres of waste could be accommodated on the Kembla Grange emplacement by lifting the top surface level by 9 metres either for the full length of the emplacement (covering the existing Ian McLennan Park) or only at the southern end (which would provide the lower limit of the volume range).

Similarly, AIS is already carrying out industrial waste dumping operations at 21 Dump, immediately west of the steelworks. No record of the consent conditions for this area can be located, but since dumping is already occurring, this must be a permissible activity. Consequently, there would appear to be no reason why additional dumping at this site could not be approved as discussed above for the Kembla Grange operation. Calculations carried out for this study indicate that as much as 8 million cubic metres could be placed on this site in a major emplacement which does not intrude into existing slag dumps and spares storage areas. Accordingly, it is considered that at least two million cubic metres could be accommodated without major interference with existing activities.

4.2 STUDY REVIEW AND RECOMMENDATIONS

4.2.1 Discussion

The problem of industrial waste disposal in the Wollongong Region, and in particular, the disposal of coal washery wastes, has been recognised by the Council for some considerable time. Council has made submissions to the National Energy Research Development and Demonstration Committee for funding of a regional study to investigate likely future patterns of waste generation, assess disposal options, and develop a regional disposal strategy that optimally equates the requirements of industry and the community.

Wastes from AIS's steel making and coal washing activities account for a considerable part of the total disposal problem. However they don't constitute the whole problem and hence it could be argued that the imminent need to make decisions in respect of AIS's current development applications, is pre-emptive of any subsequent regional planning exercise which may be carried out.

The study exercise documented in this report is not a substitute for the wider ranging regional study and it was considered important that recommendations arising from this study take account of the likelihood of this wider ranging study being undertaken. For this reason and in contrast to the emphasis placed in the EIS supporting the Wongawilli proposal, it is the considered conclusion of this study that the emphasis in developing a response to AIS's proposals should be on the short to medium term (0-10 years) rather than the long term (10-20 years).

Quite apart from any justification for such an approach based on considerations of future planning studies as discussed above, the review of alternative disposal techniques contained in **Chapter 2** of this report suggests quite conclusively that there is good reason to believe that acceptable alternatives to current landfill disposal could be developed provided that the effort is made to surmount the last few barriers preventing immediate adoption of these alternatives. Accordingly, the need to avoid making long term committments to any particular disposal strategy at this stage is considered to be of paramount importance.

This conclusion defines a context within which recommendations regarding alternative landfill disposal sites can be made. As was discussed in **Section 1.2** of this study, there is no doubt that AIS has an immediate short term problem and a solution to this is a clear responsibility of Council. As discussed in **Section 3.5.2** there is however only a limited number of options available.

AIS's proposal to establish an emplacement at Wongawilli provides a solution to the short term problem but because of its long time horizon also restricts planning flexibility. Quite apart from the significant environmental and land sterilisation impacts it is likely to have, it can also be seen as being unnecessarily pre-emptive of the type of regional planning activity mentioned above.

However, it is implied quite clearly in the EIS (pp 4, 32, and 34) that expediency is the Company's highest priority even at the expense of securing a long term site.

It is equally clear that any recommendation for an immediate short term solution must also establish a framework for making decisions on disposal strategy in the longer term. It therefore follows that is the time horizon lengthens, the options increase as does the range of recommendations.

Accordingly, in **Section 4.2.2** below recommendations are listed according to time horizon.

4.2.2 Recommendations

Short Term

As summarised in **Section 4.1.3** above, from the viewpoint adopted for this study there are only two acceptable short term options in terms of providing immediate capacity for AIS's wastes. These are:

- extension of the existing consent for the Kembla Grange emplacement to allow the placement of an additional 300 000 to 500 000 cubic metres of waste on top of the existing emplacement, and/or,

- permitting a modification of existing consents governing operations on 21 Dump to allow placement of up to 2 million cubic metres of waste over a two year period.

It is considered that the preferable option would be the latter.

A third alternative was introduced in discussions with Wollongong City Councillors, and it involves short term dumping at Cringila to allow the formation of additional playing fields. As discussed earlier in this report, Cringila is not a good site from an environmental point of view. Nevertheless, if the local community decides that it would be prepared to

tolerate short term impacts in the interests of improving recreational opportunities in the longer term then this clearly supercedes any other assessment. Quantity calculations for this option have not been prepared however, it would appear that between 0.5 and one million cubic metres of fill could be accommodated under this option. AIS may be reluctant to incur costs in providing haul road access as proposed in the Cringila EIS for such a small emplacement. Delivery might have to be permitted via Jarvie Road which would add further adverse environmental impacts.

Certain parallel studies should be carried out in addition to the strategies recommended above:

- if the regional waste disposal strategy is to be carried out, it should be commissioned immediately with completion and full review to be finalised within one year

- AIS should be required to fully assess the ultimate storage capacity of 21 Dump taking into account long term intentions for this area and any restrictions that these may place on landform design; the review should be forwarded to the DEP and Council for review and comment.

- AIS should commission a preliminary engineering design and cost study of the ocean dumping alternative to assess the findings of the conceptual study reported in this document; a detailed review of literature relating to the environmental effects of ocean dumping should also be carried out during this period; the two studies would be reviewed in conjunction with relevant authorities to establish whether there is any basis for proceeding further with investigations; both studies should be completed within 6 months.

- the findings of the two studies should be incorporated into the regional waste disposal study.

The further options available upon completion of the waste disposal study would largely depend on the findings of the study. However certain scenarios can be postulated:

- AIS may find that 21 Dump has significant capacity potential (say 8-10 mcm) and a continuation of dumping into the medium term may be consistent with the regional waste disposal strategy; in this case, an EIS to support an extended dumping operation at 21 Dump should be prepared with a view to securing approval at the end of the then current approval period.

- alternatively 21 Dump may prove to have more limited capacity, in which case an alternative landfill site would be required; the next best option would be the **Berkeley Hill** development with a possible extension to Berkeley Reservoir if more capacity was required; if the findings of the ocean dumping studies are positive, the relevant environmental and oceanographic studies should be commissioned, scheduled for completion within 3-4 years with a view to securing approval in approximately 5 years.

Medium Term (2-10 years)
As implied above there are a number of medium term options open.

An extended dumping operation at **21 Dump** would be the most straight-forward from both the practical and environmental points of view. At this stage there is insufficient information available to establish what the ultimate potential of this site is but given the large area of the site it would be surprising if four to five mcm could not be accommodated without seriously jeopardising the future utility of the site.

The next best landfill alternative would be to establish the **Berkeley Hill** emplacement. As has previously been discussed it is considered that this site has significant practical and environmental advantages in comparison with the proposed Wongawilli emplacement.

Long Term
Recommendations for a long term disposal strategy could only be made after completion of the previously recommended regional waste disposal study.

However, it is worth observing that if the coal and steel industries are to have a long term future in the region, wastes continue to be generated at rates broadly comparable with the present and the region's urban areas continue to grow, waste disposal strategies based on landfill disposal will become increasingly difficult to support (unless options such as permitting urban development on landfill sites are adopted). Ocean dumping in this unique land-locked environment appears to hold the greatest potential provided the necessary studies can demonstrate its environmental acceptability.

In view of the above conclusions the following resolutions are suggested for the consideration of Council.

1. That 21 Dump is the favoured practical location for industrial waste emplacement by AIS Pty Limited - certainly for the short term (0-2 years) and potentially up to 8 years - the maximum emplacement time span to be resolved by AIS investigation and report under the direction of Council and the Department of Environment and Planning and subject to Ministerial approval.

2. That Berkeley Hill is the best location for landfill emplacement subsequent to 21 Dump - commencement being dependent upon emplacement time span at 21 Dump and/or the time period required for property purchase negotiations and transfer and planning approval processing.

   Berkeley Hill has potential for an 8-14 year emplacement commencing in between two and four years.

3. That high priority be given for more detailed studies into ocean dumping as the option having the greatest potential for disposal in the medium and long term (ie, more than five years).

4. That a Regional Waste Disposal Study, as applied for by Council to the NERRDC, be regarded as an essential cost/benefit analysis for an integrated approach for waste disposal by the Region's industries over the long term, which is compatible with Regional planning and environmental objectives and strategies.

APPENDIX 1

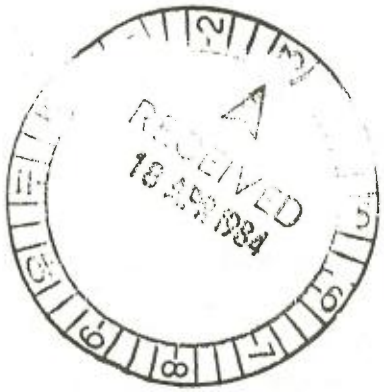
BDR

CITY OF WOLLONGONG

TOWN HALL, WOLLONGONG
TELEPHONE : 29 9111
P.O. BOX 21
WOLLONGONG EAST 2500

DX 5183
IN REPLY PLEASE QUOTE : P.DRB/JO D84/33 M190/1/27
IF PHONING ASK FOR : David Broyd
ON EXTENSION : 411

PLEASE ADDRESS ALL CORRESPONDENCE TO THE TOWN CLERK



17 April 1984

The Manager
Sinclair Knight & Partners Pty Ltd
1 Chandos Street
ST LEONARDS 2065

Dear Sir/Madam

RESEARCH STUDY IN RELATION TO THE DEVELOPMENT APPLICATION FOR AUSTRALIAN IRON AND STEEL PTY LIMITED TO EMPLACE COAL REJECT MATERIAL AND OTHER INDUSTRIAL WASTE AT WONGAWILLI, WEST DAPTO

You will recall that Council advertised in early January 1984, on behalf of a meeting of local State and Federal Members of Parliament with Council Aldermen, for initial expressions of interest to undertake a Regional Environmental study: **"Coal Reject Disposal in the Wollongong Region"**. It was proposed to conduct such a study under the auspices of a committee formed by the Minister for Planning and Environment under Section 22 of the Environmental Planning and Assessment Act 1979. The formal proposals for the Regional Environmental Study and the Section 22 Committee were submitted to the Minister in December 1983. The Minister however has decided not to authorise such a Regional Environmental Study or Section 22 Committee, but has directed that a Commission of Inquiry be held into the development application by Australian Iron and Steel Pty Limited (AIS) to emplace coal reject material and other industrial waste at Wongawilli, West Dapto. The Terms of Reference for the Commission of Inquiry are included in the attachment to this letter.

Also, following meetings of local State and Federal Members of Parliament with Council Aldermen, application was made to the Federal Government for the funding of the proposed Regional Environmental Study under the Steel Centres Assistance Programme. Discussions have been taking place within the Federal Government over the past

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two (2) months. The Minister for Employment and Industrial Affairs has recently informed Council that the proposal is not considered to comply with the guidelines for funding under the Steel Centres Assistance Programme, and hence Councl's application is not approved.

Council had already recently resolved that in the event of no Federal funding being made available that a submission be prepared for the Commission of Inquiry on the Wongawilli Development Application by -

(a) the Council Forward Planning Section dealing with relevant strategic planning factors;

(b) the engagement of engineering consultants to investigate engineering and relevant environmental aspects.

Council has established an overall budget constraint for this engagement of consultants.

Council has made these resolutions in view of the level and nature of research which it regards as still being demanded given the issues raised by the proposed Wongawilli emplacement and by future needs for coal reject material emplacement in the Wollongong area over the next twenty (20) years. In view of the scale and nature of research that is still required in Council's view, Council has resolved to "advise the Department of Environment and Planning that an interim submission (to be prepared by Council officers) will be made during April, and request that the Commission of Inquiry be delayed until September so as to allow Council to conduct a study and prepare a submission of the scale and nature which it regards as being essential in relation to the future strategy of the coal reject and industrial waste disposal in the Wollongong region, given the major implications for future planning and development which are involved."

Additionally, Council resolved that "the Minister for Planning and Environment be informed that Council regards the Terms of Reference for the Commission of Inquiry as being too limited given the need to resolve the major planning implications of deciding upon a long-term strategy for coal reject disposal in the Wollongong region."

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Your firm is invited to submit a proposal to Council to carry out the more specific research on engineering and environmental matters which will be part of Council's submission to the Commission of Inquiry and attached are the Terms of Reference.

It is most important that the consultants be able to make a full-time commitment to this work for a 6-8 week period commencing from early/mid-May in 1984. Should you have any further enquiries with regard to this matter, please do not hesitate to contact David Broyd - Assistant City Planner for Forward Planning - on Extension 411.

Detailed proposals should be submitted by 4 May 1984.

Yours faithfully

P W Berthold
Town Clerk - General Manager

ENCLS

Terms of Reference for the Engagement of a Consultancy Firm to Investigate Certain Engineering and Environmental Matters as Input to the Submission to the Commission of Inquiry by Wollongong City Council Regarding the Proposed Emplacement of Coal Reject Material and Other Industrial Wastes at Wongawilli, West Dapto

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Introduction

1. Australian Iron and Steel Pty Limited has submitted (on 20 January 1984) a Development Application for the emplacement of approximately 18 million cubic metres of coal reject material and other industrial wastes over a period of 18-20 years on 100 hectares of its freehold land at Wongawilli, West Dapto. The Environmental Impact Statement for this Designated Development was exhibited between 8 February and 15 March 1984. The New South Wales Minister for Planning and Environment has directed that a Commission of Inquiry be held into the Development Application with the following Terms of Reference:

   (a) the investigation of the development application (hereinafter called "the application") dated 20th January, 1984 lodged by Australian Iron and Steel Pty Limited (hereinafter called "the applicant") for the emplacement of coal washery refuse and industrial waste on land at Wongawilli in West Dapto;

   (b) as part of the consideration of the application, the investigation of alternative sites within the Wollongong Plains Sub-region, including the Cringila site, with the view to selecting both a short and a long term solution to the problem of solid waste disposal from the Port Kembla Steelworks for the next twenty years;

   (c) the consideration of public submissions lodged in respect of the report entitled, "Coal Reject Disposal in the Southern Coalfields", which was prepared by the Coal Reject Disposal Sub-Committee and which was on public exhibition from 23rd September, 1983 to 31st December, 1983; and

   (d) the evaluation of the proposed emplacement at Wongawilli in the context of potential urban expansion in West Dapto and the evaluation of the impact that the emplacement would have on that expansion potential both in the short and long term.

   The Company previously applied (October 1980) for a short-term (3-5 years) emplacement at a site at Cringila, and this is still asserted by the Company to be the alternative to Wongawilli. (The Cringila proposal was not determined pending a Public Inquiry mainly because the Department of Environment and Planning concluding in its Assessment that alternative sites had not been adequately investigated.)

2. The Development Application for Wongawilli follows the public exhibition of a report by the Coal Reject Disposal Sub-Committee proposing 4 sites in the West Dapto area for potential emplacement. Council subsequently resolved on 7 November 1984:

"(1) that the forthcoming development application by Australian Iron and Steel Pty Limited is an essentially integrated issue and should form part of all further investigation of coal reject emplacement in the Wollongong region;

(2) torequest the Minister for Environment and Planning to cause to be prepared a Regional Environmental Plan, under Section 40 of the Environmental Planning and Assessment Act 1979 on **Coal Reject Disposal in the Wollongong Region** (including areas to the west of the Escarpment as appropriate) because it is a matter of major regional significance and that a Regional Environmental Study be completed prior to the preparation of the draft plan;

(3) to request the Minister for Environment and Planning to establish a Committee under Section 22 of the Environmental Planning and Assessment Act 1979 which is comprised of members appointed by the Minister from relevant private industry; Trade Unions; State Government Departments; Councils; and community based interest groups and that this Committee has the function of overseeing the preparation of the Regional Environmental Study."

The Minister has decided to hold a Commission of Inquiry on the Wongawilli Development Application as the alternative to authorising the above proposed Study and Section 22 Committee. Council's approach gained the endorsement of local Federal and State Members of Parliament and an application was accordingly made to the Federal Government for funding of the proposed Regional Study under the Steel Centres Assistance Programme. Determination of this application is yet to be made by the Minister for Employment and Industrial Affairs.

3. Council is seeking to make a substantial submission to the Commission of Inquiry. Council's Forward Planning Section will undertake relevant strategic planning analysis but Consultants are to be commissioned to broadly -

(1) identify and evaluate all alternative sites for potential suitability for short-term and long-term emplacement;

(2) investigate implications of currently established (and future potential) methods/technology for utilisation or disposal of coal reject and industrial waste materials.

Objectives for the Submission to the Commission of Inquiry

4. The objectives are:

(a) to fully evaluate the implications of the proposed Wongawilli emplacement for the adequacy of future residential land availability in the City and sub-region;

(b) to identify all alternative sites, methods and strategies for coal reject and industrial waste disposal in the Wollongong area - including alternative strategies and programmes of multi-site disposal. (This will include an evaluation of alternatives included in the Environmental Impact Statement plus other potential alternative sites not necessarily limited to the City of Wollongong area.);

(c) to provide Council and the Commission of Inquiry with a more thoroughly researching basis for the judgement to be made between ensuring the economic and efficient future operations of the City's major employer: Australian Iron and Steel Pty Limited; and needs to safeguard residential land avalability and environmental quality in the City.

Requirements of the Consultancy Firm

5. The Consultancy Firm will be required to:

(a) Identify alternative sites in the Wollongong region to potentially accommodate, independently or in combination, the scale of waste for proposed emplacement by Australian Iron and Steel Pty Limited. On the basis of initial engineering suitability analysis, evaluate the physical and environmental constraints and opportunities which apply including pollution, visual, site development costs, land ownership and other relevant factors. Also, to evaluate transportation options and related costs.

(Information currently available to Council would provide a basis for identification of potentially alternative sites within the City of Wollongong. Investigations should also be made of potential sites west of the escarpment.)

(b) Investigate the implications which are currently established, (and future potential), methods/technology for utilisation or the disposal of coal reject and industrial solid waste material would have on the scale and nature of the disposal problem within the Region and to draw out particularly the implications for an alternative programmed use of a site or sites for disposal.

More specifically, the assessment of physical constraints and opportunities associated with potential emplacement on identified alternative sites in the Region should include:

(a) restrictions and policies which would be applied by the Metropolitan Water Sewerage and Drainage Board on land within or adjacent to the Water Catchment Area, or other physical infrastructure of private/public authorities;

(b) areas warranting protection because of visual, ecological, scientific or other environmental attributes;

(c) potentially unacceptable air, noise or water pollution effects on adjacent areas which could result from coal washery reject emplacement;

(d) items of environmental heritage; and,

(e) land ownership and existing land uses and developments.

Investigation of all options for transportation should be undertaken of the material to identified alternative sites and the associated public and private cost and benefits in terms of -

(a) the economic costs to the coal and steel making industries of transporting material to alternative sites;

(b) levels of heavy truck transportation through urban and rural areas and the associated environmental costs and benefits;

(c) road building improvements that would be necessary to carry the transportation of reject material to the alternative emplacement sites; and,

(d) alternative use of rail transportation to carry the reject material to alternative emplacement sites.

Output and Timing

7. Output will be a report to Council and for subsequent incorporation, when endorsed by Council, into its submission to the Commission of Inquiry. Ten copies shall be supplied of the report. A decision will be made when the Consultancy Firm's report is presented to Council as to whether the firm will be engaged to directly present evidence to the Inquiry.

8. It is aimed to select Consultants by early/mid-May and the Firm should be able to commit sufficient resources to complete the Study within 6-8 weeks.

Submissions by Consultants

9. Consultants are invited to submit proposals to carry out the Study which set out the following:

(a) detailed approach to the project;

(b) previous relevant experience;

(c) qualifications and experience of nominated staff, particularly the Project Director;

(d) personnel available to work on the project together with anticipated hours and rates of renumeration;

(e) proposed timetable, and a break-down of an overall cost estimate.

Council has set an overall budget constraint for the Study.

(1) PURPOSES OF THE DEPUTATION

1.1 The purposes of the Deputation are:

(a) to explain the reasons for the opposition of Council, and local State and Federal Members of Parliament, to the present development proposal for industrial waste emplacement by Australian Iron and Steel Pty Ltd at Wongawilli, West Dapto;

(b) to seek your agreement, Mr Minister, for the deferrment of the Public Inquiry on the development proposal for industrial waste emplacement at Wongawilli until September 1984 to enable Council to complete research which it regards as being essential for its submission to that Inquiry;

(c) to seek your formal agreement, Mr Minister, that a Regional Study to formulate **"a Strategy for the Disposal and Utilisation of Industrial Waste Materials in the Wollongong Region"** is necessary and to seek your support for the application made by Council to the Federal National Energy Research Development and Demonstration Council (served by the Department of Resources and Energy) for funding of such a Study.

1.2 Council has resolved that the Wongawilli Development Application, and its long-term implications, must be integrated with a research Study of the scale and nature which is adequate for decision-making on this issue and that this Study shall seek to formalise short-term and long-term strategies for industrial waste emplacement in the Wollongong Region. Council is firmly of the opinion that existing documentation is highly inadequate in providing a proper basis for decision-making.

1.3 This Report is structured as follows:

- An explanation of the major issues relating to the industrial waste emplacement proposal for Wongawilli and industrial waste emplacement demands generally in the Wollongong Region.

- An explanation of the resolutions of Council and meetings of local State and Federal Members of Parliament with Council Aldermen on these issues.

- Relevant comments contained in Submissions by State Government agencies on the Wongawilli Application.

- An explanation of the nature of the proposed Regional Study: **"Strategy for Utilistion and Disposal of Industrial Waste Materials in the Wollongong Region"**.

- An account of the implications for the future urban development of Wollongong arising from the Wongawilli Development Application and the Coal Reject Disposal Sub-Committee Report.

- An account of some of the most important environmental issues arising from the Wongawilli Development Application.

(2) MAJOR ISSUES

2.1 Below are the major issues which have been emphasised in formal resolutions and debates of Council and in the meetings between local State and Federal Members of Parliament with Council Aldermen regarding the Wongawilli Development Application and general demands for industrial waste emplacement in the Wollongong Region:

(a) the implications for land availability for the efficient future development of the urban area of Wollongong and in particular the implications for the adequacy of future residential land availability;

(b) the paramount need for a sound research basis in the form of a Regional Study leading to the preparation of a Regional long-term strategy for disposal and utilisation of industrial waste materials in the Wollongong region and which represents a full evaluation of alternative methods, strategies and locations for such disposal and/or utilisation and of the associated public and private costs and benefits;

(c) adverse environmental effects - air, water, noise and visual pollution;

(d) the extent to which alternative technologies and methods of utilisation or other alternatives such as off-shore dumping etc. can alleviate the pressures for landfill industrial waste emplacement in the Wollongong Region.

2.2 The regional land use conflict and the issue of future urban growth options for the City of Wollongong which arise out of the Wongawilli emplacement proposal, and out of the recommendations of the Report of the Coal Reject Disposal Sub-Committee, are the most critical - in terms of the forward strategic planning of the efficient future development of the City of Wollongong, and indeed, to a significant extent, of the Wollongong Sub-Region (Wollongong-Shellharbour-Kiama) to which the State Government's Illawarra Urban Development Programme relates.

(3) RESOLUTIONS OF WOLLONGONG CITY COUNCIL AND OF MEETINGS OF LOCAL STATE AND FEDERAL MEMBERS OF PARLIAMENT WITH COUNCIL ALDERMEN; AND SUBMISSIONS BY STATE GOVERNMENT AGENCIES

3.1 Council's position is explained in general terms by the relevant resolutions below - the date of adoption is given in parentheses:

(1) Although recognising the needs of Australian Iron and Steel Pty Ltd to economically dispose of coal washery refuse and other industrial wastes in order to maintain production and employment levels in the region, Council is opposed to the present proposal at Wongawilli for the following reasons:

(a) significant sterilisation of future residential land; and,

(b) the potentially adverse nature of water, air and noise pollution on the overall residential amenity in the surrounding West Dapto area. (7 May 1984)

(2) To advise the Minister for Planning and Environment that it is proposing to conduct a more detailed Study into the strategic planning, environmental and engineering implications of the Wongawilli proposal and also into the options for the disposal of the subject waste materials. (7 May 1984)

(3) In light of the above proposed Study and delay in receipt of submissions from Statutory Authorities, Council reiterate its request for the deferrment of the Commission of Inquiry until September 1984 to allow its study of the scale and nature regarded as being essential for its submission to the Inquiry to be completed. (7 May 1984)

These resolutions were endorsed, in full, at a meeting of local State and Federal Members of Parliament with Council Aldermen on 18 May 1984.

(4) That you, Mr Minister, be informed that Council regards the Terms of Reference for the Commission of Inquiry as being too limited given the need to resolve the major planning implications of deciding upon a long-term strategy for coal reject disposal in the Wollongong Region. (28 February 1984)

3.2 On the more general issue of coal washery reject disposal in the Wollongong Region, relevant resolutions of Council are:

(1) Council does not accept the Recommendations numbered 1, 2 and 3 of the Report by the Coal Reject Disposal Sub-Committee with regard to the proposed four emplacement sites in West Dapto on the basis that -

(a) it considers that the proposed sites (A), (B) and (C) will have unacceptably adverse implications for the adequacy of future residential land availability in the City and in the Wollongong Sub-Region;

(b) in view of the range of conflicting land-use demands, that determination of any waste emplacement sites in West Dapto shall be part of the West Dapto Local Environmental Study; and the

specification to that effect is gazetted by the Director of the Department of Environment and Planning; in the context of a Regional Planning Policy on the issue;

(c) the Report by the Coal Reject Disposal Sub-Committee is a highly inadequate analysis of:

i. the range of planning factors relevant to the determination of a selection of a limited number of sites for detailed environmental impact assessment;

ii. the alternative locations and methods for coal washing and coal reject emplacement, the related private and public costs and benefits; and alternative strategies for washing and emplacement;

iii. the projections of coal and steel production and of coal export relevant to the need of disposal sites in the Wollongong Region;

iv. certain aspects of environmental impact of coal reject emplacement generally and of emplacement at the proposed four sites in West Dapto; and

v. certain aspects of new technological advances for utilising and disposing of coal washery reject materials. (7 November 1983)

(2) That the Development Application by Australian Iron and Steel Pty Ltd is an essentially integrated issue and should form part of all further investigations of coal reject emplacement in the Wollongong Region. (7 November 1983)

(3) That the Minister for Environment and Planning be requested to cause to be prepared a Regional Environmental Plan, under Section 40 of the Environmental Planning and Assessment Act 1979 on **Coal Reject Disposal in the Wollongong Region** (including areas to the west of the Escarpment as appropriate) because it is a matter of major regional significance and that a Regional Environmental Study be completed prior to the preparation of the Draft Plan. (7 November 1983)

(4) That the Minister for Environment and Planning be requested to establish a Committee under Section 22 of the Environmental Planning and Assessment Act 1979 which is comprised of members appointed by the Minister from relevant private industry, Trade Unions, State Government Departments, Councils and community-based interest groups and that this Committee have the function of over-seeing the preparation of the Regional

Environmental Study referred to above. (7 November 1983)

(5) That the Minister for Planning and Environment be requested to include in the Specifications for the proposed Regional Environmental Study the following matters:

(a) conflicting demands on land - particularly in the Wollongong Plains Sub-Region - of coal waste emplacement and existing and potential urban uses - particularly with regard to the limited supply of land for future residential development;

(b) alternative locations, methods and strategies - including transportation - for coal washing and emplacement and an evaluation of the private and public costs and benefits in relation to conflicting land use demands as referred to in the specification (a) above;

(c) the comparative environmental impacts of alternative potential locations for emplacement given the analyses for specification (b) above;

(d) the evaluation of alternative technology to landfill emplacement for coal reject utilisation and disposal and the implications for land consumption and emplacement site demand in the future;

(e) detailed analysis of projected coal and steel production in the Wollongong Region - including coal export as relevant - and of the projected volumes of reject required for disposal or utilisation;

(f) that the conduct of the Study be integrated and co-ordinated with the West Dapto Local Environmental Study being undertaken by Wollongong City Council; (7 November 1983)

(6) Cringila and other residential areas be included in the Study of the residential areas. (7 November 1983)

3.3 The resolutions of a meeting of local State and Federal Members of Parliament on 25 November 1983 were:

(1) In line with Council's resolution of 7 November 1983 it was agreed that a Regional Study investigating alternative sites and methods for the disposal of coal washery reject material was an urgent requirement and that some specialised cost/benefit analyses of all options should be an integral part of such a Study which should be carried out under the Environmental Planning and Assessment Act 1979.

(2) It was agreed that a Committee should be established under the State Environmental Planning and Assessment Act 1979 comprised of local members of Federal, State and Local Governments, relevant industries etc - overall composition to be resolved at a subsequent meeting.

(3) That this meeting reject the Report of the Coal Reject Disposal Sub-Committee and a letter be sent accordingly to the Minister for Mineral Resources.

(4) Federal Members, the Hon S West and Mr C Hollis to investigate the use of Federal funding for the above proposed Regional Environmental Study with the possibility of some of the Infrastructure Funding within the Steel Centres Assistance Programme being used for this purpose.

3.4 Following the decision of your Ministry not to authorise a Regional Environmental Study or the proposed Section 22 Committee, Council has:

(1) Allocated up to $20,000 to engage consultants to research certain engineering and environmental aspects of potentially alternative sites and methods for disposal and/or utilisation of industrial waste materials proposed for emplacement at Wongawilli - the findings to be integral to Council's Submission to the Public Inquiry.

(2) Submitted an application for the funding of a $150,000 study to prepare a **Strategy for the Disposal and Utilisation of Industrial Waste Materials in the Wollongong Region** to the National Energy Research Development and Demonstration Council - serviced by the Federal Department of Resources and Energy. This application has been wholeheartedly supported at the meeting of local Parliamentarians with Council Aldermen on the 18 May 1984.

3.5 Hence Council's resolved that a substantial amount of research is needed prior to the Commission of Inquiry - particularly on the evaluation of alternative sites and/or multi-site strategies and the formal request to you to defer the Public Inquiry until September. It also reflects Council's position of regarding the existing relevant documentation: the Environmental Impact Statement relating to Wongawilli and the Coal Reject Disposal Sub-Committee Report as being highly inadequate to provide a basis for decision-making on this most important issue.

3.6 It would now appear that there is insufficient time to complete a Study of the scale and nature and which is subject of Council's Application to the National Energy Research Development and Demonstration Council, before the Public Inquiry. Such a Study has been consistently strongly supported by Council and local Parliamentarians since November 1983. There is still uncertainty, however, about

the extent of remaining capacity at Kembla Grange. The Department of Mineral Resources, in its Submission on the Wongawilli development proposal, has stated that:

> "Based on an observation of the apparent remaining capacity at Kembla Grange by the Department it is possible that urgency on the selection of a new site may be overstated. To verify the urgency, an assessment, taking into account the following factors, would be required:
>
> i. remaining capacity as determined by the site's present layout and emplacement design and subject to the conditions imposed in the Development approval;
>
> ii. the rate at which Australian Iron and Steel is producing waste in excess of that being utilised and disposed of elsewhere;
>
> iii. the possibility of extending the capacity of the site by redesign and extension, subject to further approval.
>
> If the Kembla Grange site does have a significant capacity remaining and could be extended above existing approvals, the site could provide further short-term disposal capacity while longer-term alternatives are being investigated. Nineteen (19) alternative sites were investigated by the Company and, with the exception of the Cringila and Wongawilli sites, were rejected chiefly on the basis that land acquisition and engineering and environmental design would involve unacceptable delays in gaining Development Consent, as well as on capacity grounds.

The remaining capacity of Kembla Grange, therefore, requires official validation. The large-scale Regional Study proposed would take six to nine months from the date of commissioning of Consultants and there would, of course, be a subsequent extensive period of public debate. However, a decision on a short-term alternative - an extension of Kembla Grange or another short-term site - would facilitate the completion of such a Strategy for the Disposal and Utilisation of Industrial Waste Materials in the Wollongong Region and provide a soundly researched and publicly debated basis for a long-term strategy to be formalised.

3.7 The State Pollution Control Commission commented in its submission on the Wongawilli emplacement proposal, in comparing the Wongawilli and Cringila sites, that:

> "operating a site at Cringila with a five year life expectancy would provide a short-term period during in which positive research can be developed to obtain viable alternatives to landfill waste disposal or alternative land fill sites which are identified but precluded at present due to development time constraints;

"operating a site at Wongawilli with a twenty-year life expectancy will only delay unneccessarily the inevitable need to undertake the research mentioned in the point above;

"operating a site at Wongawilli may create a landuse conflict and permanently sterilise part of the land which could be suitable for residential development".

3.8 In line with the above, Council certainly opposes any commitment to a long-term site in the absence of such research and strategy which this proposed study would produce.

3.9 The waste emplacement proposal for Wongawilli has been discussed at the Wollongong Plains Sub-Regional Residential Expansion Committee which, as the Minister will be aware, oversees the Urban Development Programme for the Wollongong Sub-Region. It adopted a Report at its meeting of 2 May 1984 (Regional Manager's Report No. 84/1) for submission to the Urban Development Committee which included the following recommendations:

"It is RECOMMENDED that the Urban Development Committee -

(a) note with concern the major impact that the proposed industrial waste emplacement by Australian Iron and Steel Pty Ltd at Wongawilli is likely to have on the future of the Illawarra Urban Development Programme, due to the sterilisation of a large tract of land which, with other commitments by the State Government to Australian Iron and Steel Pty Ltd, would lead to a reduction of approximately 25% of land in West Dapto suitable for urban development;

(b) note the complexity of the problem and issues and the involvement of a number of Government interests, and the potential impact the proposal would have on these; and

(c) recommend to the Minister that he defer the Inquiry date to September 1984 to allow sufficient time for the completion of relevant studies by the appropriate authorities.

It is further RECOMMENDED that the Urban Development Committee forward this report to the Minister for Planning and Environment and the Housing Committee of Cabinet emphasising the implications the waste emplacement proposal may have on government policy/interest and expenditure.

It is finally RECOMMENDED that the Urban Development Committee:

(a) request the Public Works Department to expedite its West Dapto Flood Study to assist in the Commission of Inquiry;

(b) request the State Pollution Control Commission to commence an Air Pollution Study for West Dapto as a matter of urgency; and

(c) request the Director of the Department of Environment and Planning to give priority to its examination of the costs/benefits involved with alternative sites and methods of disposal, for submission to the Public Inquiry."

(4) THE PROPOSED REGIONAL STUDY: "STRATEGY FOR THE UTILISATION AND DISPOSAL OF INDUSTRIAL WASTE MATERIALS IN THE WOLLONGONG REGION."

4.1 Attachment 2 to this report is a copy of the application made by Council to the National Energy Research Development and Demonstration Council through the Department of Resources and Energy for the funding of the preparation of a "Strategy for the Utilisation and Disposal of Industrial Waste Materials in the Wollongong Region" to the extent of $150,000. The proposed Study is substantially the same as that originally proposed in November 1983 for authorisation as a formal Regional Environmental Study. However there is now additional emphasis on alternative methods and technologies of utilisation given the Council to which the application has been made.

4.2 Broadly, the objectives of the Study are expressed as:

(1) To establish a fully informed environmental, social and economic evaluation of all relevant public and private costs and benefits associated with alternative utilisation methods and technologies and emplacement locations for coal washery reject material disposal in the Wollongong Region - with particular reference to the long-term dipsosal requirements of Australian Iron and Steel Pty Ltd.

(2) To particularly identify, research and evaluate alternative methods of utilisation of coal washery reject material in the Wollongong Region given its assets, resources and development opportunities.

(3) To evaluate also alternative sites for emplacement which will lead to a strategy which:

(a) creates acceptable cost efficiencies to industry, and

(b) provides a basis for judgment to ensure the continued economic operations of the coal and steel industry and adequately safeguards land availability for future development in the Wollongong Region and its environmental quality.

Only by such a full investigation and evaluation of all alternative sites, emplacement techniques and alternative methods and techniques of utilisation, and the associated private and public costs and benefits, can a fully informed decision be made on this issue which is most critical for the City of Wollongong and its sub-region. The Study proposal was wholeheartedly supported at the meeting of 18 May 1984 of local Parliamentarians with Council Aldermen.

The proposed Study would take about 6-9 months by consultancy firm(s). Hence unless Kembla Grange can be extended to provide additional adequate capacity, such a Study could not be completed prior to the Public Inquiry and subsequent decision-making. However, government agreement and funding approval for such a study could have implications for the nature and capacity of a site for which approval would be given for short-term emplacement and the nature of conditions applicable in the relevant development consent.

Council, and the local State and Federal Members of Parliament, therefore seek your agreement, Mr Minister, that the Study proposed - **"Strategy for the Utilisation and Disposal of Industrial Waste Materials in the Wollongong Region"** - is a necessary pre-requisite for the formulation of a long-term strategy and seek your support for the application to the National Energy Research Development and Demonstration Council for the funding of such a Study.

(5) IMPLICATIONS FOR FUTURE URBAN DEVELOPMENT OF WOLLONGONG

5.1 The major aspects are:

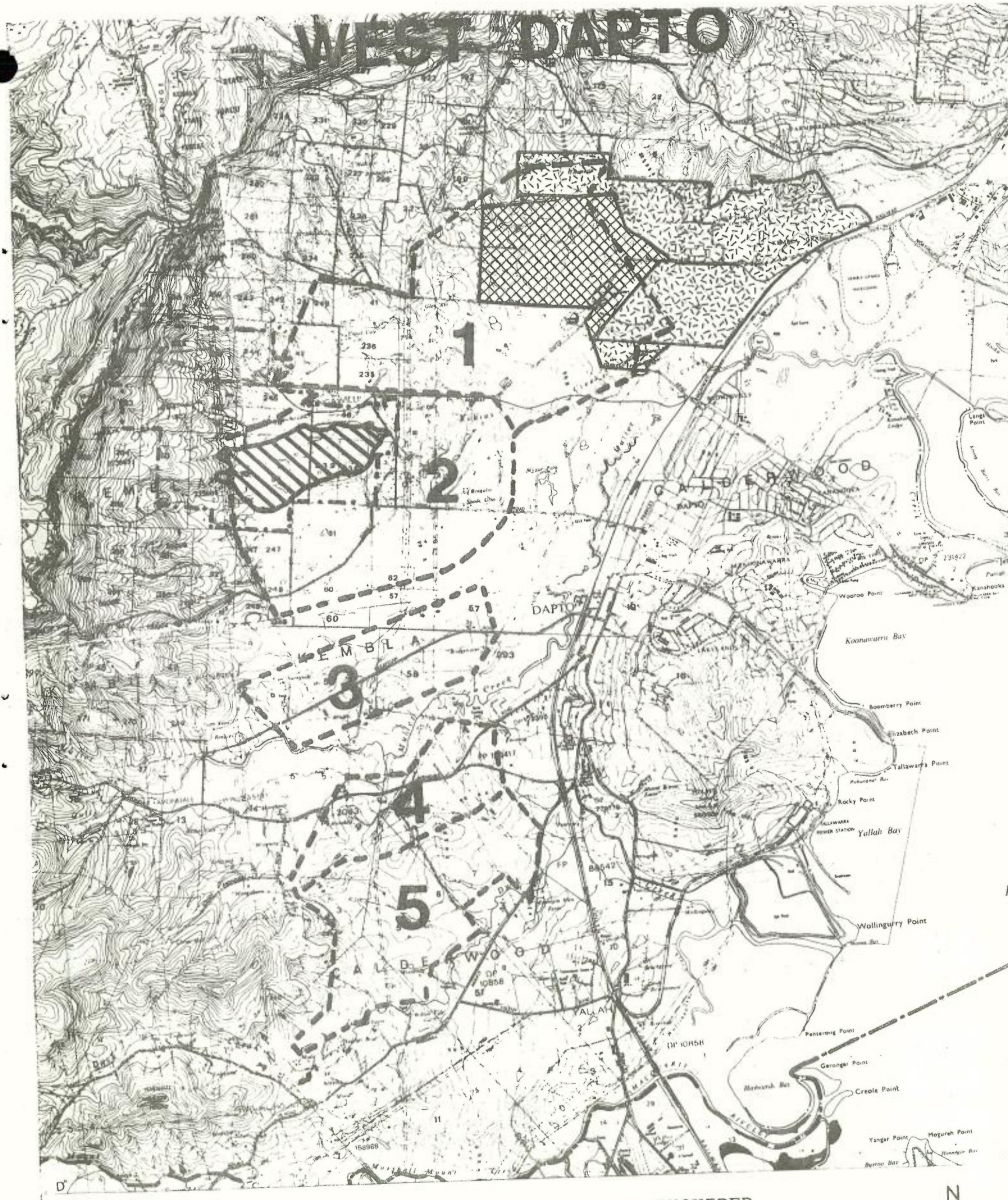
(1) The effects of the Wongawilli proposal in particular, and the Coal Reject Disposal Sub-Committee recommendations in general, for the adequacy of future residential land supply in the Wollongong Sub-Region, and in particular the growth potential of the City of Wollongong; and

(2) The ability of the land resource in the Wollongong area to accommodate the waste disposal needs of its major industries and employers.

Hence there is a crucial balance to be struck in decision-making on this issue between safeguarding firstly, the growth options for the forward planning of efficient urban growth of Wollongong and in particular future residential land development and its environmental quality; and secondly, the economic operations of Australian Iron and Steel Pty Ltd.

Future residential demand in the City of Wollongong and the Sub-Region has been extensively researched over recent years by Richard Cardew of Macquarie University - **"the Illawarra Land Market Study"** and the **"Draft Urban Consolidation Study"**. The former anticipated a serious residential land shortage in the Wollongong Region in 30-40 years and recommended a phasing programme (which has become the basis for the Sub-Regional Urban Development Programme) which included the programmed development of West Dapto areas (1) to (4) between 1988 and 1992. The Draft Urban Consolidation Study revised the demographic projections downwards but only to a limited extent (preferred projections were 274,000 in the ILMS and 269,000 in the Draft UCS for the Wollongong Sub-Region). Council's research has led to the conclusion that on the basis of demographic projections, at least 5,000 lots will be required in West Dapto by the year 2001. If the Illawarra Land Market Study and subsequent Urban Consolidation Study projections are accurate, then much more residential land in West Dapto will be needed to meet residential demand (as demographically assessed) and hold down land prices in the City. Draft Regional Environmental Planning Policies regarding proximity of new residential areas to major employment centres and making provision of residential land availability to the extent of 150% of demographically assessed residential demand also mean that more than the 5,000 lots will be required.

The Environmental Impact Statement for the Wongawilli proposal erroneously states (page 59) that **"no indications of the rate of development for West Dapto were included in the Illawarra Land Market Study"**. Also, the Environmental Impact Statement Summary (page 2) states that **"it is unlikely that there would be any necessity for residential land use to approach the site within the 18-20 year life of the proposal"**. This is clearly contrary to the extensive research on residential demand completed for Wollongong and its Sub-Region over recent years. The detailed estimates of lot yield by broad areas included in the Illawarra Land Market Study given below and relate to the map on the following page:



TO BE ZONED HEAVY INDUSTRIAL IF REQUIRED BY A.I. & S

A.I.S. PROPERTY BOUNDARY

EXISTING AND PROPOSED INDUSTRIAL LAND

BOUNDARIES OF PROPOSED RESIDENTIAL AREAS (1 - 5)

PROPOSED COAL REJECT REPLACEMENT SITE

Generalised Yield Figures from Areas 1-4 (West Dapto) and Area 5 (Yallah)

	Physical Area Gross (ha)	Net Hazard Free (ha)	Average Yield Lots/ha	Lot Potential
Area 1	560	270	10-12/ha	2,700 - 3,240
Area 2	530	310	10-12/ha	3,100 - 3,720
Area 3	180	130	10-12/ha	1,300 - 1,560
Area 4	185	95	10-12/ha	950 - 1,140
Area 5	325	215	10.5-12/ha	2,250 - 2,580
TOTAL	1780 ha	1020 ha	-	10,300 - 12,240 lots

Source: R V Cardew Illawarra Land Market Study August 1981

Area 2 within the Illawarra Land Market Study contains 310 hectares and also includes 100 hectares which are the subject of the Wongawilli emplacement proposal. Direct physical sterilisation of future residential land is therefore 100 hectares - about 1,000 to 1,200 lots and the need for further buffer zones could mean sterilisation directly of at least 1,500 lots. What is more uncertain at this stage, but possibly more significant, is the **"economic sterilisation effect"** - developers deciding against the economic feasibility of developing residential land in some of the areas in proximity to the emplacement". Sterilisation of 1,500 lots represents about 20% of the potential yield of Areas 1-4, and 40-50% of the potential of Area 2.

If the 120 hectares subject of the 1967 Legal Agreement between Australian Iron and Steel Pty Ltd, the State Government and Council also is sustained, then this, together with the emplacement area, would directly sterilise 220 hectares of residential land in Areas 1 and 2 - equivalent to 2,200 to 2,600 lots or about 30% of the potential of the Illawarra Land Market Study's Areas 1-4. Such a level of direct physical sterilisation, and potentially much **"economic sterilisation"** because of the environmental degradation factors, is unacceptable to Council.

There are also important implications for the feasibility costs and timing of sewer infrastructure by the Metropolitan Water Sewerage and Drainage Board. Recent estimates by the Board for the sewer infrastructure for Areas 1-4 is about $50 million - including new carrier, rising main and pumping station. If the lot yield in West Dapto was reduced by,

say, 25%, the Board's costs would be reduced by 7.7% only. The Illawarra Land Market Study referred to the significant economies of scale of providing for Areas 1, 2 and 3 as an integrated phased programme for the first stages of development of residential areas in West Dapto. This would, of course, be greatly undermined by giving consent for industrial waste emplacement at Wongawilli.

Particularly crucial, therefore, is the need for planning and management of the land resource in Wollongong to adequately provide for residential demand generated by the City's population - particularly for the lower price sectors of the housing market for which large scale residential development is so important. The Wollongong Plains Residential Expansion Committee has also indicated the important implications for overall residential land provision in the Sub-Region. There is a real lack of substantiation to the Environmental Impact Statement (Summary page 2) that there is a paucity of practicable emplacement sites for waste emplacement in contrast to **"substantial areas which are suitable for residential development in the West Dapto/South Wollongong Sub-Region".**

This major issue was also identified following the exhibition of the Report **"Coal Reject Disposal in the Southern Coalfields"** by the Coal Reject Disposal Sub-Committee (CRDSC). Three of the four recommended coal reject disposal sites are in direct conflict with three areas of potential residential development in West Dapto: Areas 1, 2 and 3 as included in the Illawarra Urban Development Programme. CRDSC Site (A) would directly alienate 47 hectares of Residential Area 1 - representing a loss of between 470 and 564 lots. CRDSC Sites (B) and (C) would lead to the sterilisation of approximately 2,800 to 3,300 lots within Residential Area 2 and CRDSC Site (C) would sterilise between 470 and 560 lots in Area 3. Hence, Council's resolution that the residential land sterilisation implications of the CRDSC proposals are completely unacceptable.

(6) ENVIRONMENTAL ISSUES

6.1 The environmental implications - potential air, water, noise and visual pollution are, of course, of major concern to Council and the residents of affected areas. The population which would be affected by long-term emplacement at Wongawilli would potentially substantially increase over the life span of the project given that land for future residential potential exists in relative proximity to the project site. The level of population that would locate in such areas could, of course, be substantially reduced because of the environmental effects of the emplacement. This concern for the environmental implications of the Wongawilli proposal is one of the factors which Council regards as justifying the full evaluation of public costs and benefits associated with alternative sites and methods of utilisation which should be the subject of the proposed

large scale study. The proposal would exacerbate the already substantial environmental problems which exist in the Region at a time when Federal, State and Local Governments are making substantial efforts, independently and on a co-ordinated basis, towards environmental improvements and diversification of the regional economy - including efforts to promote tourism and other such industries. West Dapto does have substantial potential not only for urban residential development but for tourism developments and rural lot subdivisions.

6.2 Of major concern at this stage are the implications arising from the 14 kilometre haul by truck transport of the waste materials. This involves 556 truck movements per day, which, in addition to the existing traffic related to Avon Colliery, would make a total of 896 truck movements per day - 1 truck each 57 seconds between 7am and 7pm and 1 truck every 1 minute 40 seconds between 7am and 11pm. As reflected in the State Pollution Control Commission Submission, this is unacceptable.

APPENDIX 2

APPENDIX 2 - INVESTIGATION INTO THE COST OF OCEAN DUMPING OF COAL REJECT

1. INTRODUCTION

This Appendix reports on the findings of a brief and preliminary investigation into the design and costing of a scheme for ocean dumping of coal reject material from the AI&S central washery at Port Kembla.

2. ALTERNATIVE OCEAN DISPOSAL METHODS

Three methods of offshore disposal of coal reject have been used overseas:

. **tipping on the foreshore in exposed locations;** this has been shown to be environmentally unacceptable,

. **pipeline disposal;** this is not considered viable for the following reasons:

- because of the potential for mobilisation by wave and current action, near-shore disposal would be environmentally unacceptable; in view of the recent estimates of cost of sewage diffuser pipelines off the Sydney coastline, the cost of the coal reject pipelines extending 10 or 20 kilometres offshore would undoubtedly be prohibitive,

- the reject would have to be converted to a slurry for pipeline transport thereby adding a further treatment cost,

- the accumulation of reject at the pipeline outlet/s would present a technical difficulty.

. **transport by bottom opening dump barges:** this option is considered potentially viable and is the subject of the following analysis.

3. REQUIREMENTS OF A DUMP BARGE DISPOSAL SYSTEM

The following facilities would be required to develop this transport system:

. a transport system to move coal reject from the coal preparation plant (CPP) to the Port Kembla harbourside,

. a barge loading facility,

. a storage area adjacent to the loading facility to provide an interface between the continuous supply of coal reject from the CPP and the intermittent loading requirements of the barges, and

. a number of barges.

4. DESIGN CRITERIA

The following assumptions were made in developing the system concept:

- harbourside land is available for the stockpile/loading facility,
- AI&S would operate and maintain the transport/stockpile/barge loading system using Australian Workers Union or Waterside Workers Federation members,
- the barges would be operated under contract to AI&S using Seamen's Union or other maritime union crews,
- the throughput of the system would be 7500t/day based on the following:
  - annual reject production would be 1.5 million tonnes (30 million tonnes averaged over 20 years),
  - allowing for public holidays, barge downtime etc, the number of working days would be 220 per year,
  - ten percent of working days would be lost due to bad weather, and
  - both the CPP and barge loading facility would operate 24 hours per day,
- the dump site would be 20 kilometres (11 nautical miles) from the loading wharf,
- the barges used would be self propelled, bottom opening barges of 1500m^3 capacity which have a laden cruise speed of about seven knots, (dump barges propelled by tugs were considered but eliminated on the basis of manning requirements and performance in adverse sea conditions),
- the transport system from coal preparation plant to loading facility would be a conveyor of approximately 900 metres length and capable of delivering coal at the rate of 650 tonnes per hour,
- the working coal stockpile would have a live capacity of two barge loads (4800 tonnes), with additional overflow capacity of about 30 000 tonnes (five days). The working stockpile would be conical and 19 metres high and the overflow stockpile would be 60 metres square and five metres high.
- the working stockpile would be connected to the barge loading facility by a conveyor 400 metres long and capable of delivering 3000 tonnes per hour.
- stacking at the stockpile would be based on direct drop from the conveyor with reclaim by a combination of dozing and underground vibratory feeders,
- the reject loading wharf would be constructed at right angles to the shoreline with two barge berths of 30 metres being provided on each side,
- sufficient power would be available on site, and
- no dust suppression equipment has been costed although undoubtedly it would be required.

5. COST ESTIMATES

The following table shows the principal capital and operational components with approximate order of costs for the system:

Item	Cost Allowance ($)
Capital	
. Dozer	525 000
. CPP reject conveyor	810 000
. conical stockpile facility	100 000
. reclaim hopper	50 000
. reclaim feeder	120 000
. outloading conveyor	480 000
. overflow stockpile area	50 000
. electrical	200 000
. structural - outloading conveyor wharf and fittings	1 500 000
Sub Total	3 835 000
plus engineering (10%)	384 000
plus contingency (20%)	767 000
Total	4 986 000
Total, say,	5 000 000
Operation (per annum)	
personnel: . stockpile attendants	150 000
. dozer drivers	150 000
. maintenance	50 000
equipment: . power	30 000
. dozer depreciation	84 000
. dozer running cost	180 000
. conveyor depreciation	225 000
. barging ($2.80-$3.75/tonne*) say $4.00/tonne for 1.5 mtpa	6 000 000
Total	6 869.000

(* Estimates provided by barging contracting companies).

Summary of Costs

Annual operating costs	6 869 000
Annual capital cost (amortised over 10 yrs at 10%)	814 000
Total	7 683 000

For a throughput of 1.5 mtpa this cost is equivalent to approximately five dollars per tonne

APPENDIX 3

APPENDIX 3 - DETAILS OF ADDITIONAL SITES

This Appendix provides details of 10 sites located from surveys carried out as part of this study. The format for the presentation is the same as that adopted in the Wongawilli EIS to allow comparison and the site numbering system follows sequentially on from the eight sites from other studies which satisfactorily passed through the **Stage 1** assessment (see **Table 3.3).**

SITE 9 - MARSHALL MOUNT

Environmental Considerations

. Topography - this would be a hill-side emplacement. The overall site gradient is 14 percent which restricts potential capacity.
. Vegetation - pasture on the lower slopes and open forest on the upper slopes
. Visibility - completely visible from six farmhouses at ranges less than one kilometre but not visible from urban areas.

Social Considerations

. Land-use - grazing on lower slopes
. Proximity to houses - 11 within 2 kilometres
. Access - F5/Marshal Mount Road
. Zoning - Rural
. Future landuse - grazing

Economic Factors

. Capacity - 1.0 mcm
. Haul distance mode - 16 km, road
. Relocation of services - nil

SITE 10 - RIVERSDALE

Environmental Considerations

. Topography - hillside emplacement, overall slope approximately 10 percent, satisfactory
. Vegetation - dry sclerophyll open forest
. Visibility - 5 properties to the south west within 2 kilometres and with unrestricted visual access. Albion Park at 2.5 km, also with unrestricted visual access

Social Considerations

. Land-use forest and rough grazing
. Proximity to housing - see **Visibility** above
. Access - F6/Marshal Mount Road or F6/Princes Highway. Minimum 500 m of new access road required through easy terrain.
. Zoning - Rural
. Future landuse - grazing

Economic Considerations

. Capacity - 3.4 mcm
. Haul distance mode - 15 km, road
. Relocation of services - 2 x 33 kV transmission line

SITE 11 - MOUNT JOHNSON

Environmental Considerations

. Topography - valley emplacement, overall invert gradient 10 percent with central creekline
. Vegetation - dry sclerophyll open forest plus improved pasture
. Visibility - seven farmhouses within 2 km but otherwise restricted

Social Considerations

. Land use - rough grazing
. Proximity to housing - one farmhouse, "Ingleside" displaced, 8 houses within 2 km
. Access - F5/Marshal Mount Road
. Zoning - Rural
. Future Land Use - grazing

Economic Considerations

. Capacity - 30 mcm
. Haul distance/mode - 18 km/truck
. Relocation of services - 1 x 330 kv transmission line

SITE 12 - OAK FARM

Environmental Considerations

. Topography - hillside/valley emplacement overall slope 5 percent
. Vegetation - dry sclerophyll open forest plus improved pasture
. Visibility - unrestricted from 5 houses to north and within 2 km partially visible from Albion Park 2 km to south east.

Social Considerations

. Land use - grazing
. Proximity to housing - see **Visibility** above
. Access - F5/Marshall Mount Road/Calderwood Road
. Zoning - Rural
. Future land use - grazing

Economic Considerations

. Capacity - 4.2 mcm
. Haul distance/mode - 18 km/truck
. Relocation of services - nil

SITE 13 - MILLER VALE

Environmental Considerations

. Topography - valley/hillside emplacement overall slope of 11 percent
. Vegetation - predominantly pasture with remnant open forest
. Visibility - unrestricted from 7 properties within 2 km to the north and north-east

Social Considerations

. Land-use Rough grazing
. Proximity to housing - see **Visibility.** One farm house, "Miller Vale" displaced
. Access - F6/Princes Highway/Avondale Road
. Zoning - Rural
. Future land use - grazing

Economic Considerations

. Capacity - 2.0 mcm
. Haul distance/mode - 20 km/truck
. Relocation of services - nil

SITE 14 - LUCKWARRA

Environmental Considerations

. Topography - valley emplacement overall gradient 10 percent, central creekline
. Vegetation - cleared for pasture with some shrubby regrowth
. Visibility - 6 residences to the south and within 2 kms

Social Considerations

. Land use - grazing
. Proximity to housing - see **visibility** above. One farmhouse displaced, possibility of two
. Access - F5/Princes Highway/Illawarra Highway
. Zoning - Rural
. Future land use - grazing

Economic Considerations

. Capacity - 8.0 mcm
. Haul distance/mode - 35 km/truck
. Relocation of services - 1 x 330 kv transmission line

SITE 15 - BEAVER LODGE

Environmental Considerations

. Topography - hillside emplacement, average grade 10 percent
. Vegetation - cleared for pasture
. Visibility - readily from Princes Highway and Oak Flats to the north (range 1 km)

Social Considerations

. Land use - grazing with adjacent hard rock quarries
. Proximity to housing - Oak Flats within 1 km
. Access - South coast Line (rail) or F6/Princes Highway
. Zoning - Rural
. Future land use - grazing

Economic Considerations

. Capacity - 6.4 mcm
. Haul distance/mode - 21 km/rail
. Relocation of services - nil

SITE 16 - THE HILL

Environmental Considerations

. Topography - hillside emplacement, average grade 10 percent
. Vegetation - cleared for grazing
. Visibility - readily from 3 properties to the west and north east

Social Considerations

. Land use - grazing
. Proximity to housing - see **visibility** above. Shellharbour 2.5 km to the east but partially obscured by intervening topography
. Access - via South Coast Rail Line
. Zoning - Rural
. Future land use - grazing

Economic Considerations

. Capacity - 6.1 mcm
. Haul distance/mode - 23 km/truck rail
. Relocation of services - 1 x 132 kv transmission line

SITE 17 - 21 DUMP

Environmental Considerations

. Topography - flat
. Vegetation - nil
. Visibility - visual access only from the north (Mt St Thomas)

Social Considerations

. Land use - activities associated with steel production
. Proximity to housing - Mt St Thomas within 500 metres of closest point
. Access - by road from steelworks crossing Springhill Road
. Zoning - industrial
. Future land use - industrial

Economic Considerations

. Capacity - 8 mcm with additional potential depending on constraints
. Haul distance/mode - 2.5 km/truck or conveyor
. Relocation of services - nil for 8 mcm

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waste emplacement at Wongawilli

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