Synthetic rutile plant at Chandala - Production debottlenecking to 200,000 tpa - Change to environmental conditions

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Tiwest Joint Venture

Report and recommendations
of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 799
Dec 1995

THE PURPOSE OF THIS REPORT

This report contains the Environmental Protection Authority's environmental assessment and recommendations to the Minister for the Environment on the environmental acceptability of the proposal.

Immediately following the release of the report there is a 14-day period when anyone may appeal to the Minister against the Environmental Protection Authority's report.

After the appeal period, and determination of any appeals, the Minister consults with the other relevant ministers and agencies and then issues his decision about whether the proposal may or may not proceed. The Minister also announces the legally binding Environmental Conditions which might apply to any approval.

APPEALS

If you disagree with any of the contents of the assessment report or recommendations you may appeal in writing to the Minister for the Environment outlining the environmental reasons for your concern and enclosing the appeal fee of $10.

It is important that you clearly indicate the part of the report you disagree with and the reasons for your concern so that the grounds of your appeal can be properly considered by the Minister for the Environment.

ADDRESS

Hon Minister for the Environment
12th Floor, Dumas House
2 Havelock Street
WEST PERTH WA 6005

CLOSING DATE

Your appeal (with the $10 fee) must reach the Minister's office no later than 5.00 pm on 22 December 1995.

Environmental Impact Assessment (EIA)

Process Timelines in weeks

Date	Timeline commences from receipt of full details of proposal by proponent	Time (weeks)
16/10/95	Proponent Document Released for Public Comment	
13/11/95	Public Comment Period Closed	4
13/11/95	Issues Raised During Public Comment Period Summarised by EPA and Forwarded to the Proponent	0
17/11/95	Proponent response to the issues raised received	1
8/12/95	EPA reported to the Minister for the Environment	3

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Summary and recommendations

The proponent, Tiwest Joint Venture (Tiwest), seeks an amendment to the environmental conditions under Section 46 of the *Environmental Protection Act 1986*, to allow the synthetic rutile plant at Chandala an increase in nameplate production from 130,000 to 200,000 tonnes per annum (tpa) of synthetic rutile.

The plant was originally assessed by the Environmental Protection Authority (EPA) in December 1988 (EPA 1988) and was approved by the Minister for the Environment to build and operate the plant at 130,000 tpa in the conditions set in February 1989. Subsequently, through the issuing of works approvals and licences, the Department of Environmental Protection (DEP) licensed the plant to operate up to 165,000 tpa on the basis that emission levels did not exceed the levels specified in the licence conditions. During the course of this assessment to 200,000 tpa production, the Minister has been advised by the proponent that it predicted that production levels for the plant could exceed the 130,000 tpa (constrained by the Minister's conditions) but still within its maximum licence level.

In view of the predicted exceedance of 130,000 tpa approved production level, the Minister has requested the EPA under Section 48(4)(e) of the *Environmental Protection Act 1986*, to review the environmental conditions for the plant; a process which has already been initiated by the proposal.

During the assessment, the EPA sought expert advice from the DEP, Department of Minerals and Energy, Radiological Council/Health Department of WA, Water Authority of WA, and Waterways Commission/Swan River Trust. The EPA also utilised the information given in the Section 46 Public Review Document, and has taken into account additional information supplied by the government agencies, the public and the proponent.

The EPA reviewed the topics of concern including:

- noise emissions from plant operations;
- maintenance of separation distances between the plant and the nearest residences;
- air emissions (gases, particulates and odours);
- liquid waste disposal;
- solid waste disposal;
- radiological impacts; and
- inconsistency between the original environmental conditions and the existing licence conditions regarding the plant allowable production rate limit;

and concluded that the key environmental issue relating to the proposal which requires evaluation was the impacts of noise on residents.

The EPA considers that subject to its recommendations, any potential impacts arising from the proposal, including noise can be effectively managed by the DEP and other government agencies. Accordingly the EPA finds the proposal acceptable on environmental grounds, subject to the proponent's commitments and recommendations in this assessment report.

Recommended environmental conditions for the synthetic rutile plant at Chandala are also provided in this report.

Recommendation Number	Summary of recommendations
1	The proposal to expand production to 200,000 tpa is environmentally acceptable subject to the recommendations in this report and the proponent's commitments.
2	Proponent should be exempt under Section 6 of the *Environmental Protection Act 1986*, from compliance with existing noise regulations, and be required to conform with noise levels specified in the conditions set under Section 45 of the Act. Such conditions should be the same as existing licence conditions.

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1. Introduction and background

1.1 The purpose of this report

The proponent, Tiwest Joint Venture (Tiwest), seeks an amendment to the environmental conditions under Section 46 of the *Environmental Protection Act 1986*, to allow the synthetic rutile plant at Chandala an increase in production from 130,000 to 200,000 tonnes per annum (tpa) of synthetic rutile.

The Minister for the Environment has also requested the EPA, under Section 48(4)(e) of the *Environmental Protection Act 1986*, a review of environmental conditions resulting from the proponent's prediction of exceedance of 130,000 tpa, which was its approved capacity under the Minister's conditions.

This report and recommendations provide the EPA's advice to the Minister for the Environment on the environmental acceptability of the proposed production debottlenecking to 200,000 tpa of synthetic rutile, and on the review of conditions.

1.2 Background

Tiwest is Australia's first fully integrated titanium pigment project and has been in operation since December 1989. The integrated operations include a mine and wet concentrator at Cooljarloo, a dry mill and synthetic rutile plant at Chandala, a pigment plant and port facilities at Kwinana and corporate offices at Bentley. Figure 1 shows the locations of these facilities.

The synthetic rutile plant was originally assessed by the EPA in December 1988 (EPA, 1988) at a production rate of 130,000 tpa. In February 1989, the then Minister for the Environment (Minister) issued his approval for the original proposal and the conditions under which it could be implemented (Appendix 1). Even though the Minister's statement of approval (environmental conditions) set did not explicitly state a production capacity, Environmental Condition 1 restricts Tiwest to a maximum production rate of 130,000 tpa as specified in the 1988 Public Environmental Report (TiO_2 Corporation & Kerr-McGee Chemical Corporation Joint Venture, 1988).

The proponent indicated that efficiencies in operation and plant optimisation have allowed the plant to operate at higher production levels than the original design prediction, with minor modifications. The original design parameters for the synthetic rutile plant made allowance for a one month plant shut-down for refractory repairs to the ilmenite rotary reduction kiln each year. In addition, the kiln was designed to accept low quality ilmenite feed. In reality, the kiln refractory repairs have only been necessary on two occasions since plant commissioning in 1990, and the ilmenite produced at the Cooljarloo mine for synthetic rutile plant feed has proved to be equivalent to the best quality in the world.

As a result of the above, it has been possible to achieve annual production rates in excess of 130,000 tpa with only minor plant modifications. In 1993, the DEP licensed the plant to operate at an annual production rate of 140,000 tpa, which was further increased to 165,000 tpa in 1994, in view of all emissions from the plant having been within the licence limits (Appendix 2 contains the current licence conditions).

More recently, high throughput trials have demonstrated that the kiln is capable of production rates of 200,000 tpa. However, modifications would be required on various parts of the process to remove production bottlenecks, and allow all areas of the process to accommodate the increased production. The proponent hence seeks an amendment to the environmental conditions to allow the synthetic rutile plant at Chandala an increase in production capacity to 200,000 tpa.

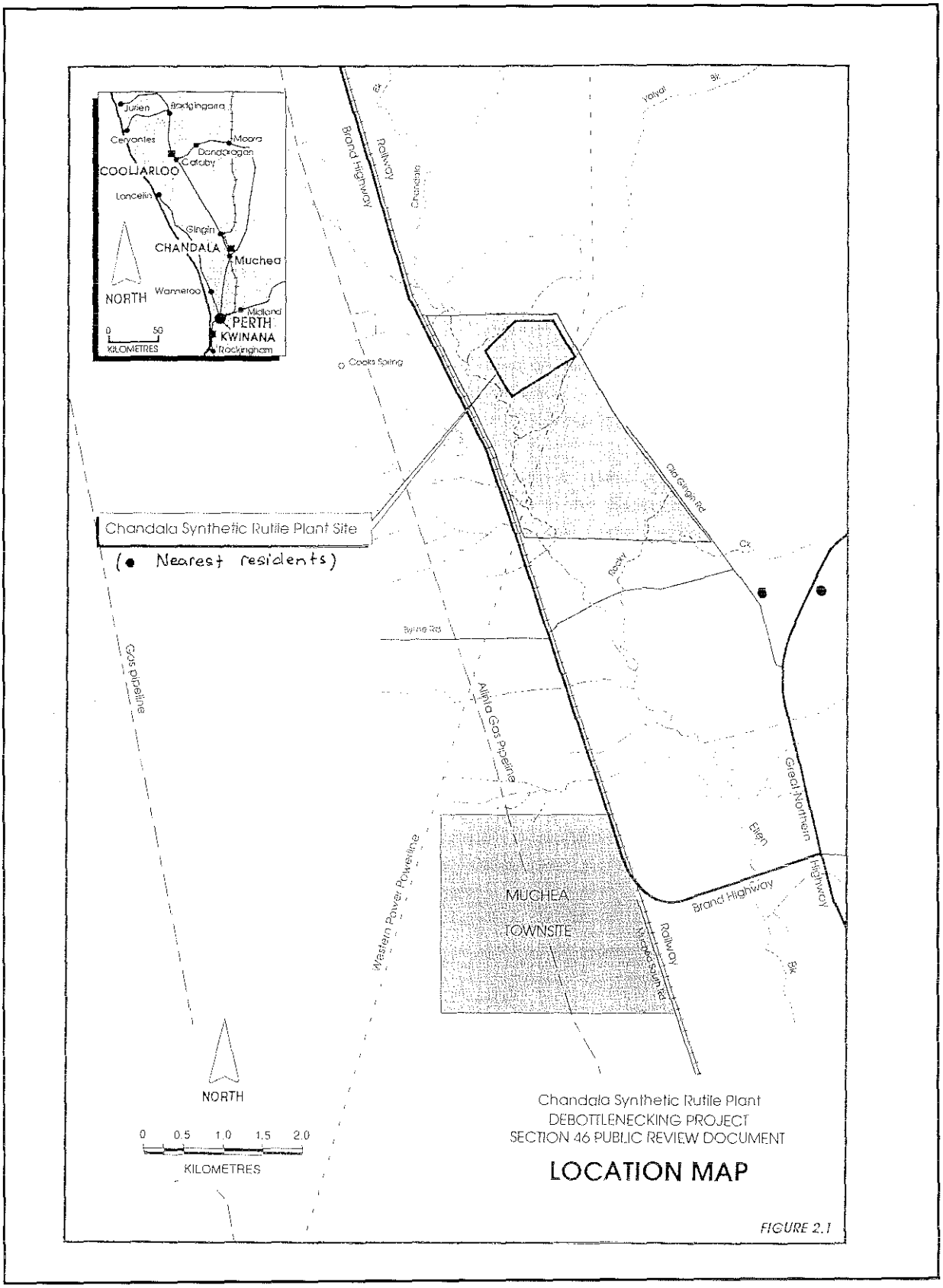

Figure 1. Location map (Source: Figure 2.1 of Tiwest's S46 Public Review Document).

Through Tiwest's proposal to increase production to 200,000 tpa, the Minister has been advised by the company of the inconsistency between the environmental conditions and the existing licence conditions regarding the allowable production capacity limit for the plant, and that it would most likely exceed its approved production of 130,000 tpa under the current production levels. In view of the predicted non-compliance with Environmental Condition 1, the Minister has determined that the appropriate course of action was to review the conditions for the plant, as provided for under Section 48(4) of the *Environmental Protection Act 1986*. This action has already been initiated by Tiwest in seeking environmental approval for this proposal.

1.3 Structure of the report

The report document has been divided into seven sections.

Section 1 describes the background to the proposed production debottlenecking to the Synthetic Rutile Plant at Chandala (proposal), and describe the structure of this report. Section 2 describes the proposal to amend the environmental conditions (more detail is provided in the proponent's review document). Section 3 explains the environmental impact assessment process, and provides a review of topics in order to identify environmental issues requiring evaluation by the EPA.

Section 4 provides an evaluation of the key environmental issue associated with the proposal. For the environmental issue, the objective of the assessment and an evaluation framework is defined. In addition, the likely effect of the proposal, the advice to the EPA from submissions, and the proponent's response to submissions are described. The EPA's analysis and recommendation with respect to the identified issue are contained in this section. The adequacy of the proponent's response is considered in terms of project modifications and environmental management commitments in achieving an acceptable outcome. Where an inadequacy is identified, a recommendation is made to achieve the environmental assessment objective.

Section 5 summarises the conditions and recommendations while Section 6 describes the recommended environmental conditions.

References cited in this report are provided in Section 7.

2. The proposal

The purpose of the synthetic rutile plant is to upgrade ilmenite (which contains 55 - 60% titanium dioxide) to a synthetic rutile grade (greater than 90% titanium dioxide) suitable for chlorination in a titanium dioxide pigment plant. The plant uses a series of metallurgical steps called the improved Becher process to remove approximately 90% of the iron, and various amounts of manganese and other impurities, from the ilmenite feedstock.

The basic process flow diagram is shown on Figure 2. The key element of the synthetic rutile production is the ilmenite rotary reduction kiln.

The proposal, or "debottlenecking project", aims to increase synthetic rutile production on the Chandala site to 200,000 tpa, which is a rate that matches the latent capacity of the rotary reduction kiln. Process elements upstream and downstream of the kiln will be modified to remove bottlenecks, by either increasing the size or number of units of equipment, or by improving the efficiency. The basic metallurgical and chemical processes will not change.

Details of the proposal are provided in Appendix 3. Table 1 provides a comparison of the inputs and outputs for the current and proposed production rates. The locations of the proposed modifications are shown on Figure 3, while the proposed modifications are described in Part 1 of Appendix 3. Table 2 is the proponent's summary of the proposed modifications and associated environmental implications.

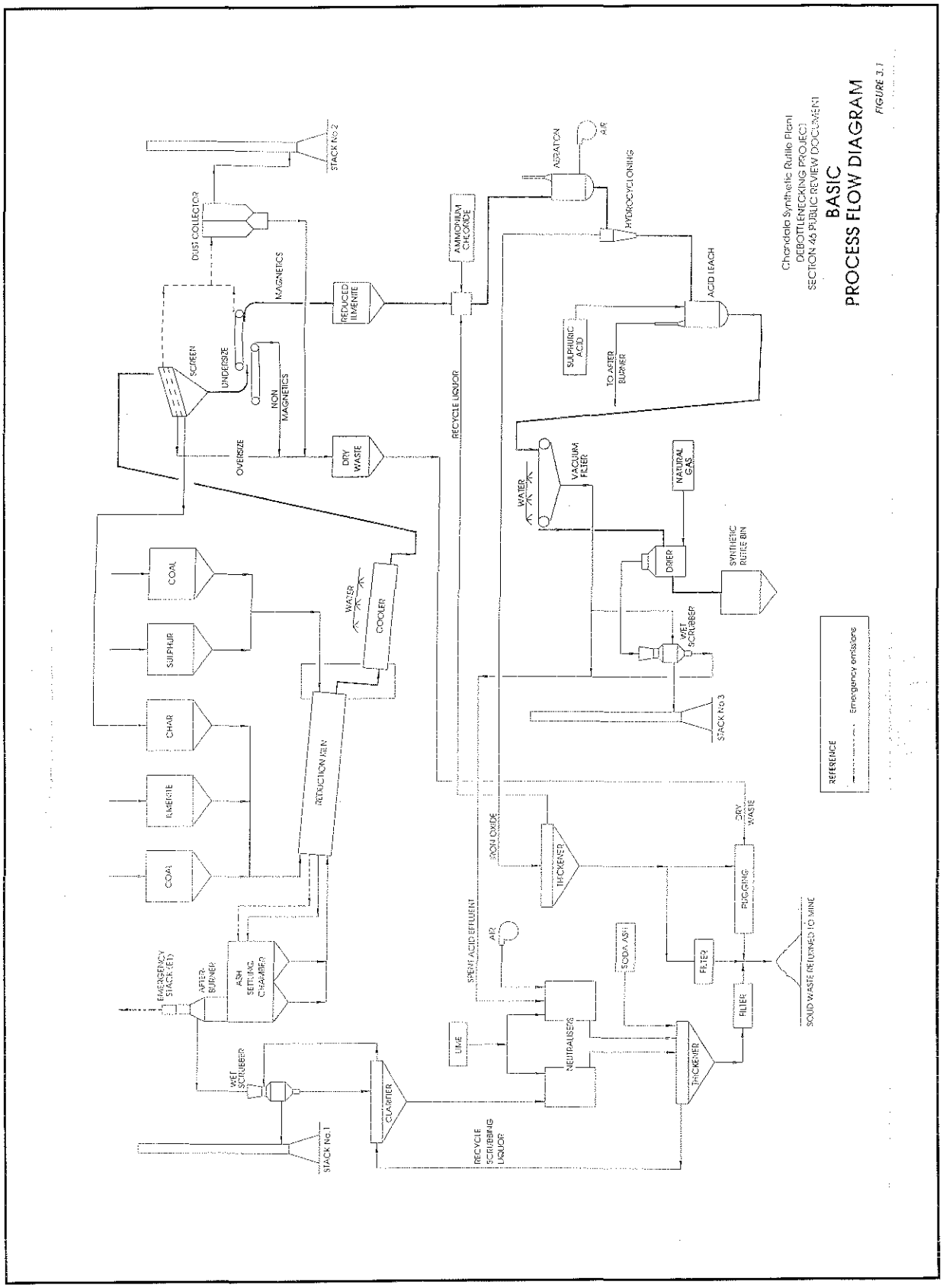

Figure 2. Process flow diagram (Source: Figure 3.1 of Tiwest's S46 Public Review document).

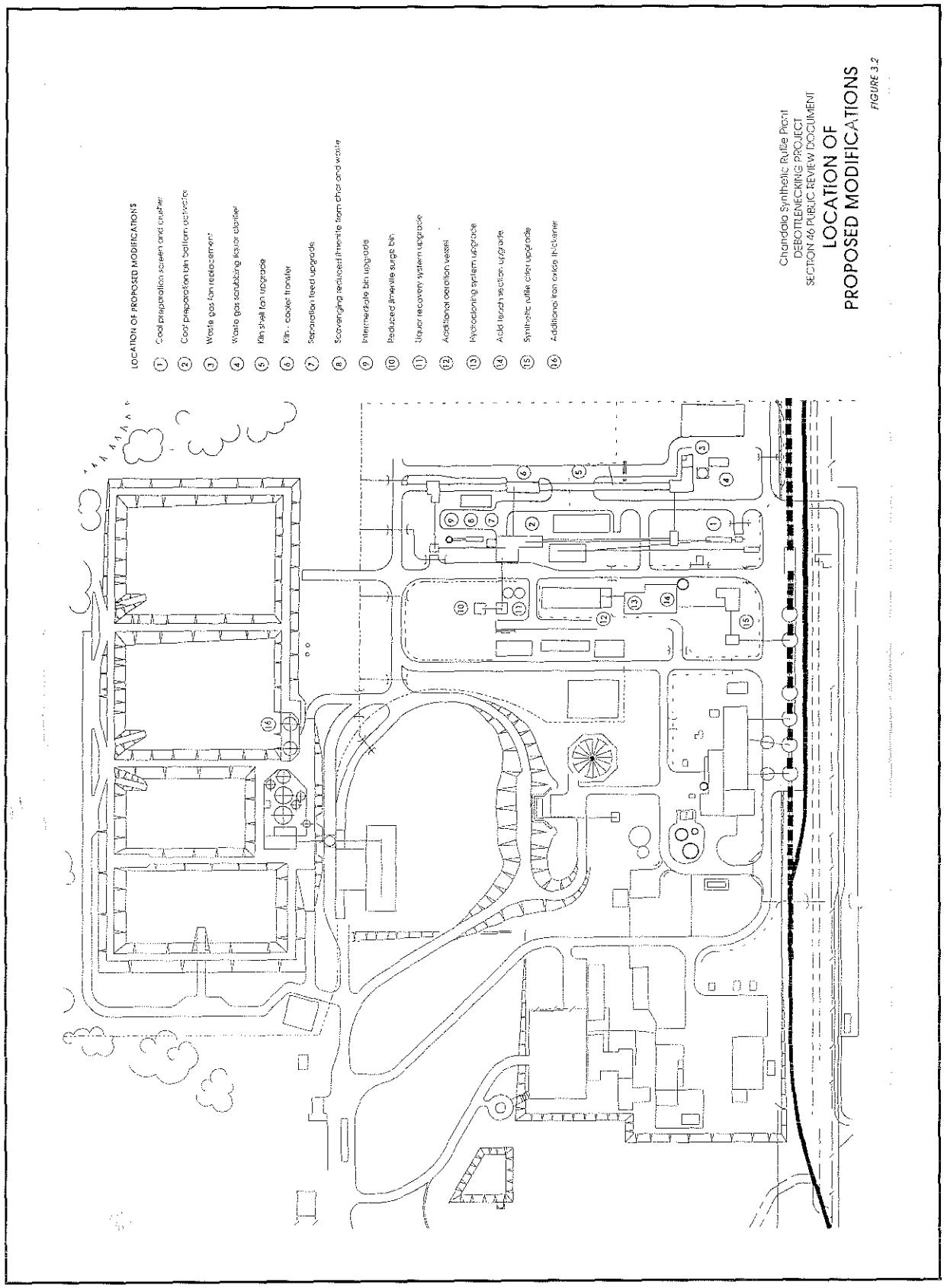

Figure 3. Locations of proposed modifications (Source: Figure 3.2 of Tiwest's S46 Public Review document).

Table 1: Comparison of plant inputs and outputs (Source: Table 3-1 of Tiwest's S46 Public Review Document)

Material	Units	Design as per PER (130,000 tpa)	Present (165,000 tpa)	Proposed Following de-bottleneck'g (200,000 tpa)
Inputs				
Ilmenite	t	220,000	275,000	335,000
Coal	t	110,000	107,000	130,000
Sulphur	t	2,000	2,000	2,400
Quick Lime	t	6,000	5,000	6,000
Soda Ash	t	700	1,500	1,800
Caustic Soda	t	800	160	200
Sulphuric Acid	t	7,000	3,300	4,000
Ammonium Chloride	t	600	1,000	1,200
Water	m^3	620,000	680,000	820,000
Outputs				
Synthetic Rutile	t	130,000	165,000	200,000
Iron Oxide and fine ash	t	70,000	100,000	120,000
Filtercake (hydroxides and sulphates)	t	54,000	16,000	20,000
Coarse Ash and Clinker	t	16,000	4,000	5,000

Note:

1. The lower sulphuric acid consumption rate for 165,000 tpa (in comparison with 130,000 tpa) production rate is due to more amenable ilmenite and better aeration performance.
2. The reduction in filter cake produced from 165,000 tpa production rate (in comparison with 130,000 tpa) is due to (1) above in conjunction with a reduction kiln sulphur dosing rates.

3. The reduction in kiln (coarse) ash/clinker output from 165,000 tpa production rate (in comparison with 130,000 tpa) is due to better kiln control and better ilmenite quality than originally anticipated.

Table 2: Proponent's summary of proposed debottlenecking modifications (Source: Table 5-1 of Tiwest's S46 Public Review Document)

Section (in text)	Description	Environmental Implications			
		Solids	Liquids	Gases	Noise
3.3.1	Coal Preparation	No effect	No effect	No effect	Some increase
3.3.2	Waste Gas Fan	No effect	No effect	No effect	Reduced emissions
3.3.3	Scrubbing Liquor Clarifier	Potentially reduced emissions	Potentially reduced emissions	Reduced emissions	No effect
3.3.4	Shell Fan Upgrade	No effect	No effect	No effect	No effect
3.3.5	Kiln/Cooler Transfer	No effect	No effect	No effect	No effect
3.3.6	Screen Capacity Increase	Potential reduction	No effect	No effect	Increased noise in immediate vicinity
3.3.7	Intermediates Bin Upgrade	Potential reduction	No effect	No effect	Potential increase
3.3.8	Reduced Ilmenite Surge Bin	No effect	No effect	No effect	No effect
3.3.9	Liquor System Upgrade	No effect	No effect	No effect	No effect
3.3.10	Additional Aerators	No effect	No effect	10% increase in vapour discharge	Increase in noise generation
3.3.11	Hydrocycloning Section Upgrade	No effect - reduced emergency dumping	No effect - reduced emergency dumping	No effect	Small increase in immediate vicinity
3.3.12	Acid Leach Section Upgrade	No effect - reduced emergency dumping	No effect - reduced emergency dumping	Reduced volume of mixed gases	Reduced emissions
3.3.13	Synthetic Rutile Drier	Reduced spillage - potential reduction	No effect	No effect	Reduced emissions
3.3.14	Waste Management Plant	Reduced clean out cycle of ponds	Potential increase	Potential reduction and lower risk of exceedances	Small increase in immediate vicinity

The potential environmental impacts associated with the project, as discussed in the proponent's review document, include air quality, noise, water quality, radiation, and solid wastes. Table 3 is the proponent's summary of potential environmental impacts associated with the project and proposed management measures. With respect to noise impact, even though Table 2 anticipates that noise emissions from some components of the proposed upgrade increase while others will fall, the overall result is that the plant sound power level will be slightly decreased.

The proponent indicated that the increased production (ie. an additional 35,000 tpa of synthetic rutile above the current production rate of 165,000 tpa) is estimated to generate an additional $35 million of export income per annum.

It is anticipated that the project will be completed by staged construction during 1996 and 1997, based on lead times involved in designing, constructing and commissioning of the modifications.

3. Identification of environmental issues

3.1 Method of assessment

The purpose of the environmental impact assessment process is to determine whether a proposal is environmentally acceptable or under what conditions it could be made environmentally acceptable.

The environmental impact assessment process for this proposed amendment to environmental conditions followed the *Environmental Impact Assessment Administrative Procedures, 1993.* (refer to flow chart in Appendix 4)

Tiwest's request for changes to the current environmental conditions set on its synthetic rutile plant at Chandala (Appendix 1), to allow the plant to increase production from 130,000 to 200,000 tpa, was referred to the EPA in April 1995 by the Minister for the Environmental under Section 46 of the *Environmental Protection Act 1986.*

The Minister has also requested under Section 48(4) of the *Environmental Protection Act 1986.* that the EPA report on the proposed changes, in view of the inconsistency between the original environmental conditions and the existing licence conditions regarding the allowable production capacity limit for the plant.

The possible topics associated with the proposal were identified. These were incorporated in the Guidelines prepared by the Department of Environmental Protection (DEP) on behalf of the EPA, which were referred to relevant agencies and local community groups for comment prior to being finalised.

The topics were considered by Tiwest in its Section 46 Public Review Document (review document). The review document was checked by the DEP on behalf of the EPA to ensure that each topic had been discussed in sufficient detail by the proponent prior to release for public comment. The review document was available for comment for a period of 4 weeks between 16 October 1995 and 13 November 1995.

The submissions received were summarised by the DEP on behalf of the EPA, and Tiwest was asked to respond to the topics raised in submissions. Tiwest also received copies of the full submissions from government agencies and public (Chittering Ratepayers Association). Appendix 5 contains a summary of the topics raised in submissions and the proponent's response to those topics. A list of submitters appears as Appendix 6. The proponent's commitments appear in Appendix 7.

The proponent's review document, the submissions and the proponent's response were then subjected to analysis for environmental acceptability. All topics raised were considered by the EPA. The key environmental issues requiring evaluation by the EPA were identified from these

Table 3: Proponent's summary of potential impacts and proposed management measures (Source: Table 5-2 of Tiwest S46 Public Review Document)

Category	Topics of Concern	Present Status	Proposed Modifications	Proposed Management	Predicted Outcome
Pollution	Atmospheric Emissions	Current stack emissions are well within licence limits (see Appendix 3, Part 2).	There will be a 20% increase in volume from S1 due to the project (see Appendix 3, Part 3).	Despite the increase, emissions will still be well below licence limits, therefore, no changes are proposed to the current management or monitoring procedures.	No adverse effect.
	Noise Emissions	Current emissions are within the licence limits for total and tonal noise.	There will be no net increase in noise emissions as a result of the proposed project (see Appendix 3, Part 4).	Noise emissions will still be below licence levels. Tiwest will continue with its monitoring programme and a programme of continuous improvement in the plant to reduce noise levels.	No adverse effect.
	Waste Disposal	The current operations have not contaminated the environment as a result of waste disposal.	There will be a 20% increase in the quantity of waste material produced as a result of the project (see Table 1).	The increase in waste can be accommodated at the Cooljarloo mine, therefore, no changes are proposed to the current management and monitoring programmes.	No adverse effect.
Hydrological	Surface Water Quality	Monitoring has indicated that the current operations are not adversely impacting on the quality of surface water at Chandala.	There will be no impacts on the surface water quality on the site as a result of the project.	No changes are proposed to the monitoring or management programmes.	No adverse effect.
	Groundwater Levels	Current groundwater abstraction rates are well within the licence limit and there have been no effects on groundwater levels or biological communities relying on groundwater.	There will be a 20% increase in the volume of water required for processing (see Table 1).	The increase in water requirements will be well within the licence limits, therefore, no changes are proposed to the management or monitoring programmes.	No adverse effect.
	Groundwater Quality	Apart from one incidence of waste pond seepage, the current operations have not contaminated the groundwater.	There will be no impacts on groundwater quality as a result of this project.	No changes are proposed to the current management and monitoring programme.	No adverse effect.
Social	Visual Impact	The current tree planting programme has reduced the visual impact of the plant on surrounding properties and the Brand Highway.	There will be no visual impacts associated with the project.	No changes are proposed to the current management programme.	No adverse effect.

topics. For each environmental issue, an objective was defined and an evaluation framework established for the EPA's consideration of the issue.

The expected impact of the proposal, with due consideration to the proponent's commitments to environmental management, was then evaluated against the environmental objective. The EPA then determined the acceptability of the impact.

In conducting this assessment, the EPA has also taken the opportunity to update the Minister's 1989 statement of approval.

Limitation

This evaluation has been undertaken using information currently available. The information has been provided by the proponent through preparation of the review document, by DEP officers utilising their own expertise and reference material, by utilising expertise and information from other State government agencies, information provided by members of the public, and by contributions from EPA members.

The EPA recognises that further studies and research may affect the conclusions. Accordingly, the EPA considers that if the proposal has not been substantially commenced within five years of the date of this report, then such approval should lapse. After that time, further consideration of the proposal should occur only following a new referral to the EPA.

3.2 Public and agency submissions

Comments on the proposal were sought from the public, community groups, as well as local and State government agencies. During the public review period, five (5) submissions were received.

Submissions were within the following categories:

- one (1) from the Chittering Ratepayers Association; and
- four (4) from State government agencies (excluding the DEP).

The topics of concern raised in the submissions included:

Pollution impacts

- noise emissions from the plant operations;
- maintenance of separation distances between the plant and the nearest residences;
- air emissions (gases, particulates and odours);
- liquid waste disposal;
- solid waste disposal; and
- radiological impacts.

Other concerns

- inconsistency between the original environmental conditions and the existing licence conditions, regarding the plant allowable production capacity limit; and
- community consultation.

A synopsis of the submissions is provided below.

3.2.1 Synopsis of public submissions

The only submission received from the public was from the Chittering Ratepayers Association Inc. This submission was primarily concerned with the potential pollution impacts of noise and air emissions, and solid and liquid waste disposal associated with the current operations of the

synthetic rutile plant. The Association indicated that while it would like to oppose the proposal on the same grounds on which it opposed the original proposal, ie. the site is a flood plain and low lying wetland area with high water table, and hence the wrong place to put the plant, it considers the proposal as "an excellent opportunity for Tiwest to significantly improve its environmental performance" in order to minimise these impacts.

The four submissions from State government agencies, namely the Water Authority, Department of Minerals and Energy, Department of Resources Development, Health Department, indicated no major problem with the proposal (Appendix 5, Part 1).

3.3 Review of topics

There were no additional topics generated from other information sources during the assessment process. Hence the topics raised in submissions (Section 3.2) are considered as the topics identified for this proposal.

These topics are reviewed in conjunction with the characteristics of the proposal and the comments received, in order to identify the environmental issues requiring evaluation by the EPA.

The identification of issues is provided below and summarised in Table 4.

3.3.1 Noise emissions

The plant operations have been a subject of on-going noise complaints. The issue requires evaluation by the EPA.

3.3.2 Maintenance of separation distances

The submission from the Chittering Ratepayers Association strongly opposes any claim by Tiwest for an exclusion zone outside the site boundaries. The Association did not see this as an acceptable mechanism to control noise impacts. Furthermore, there may be a concern that Tiwest may sub-divide its land for other industrial activities, thus creating an industrial site at Chandala (previous submission from the Chittering Ratepayers Association to the DEP on the draft Guidelines for the proposal).

Tiwest indicated that a buffer zone around Chandala plant is not sought as a consequence of the proposal. However it will review all proposed land use planning changes adjacent to the Chandala site to ensure that any proposed residential area is not impacted by the plant's operations, and participate as an involved party in planning decisions.

The DEP commented that it would support the development of an appropriate buffer zone for industrial activities in general, and recognises that buffer zones provide one of several options for achieving environmental conditions.

The DEP further advised the EPA that Tiwest is currently able to meet air and noise licence conditions at the nearest residences and would be able to do so following the proposal. However, encroachment of residential development closer to the plant site may result in Tiwest exceeding the noise licence conditions.

The Department of Resources Development advised that any consideration of buffer zone for the plant needs to be reviewed in the context of land use planning, and should be consistent with the State Industrial Buffer Policy being developed.

In the interest of protecting both the industry and the community, the EPA supports appropriate development and maintenance of buffer zones (that is, separation of incompatible land uses). However the EPA considers that this is a long term land use planning matter which should be addressed by the Department of Resources Development, Tiwest, the Shire of Chittering and the Western Australian Planning Commission in the context of the State policy when it has been developed. Hence this matter is not addressed further in the report.

Table 4: Identification of issues requiring Environmental Protection Authority evaluation.

TOPICS	PROPOSAL CHARACTERISTICS	GOVERNMENT AGENCIES' COMMENTS	PUBLIC COMMENTS	IDENTIFICATION OF ISSUES
Pollution impacts				
Noise impact on residents.	No net increase in noise emissions. Compliance with existing licence conditions at the nearest residents.	Licence conditions set higher noise levels than noise regulations (stipulated in environmental conditions).	Licence conditions set higher noise levels than the original environmental conditions.	Inconsistency between existing licence conditions and noise regulations requires EPA evaluation.
Maintenance of separation distances between the plant and residents.	No buffer zone is established or sought.	Noise licence conditions would be exceeded if residential development encroached closer to the plant site. Buffer zone should be consistent with the State Industrial Buffer Policy.	Strong opposition to buffer zone.	Long term land use planning matter to be considered in the context of State policy by WA Planning Commission. Requires no further evaluation by EPA.
Impacts of air emissions on residents and vegetation.	Some increase in SO2 and particulate emissions, but all emissions will be within existing licence conditions.	Current and proposed air emissions comply with existing licence conditions	Concern about odours and visible plumes detected at more than 10 km from the plant site, under current operations.	Appropriately managed by the DEP works approval and licensing process, and proponent's action on fugitive dust control measures. Requires no further evaluation by EPA.
Impacts of liquid waste disposal on water resources.	Impacts are the same as under current plant operations.	Current and proposed disposal, surface/ground water monitoring programme, and management of the waste pond leakage are acceptable.	Concern about the waste pond leakage and its management.	Effectively managed by DEP and Water Authority. Requires no further evaluation by EPA.
Impacts of solid waste disposal on water resources.	Impacts are the same as under current plant operations.	Current and proposed disposal and ground water monitoring programme at Cooljarloo mine site are acceptable.	Concern about waste spillage during transport to the mine site for disposal.	Appropriately managed by DEP and Dept of Minerals and Energy. Requires no further evaluation by EPA.
Radiological impacts.	Impacts are the same as under current plant operations.	Current and proposed radiation management are acceptable.	Radiological impacts should be reduced.	Appropriately managed by Dept of Minerals and Energy and Radiological Council. Requires no further evaluation by EPA.
Other concerns				
Inconsistency in allowable production rate limit.	Currently operating at 165,000 tpa. Proposing to increase from 130,000 to 200,000 tpa.	The inconsistency between licence conditions and environmental conditions needs to be addressed.		Appropriately addressed through EPA's assessment of the proposal.
Community consultation.	The same as currently implemented.		Concern about effectiveness and impartiality of the MAC Commitee	EPA has referred this matter to MAC Committee.

3.3.3 Air emissions (gases, particulates and odours)

The submission from the Chittering Ratepayers Association was primarily concerned with odours and particularly visible plumes from the emergency stack and the main stack currently, which could be detected at long distances (more than 10 km) from the plant site under both normal and abnormal operations . The submission claimed that the frequency of the emergency stack cap lifts and the number of the reported cap lift incidents are understated by the proponent.

The submission was also concerned with the damaging effects to foliage within and outside Tiwest's boundaries, from heavy black dust deposits on flora.

The proponent indicated that the plant air emissions are currently within the existing licence conditions, and that these emissions would still be within the licence conditions, following implementation of the proposed upgrade. Tiwest indicated that it undertakes a stack monitoring programme in accordance with licence requirements. It is legally obliged to notify the DEP of emergency stack operations.

Tiwest indicated that the handling of coal char fines as a waste product from the kiln at times causes fugitive dust emissions which settled out on vegetation in close proximity to the plant. There has been no evidence of damage to any vegetation. However, arrangements are now in place to reduce these fugitive emissions (Appendix 5).

The DEP advised that it does not envisage any problem with the plant in terms of compliance with licence conditions for air emissions currently or following implementation of the proposal. However, it intends to review the plant's licence conditions to incorporate current standards and practice, irrespective of the proposal.

The EPA considered that the concerns raised can be addressed by the DEP under the provision of Part V of the *Environmental Protection Act 1986* , which deals with control of pollution. Hence these concerns are not addressed further in this report.

3.3.4 Liquid waste disposal

The submission from the Chittering Ratepayers Association raised concern about the waste pond leakage incident which was discovered by Tiwest in 1994 through its ground water monitoring system at the plant site. The submission was also concern about the management of the leakage after the discovery.

The review document indicated that contamination of ground water from seepage from two of the four waste ponds on site (Ponds 1 and 2) was detected, and the seepage was found to be caused by a failure in the pond liner.

Tiwest is currently carrying out the recovery process to clean up the contamination. It is also investigating measures to improve the performance of all the waste ponds (to minimise structural and operational failures), as well as the ground water monitoring/detection systems (to enable early leak detection). Additional ground water monitoring/detection bores and piezometers have been installed near the waste ponds following the 1994 leak detection.

Although the Water Authority commented that "if the underpond drainage had been designed and/or worked correctly, the leak may have been discovered earlier, with less contamination occurring", both the DEP and Water Authority advised that the pond seepage has been satisfactorily managed by the proponent. Both departments will continue to monitor the recovery process through periodic reports from Tiwest, and evaluate the pond/leak detection improvement measures to be proposed by Tiwest.

The DEP further advised that under the works approval/licence systems, all new waste ponds installed by Tiwest for the plant should meet best practice requirements such as certification of design and construction work, low impact disposal and cleaning systems, and proven leak detection and recovery systems.

Since the topic of pond leakage is being adequately dealt with by the DEP under the provision of Part V of the *Environmental Protection Act 1986* in consultation with Water Authority, it is not considered further in this report.

With respect to impact on surface and ground water in general, the proposal indicated that monitoring programme for surface and ground water quality at the Chandala site has been conducted to the requirements of the Water Authority. The EPA considers that the impact from the proposal would be the same as the current operations, hence it does not require further evaluation by the EPA.

3.3.5 Solid waste disposal

The submission from the Chittering Ratepayers Association expressed concern about spillage incidents associated with transportation of solid waste for disposal off-site, and the effects of these spillages on grazing pasture for livestock and subsequently on meat used for human consumption.

The proposal indicated that all process solid wastes (dry solids as well as solids removed from waste slurry streams by high pressure filtration) are currently transported off-site for disposal at the Cooljarloo mine site, as required by the licence conditions. The road trains are specifically designed and have roll tarpaulins to prevent dust or spillage during transport. Each truck has a computer log to ensure safe driving procedures.

The proposal also indicated that there had been some instances of waste spillage, and procedures had been introduced to reduce any recurrence. A clean-up procedure has also been implemented by Brambles (the transport contractor) to cater for road spillage, including the need to transfer loads between vehicles in the event of breakdown. Tiwest indicated that uptake of metal compounds from the waste by pasture grasses following road spillage of waste enroute to Cooljarloo, would be negligible.

Waste spillage during transport should be appropriately managed by the Department of Minerals and Energy under the Dangerous Goods Regulations 1992 and/or by the DEP under the provision of Part V of the *Environmental Protection Act 1986* .

With respect to impact on ground water from solid waste disposal, the monitoring programme for potential leachates from the solid waste buried at Cooljarloo mine site to date indicates no contamination of ground water. The EPA considers that the impact from the proposal would be the same as from the current operations. The topic does not require further evaluation by the EPA.

3.3.6 Radiological impacts

The submission from the Chittering Ratepayers Association identified radiation as a concern. The Association believed that, as a result of the proposal, the proponent should be required to reduce radiological impacts.

The proposal indicated that the plant is currently operated in accordance with a Radiation Management Plan approved by the Department of Minerals and Energy. Tiwest has made a commitment to complete a review of the Plan within three months of environmental approval. The results obtained from the environmental monitoring programme to date (in air, and potable/surface/ground water) are well within allowable limits.

The Department of Minerals and Energy advised that there would be minimal radiological impacts on the workforce and on the environment from the proposal. The Radiological Council did not indicate any significant problem with the current operations or the proposal.

The EPA considers that the radiation aspect should continue to be managed to the satisfaction of the Department of Minerals and Energy and the Radiological Council, and no further evaluation by the EPA is necessary.

3.3.7 Inconsistency in the plant production rate limit

Environmental Condition 1 (Appendix 1) requires Tiwest to implement the original proposal as described in the 1988 Public Environmental Report (TiO2 Corporation & Kerr-McGee Chemical Corporation Joint Venture, 1988), which specified a production rate of 130,000 tpa of synthetic rutile. The current licence conditions issued by the DEP allows the plant to operate at 165,000 tpa. As mentioned earlier in this report, the inconsistency between the existing environmental conditions and the licence conditions regarding the allowable production rate needs to be addressed. The Minister has been notified by Tiwest of this matter, and has directed the EPA to consider it in the assessment of the proposal in accordance with Section 48(4) of the *Environmental Protection Act 1986* .

The DEP advised that the inconsistency resulted from the environmental conditions not explicitly specifying the annual production capacity limit. Based on the DEP's review of the plant's environmental performance to date, all the plant's emissions have been well within the licence conditions. Nevertheless, procedures have now been put in place by the DEP to ensure consistency between environmental conditions and licence conditions.

The EPA considers that this matter does not need further evaluation by the EPA as the assessment of this proposal addresses the inconsistency regarding the allowable production capacity, through changes to environmental conditions.

3.3.8 Community consultation

The submission from the Chittering Ratepayers Association expressed concern about the Muchea Area Consultative (MAC) Committee, in regard to its impartiality and effectiveness as a communication vehicle to the local population.

The proposal indicated that the MAC Committee was formed in 1988 following a request from the community for a forum where concerns could be addressed and information could be exchanged. Membership from the Committee comprises Chittering Shire Councillors, representatives from the Bindoon, Chittering and Muchea Progress Association, and two representatives from Tiwest. Minutes of the meetings are sent to Chittering Shire Council, Department of Resources Development and the DEP.

The concern can be appropriately addressed by the MAC Committee, the proponent and the Shire of Chittering, and the EPA has referred this matter to the MAC Committee.

4. Evaluation of environmental issues

The EPA has considered the topics raised during the environmental impact assessment process, including matters identified in public submissions. The EPA believes the only environmental issue requiring evaluation is noise impacts.

The EPA has evaluated this issue, based on existing information, submissions and advice from the DEP.

As indicated in Section 3.3, other topics of concern raised during the environmental impact assessment process can either be appropriately dealt with under the provisions of Part V of the *Environmental Protection Act 1986*, which deals with control of pollution, or by other agencies.

The EPA's evaluation of the noise impacts is discussed below.

4.1 Noise impacts

4.1.1 Objective

The EPA's objective is to ensure that noise impacts from the plant on the nearest residences comply with licence conditions.

4.1.2 Policy

Noise levels for projects within Western Australia are subject to the Noise Abatement (Neighbourhood Annoyance) Regulations 1979 (existing noise regulations), which are currently the prescribed standard for noise under the *Environmental Protection Act 1986*. These regulations specify the Assigned Outdoor Neighbourhood Noise Levels for various types of noise-receiving premises for different times of the day. In the case of predominantly residences, such as Muchea, the Assigned Noise Levels are 30-35 dB(A) at night (10.00 pm - 7.00 am); 35-40 dB(A) during the evening (7.00 pm - 10.00 pm) and on weekends/public holidays (7.00 am - 7.00 pm); and 40-45 dB(A) during weekdays (7.00 am - 7.00 pm).

When the plant was originally assessed in 1988, the proponent made a commitment to comply with the noise regulations. Environmental Condition 7 (Appendix 1) stipulates this commitment as a legal requirement. The plant, however, has had difficulties in complying with the noise regulations at the nearest residences since its commissioning in 1990.

In 1992, the DEP considered that the noise levels set in the noise regulations could not be realistically achieved by the plant. Consequently, the DEP set appropriate noise levels in the licence conditions for the plant. These levels are 40 dB(A) at night (10.00 pm - 7.00 am); 45 dB(A) during the evening (7.00 pm - 10.00 pm) and on weekends/public holidays (7.00 am - 7.00 pm); and 50 dB(A) during weekdays (7.00 am - 7.00 pm), when measured at premises used for residential or other noise sensitive purposes. These noise levels were proposed in the new noise regulations at the time, and the timing and the noise levels established as new noise regulations were thought to be imminent. However it has taken longer than anticipated to get the new noise regulations in place, leading to an inconsistency between licence conditions and the existing regulations.

For this proposal, the EPA considers that the plant should continue to meet the current licence conditions for noise.

4.1.3 Technical information

A review of Tiwest's environmental performance by the DEP (ie. results of a series of noise monitoring and noise reduction programmes undertaken at the plant over the last four years, some of these in conjunction with the DEP) indicated that the Chandala operations are in accordance with the total and tonal noise emissions specified in the licence conditions, when measured at the two nearest residences to the south-east of the plant (Fig 1).

Tiwest has proposed to replace noise emitting equipment with less noisy equipment. A comparison of sound power levels for the existing plant and as the result of the proposal is shown in Table 5-4 A and B of Appendix 3. An estimated reduction of 0.4 dB(A) in the overall noise emission from the plant is achieved as a result of the proposal. A review of the noise emissions from the proposal has been undertaken by a consultant (SVT) for Tiwest, and is summarised in Appendix 3.

With respect to the noise impacts, the proposal indicated that the noise levels are predicted to be always less than 40 dB(A) at the nearest residences to the south-east of the plant, for all meteorological conditions. There are areas on the east, west and north side of Tiwest boundaries (currently non residential) where noise levels are predicted to exceed 40 dB(A) on some occasions.

4.1.4 Comments from key government agency(ies) and public

The DEP advised that the noise predictions for the proposal are acceptable, and that the proposal is expected to make a slight, generally unnoticeable, reduction in the level of noise emissions from the plant. However Tiwest should be required to make a commitment to ensure that all measures stated and assumptions made in the SVT's review of noise emissions, as outlined in Appendix E of the review document (Appendix 3), are implemented at the appropriate stage.

The DEP also advised that the inconsistency in the noise levels for the plant between the licence conditions and the noise regulations should be addressed in the assessment for this proposal.

The submission from the Chittering Ratepayers Association (Appendix 5) expressed concern about the plant being allowed, under the licence conditions, to operate at higher noise levels than the levels originally set in the environmental conditions, which are the noise levels specified in the noise regulations. Reference was also made to previous non-compliance and the unsuccessful attempts to date by Tiwest to comply with the noise levels set in the original conditions.

4.1.5 Response from proponent

In response the proponent indicated that (Appendix 5) investigations undertaken by Tiwest show that the proposal will not result in increased noise emission levels from the Chandala site. Tiwest has also committed to a post commissioning survey.

The proponent stressed that noise emissions from the Chandala site have been progressively reduced since the plant commissioning. This process of continuous improvement and associated noise surveys will also continue.

Commitments made by the proponent

Commitments made by Tiwest regarding management of noise (Appendix 7) are summarised as follows:

1. Tiwest will continue with its noise monitoring programme and a programme of continuous improvement to reduce plant noise levels.
2. Tiwest will conduct a survey of noise emissions from the Chandala site following the debottlenecking project, and will ensure that noise emission levels from the site do not increase as a result of the project.
3. Tiwest will ensure that all the measures stated and assumptions made in Appendix E of the S46 Public Review Document are appropriately implemented.

4.1.6 EPA evaluation

The EPA has reviewed the information contained within the proponent's review document and the advice from the DEP, which indicate that the noise emissions from the plant will meet existing licence conditions for noise and will not increase as a result of the proposal. The EPA notes the proponent's commitments to a programme of continuous improvement to reduce the plant noise levels, and a post commissioning survey to ensure that the noise levels do not increase.

The EPA considers that predicted noise impacts from the plant as a result of the proposal are acceptable.

Accordingly the EPA recommends that:

(a) the proponent be exempt under Section 6 of the *Environmental Protection Act 1986* from the Noise Abatement (Neighbourhood Annoyance) Regulations 1979 for the synthetic rutile plant operations at Chandala; and

(b) the following condition be set by the Minister for the Environment in the Statement of Conditions:

The maximum noise levels allowed be:

(i) 50 dB(A) Slow between 0700 hours and 1900 hours Monday to Saturday;

(ii) 45 dB(A) Slow between 1900 hours and 2200 hours Monday to Saturday;

(iii) 45 dB(A) Slow between 0700 hours and 2200 hours Sundays and Public Holidays; and

(iv) 40 dB(A) Slow between 2200 hours and 0700 hours always;

when measured:

- at any point on or adjacent to other premises not occupied by the proponent and used for residential or other noise sensitive purposes; and
- at a height between 1.2 metres and 1.5 metres above ground level and greater than 3.5 metres from any reflecting surface other than the ground;

and subject to a noise characteristic assessment.

5. Conclusions and recommendations

The EPA concludes that Tiwest's proposal to amend its environmental conditions to allow the synthetic rutile plant at Chandala to increase its production rate from 130,000 to 200,000 tpa, is environmentally acceptable, subject to the proponent's commitments and the recommendations contained in this report. In recommending to the Minister for the Environment that the proposal is acceptable on environmental grounds, the EPA also advises that government approval for expansion of the plant to 200,000 tpa would resolve the inconsistency between Tiwest's existing approval for 130,000 tpa and its predicted exceedance this year.

In reaching this conclusion, the EPA considered all the topics of concern, including noise emissions, maintenance of separation distances between the plant and the nearest residences, surface and ground water protection from disposal of liquid and solid wastes, air emissions (gases, particulates, odours) and radiological impacts. The EPA believes that these can be appropriately managed by the DEP and/or by other government agencies, with the exception of noise.

For noise, the EPA recommends that the proponent be exempt from existing noise regulations, and specific noise conditions be set in the Ministerial Statement for the plant to the same levels currently contained in the plant's licence conditions. A summary of the EPA's recommendations are set out in Table 5.

Recommendation 1

The Environmental Protection Authority concludes that the proposal by Tiwest Joint Venture to amend the environmental conditions of the synthetic rutile plant at Chandala, to allow its production rate to increase from 130,000 to 200,000 tpa, is environmentally acceptable.

Accordingly, the Environmental Protection Authority recommends that the proposal could proceed subject to the proponent's commitments to environmental management and the following recommendation.

Table 5: Summary of Environmental Protection Authority recommendations.

ISSUE	OBJECTIVE	EVALUATION FRAMEWORK	PROPONENT'S COMMITMENTS	EPA RECOMMENDATIONS
Pollution issue				
Impacts of noise upon residents.	Compliance with acceptable noise levels.	Current licence conditions for noise.	Proponent will: - continue with its noise monitoring programme and a programme of continuous improvement to reduce plant noise levels; - conduct a survey of noise emissions from the Chandala site within 3 months after comissioning of the upgraded plant, and ensure that noise emission levels have not increased; and - ensure that Appendix E of the S46 Public Review Document are appropriately implemented.	- proponent should be exempt under Section 6 of the EP Act from the existing noise regulations; and - proponent is required to conform with special noise levels which are the same as those in existing noise conditions in the licence for the plant.

Recommendation 2

The Environmental Protection Authority recommends that:

(a) the proponent be exempt under Section 6 of the *Environmental Protection Act 1986* from the Noise Abatement (Neighbourhood Annoyance) Regulations 1979 for the synthetic rutile plant operations at Chandala; and

(b) the following condition be set by the Minister for the Environment in the Statement of Conditions:

the maximum noise levels allowed be :

(i) 50 dB(A) Slow between 0700 hours and 1900 hours Monday to Saturday;

(ii) 45 dB(A) Slow between 1900 hours and 2200 hours Monday to Saturday;

(iii) 45 dB(A) Slow between 0700 hours and 2200 hours Sundays and Public Holidays; and

(iv) 40 dB(A) Slow between 2200 hours and 0700 hours always;

when measured:

- **at any point on or adjacent to other premises not occupied by the proponent and used for residential or other noise sensitive purposes; and**
- **at a height between 1.2 metres and 1.5 metres above ground level and greater than 3.5 metres from any reflecting surface other than the ground;**

and subject to a noise characteristic assessment.

6. Recommended environmental conditions

Based on the assessment of this proposal and recommendations in this report, the Environmental Protection Authority considers that the following recommended environmental conditions are appropriate.

STATEMENT TO AMEND CONDITIONS APPLYING TO A PROPOSAL (PURSUANT TO THE PROVISIONS OF SECTION 46 OF THE ENVIRONMENTAL PROTECTION ACT 1986)

PROPOSAL:	SYNTHETIC RUTILE PLANT, MUCHEA (169 / 967)
CURRENT PROPONENT:	TIWEST JOINT VENTURE
CONDITIONS SET ON:	27 FEBRUARY 1989

The implementation of this proposal is now subject to the following conditions which replace all previous conditions:

NB Numbers in square brackets are the original condition numbers in the statement of 27 February 1989. The majority of these conditions have been complied with.

1 Proponent Commitments

The proponent has made a number of environmental management commitments in order to protect the environment.

1-1 [1] In implementing the proposal, including the increase in production documented in October 1995, the proponent shall fulfil the relevant environmental management commitments made in connection with modifications described in the document "Synthetic Rutile Plant at Chandala, Production Debottlenecking to 200 000 tonnes per annum" (October 1995) and reported on in Environmental Protection Authority Bulletin 799, in the Public Environmental Report (1988), and in subsequent documents and listed in Environmental Protection Authority Bulletin 369 as Appendix 3, and in response to issues raised following public submissions; provided that the commitments are not inconsistent with the conditions or procedures contained in this statement.

A schedule of those environmental management commitments (December 1995) which will be audited by the Department of Environmental Protection was published in Environmental Protection Authority Bulletin 799 (Appendix 7) and a copy is attached.

2 Implementation

Changes to the proposal which are not substantial may be carried out with the approval of the Minister for the Environment.

2-1 Subject to these conditions, the manner of detailed implementation of the proposal, including the increase in production rate/capacity to 200 000 tonnes per annum, shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal.

2-2 Where, in the course of the detailed implementation referred to in condition 2-1, the proponent seeks to change the designs, specifications, plans or other technical material submitted to the Environmental Protection Authority in any way that the Minister for the Environment determines, on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

3 Proponent

These conditions legally apply to the nominated proponent.

3-1 [14] No transfer of ownership, control or management of the project which would give rise to a need for the replacement of the proponent shall take place until the Minister for the Environment has advised the proponent that approval has been given for the nomination of a replacement proponent. Any request for the exercise of that power of the Minister shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the project in accordance with the conditions and procedures set out in the statement.

4 Groundwater Extraction

4-1 [2] Prior to the commencement of groundwater extraction, the proponent shall include in the monitoring and management programme (required by condition 13-1) specific proposals for the protection of the groundwater resource and provision for the protection of wetlands and native vegetation in the area, to the requirements of the Department of Environmental Protection on advice of the Water Authority of Western Australia.

5 Dieback Fungus

5-1 [3] The proponent shall prevent the introduction of the dieback fungus *Phytophthora cinnamomi* into the borefield area or along the pipeline and access route.

5-2 [3a] To achieve the objective of condition 5-1, prior to construction of the borefield, the proponent shall prepare a dieback management programme to the requirements of the

Department of Environmental Protection on advice of the Department of Conservation and Land Management.

5-3 [3b] Prior to construction of the borefield, the proponent shall implement the dieback management programme required by condition 5-2 to the requirements of the Department of Environmental Protection on advice of the Department of Conservation and Land Management.

6 Drainage and Wastewater Disposal

6-1 [4] The proponent shall prepare in stages the following plans:

1 A detailed drainage plan for the site; and

2 Design plans for the construction of the wastewater disposal system,

to the requirements of the Department of Environmental Protection on advice of the Swan River Trust and the Water Authority of Western Australia.

6-2 [4a] The proponent shall implement the plans required by condition 6-1 to the requirements of the Department of Environmental Protection on advice of the Swan River Trust and the Water Authority of Western Australia.

7 Landscaping

7-1 [5] Prior to construction, the proponent shall prepare a detailed landscaping and planting programme designed to :

1 Screen the plant from neighbouring properties and roads;

2 Lower the water table on the site; and

3 Improve the fringing river vegetation.

7-2 [5a] The proponent shall implement the landscaping and planting programme required by condition 7-1.

8 Dust

8-1 [6] The proponent shall minimise the wind-blown dust nuisance from the plant and prevent spillage of residue onto roads during transport of residue back to the mine site.

8-2 [6a] Prior to commissioning, the proponent shall prepare a plan to achieve the objectives of condition 8-1.

8-3 [6b] Prior to commissioning, the proponent shall implement the plan required by condition 8-2.

9 Noise

9-1 [7] The proponent shall minimise noise impacts during construction and operation of the plant.

9-2 Subject to conditions 9-3 and 9-4, the premises shall be managed and operated such that the noise emissions from the premises do not cause or contribute to noise levels in excess of:

(i) 50 dB(A) Slow between 0700 hours and 1900 hours Monday to Saturday;

(ii) 45 dB(A) Slow between 1900 hours and 2200 hours Monday to Saturday;

(iii) 45 dB(A) Slow between 0700 hours and 2200 hours Sundays and Public Holidays; and

(iv) 40 dB(A) Slow between 2200 hours and 0700 hours always;

when measured:

(i) at any point on or adjacent to other premises not occupied by the licensee and used for residential or other noise sensitive purposes; and

(ii) at a height between 1.2 metres and 1.5 metres above ground level and greater than 3.5 metres from any reflecting surface other than the ground.

9-3 Where the combined level of the noise emissions from the premises and the normal ambient noise exceeds the levels specified in part (a) of this condition, this condition shall be considered to be contravened only when the following criteria are also met at the measurement point:

(i) the noise emissions from the premises are audible to an Inspector (appointed under Section 88 of the *Environmental Protection Act 1986*); and

(ii) the noise emissions from the premises are identifiable by an Inspector (appointed under Section 88 of the *Environmental Protection Act 1986*) as emanating from the premises.

9-4 Noise emissions shall not cause unacceptable annoyance due to tonal or impulsive components. Those characteristics shall be assessed by an Inspector (appointed under Section 88 of the *Environmental Protection Act 1986*).

9-5 The proponent shall conduct noise surveys (including baseline measurements) and assessments (including the impact of tonal noise) in consultation with the Department of Environmental Protection.

9-6 The proponent shall manage traffic noise to protect the amenity of residences by ensuring that heavy construction traffic related to deliveries and commercial vehicle movements are limited to between 0700 hours and 1800 hours on Monday to Friday inclusive.

9-7 Within three months of the (re-)commissioning of the plant following the increase in production rate/capacity to 200,000 tonnes per annum, the proponent shall provide a report to the Minister for the Environment detailing measurements and assessments made to confirm that compliance with conditions 9-2, 9-3 and 9-4 is being achieved, and that the noise levels do not increase above the pre- (re-) commissioning levels.

9-8 The proponent shall subsequently conduct operations in a manner consistent with the report required by condition 9-7.

10 Chandala Brook Crossing

10-1 [8] The proponent shall design the bridges crossing the Chandala Brook to minimise disruption to the banks of the Brook, to the requirements of the Department of Environmental Protection on advice of the Swan River Trust.

11 Brand Highway Entry

11-1 [9] In addition to any Main Roads of Western Australia requirements, the proponent shall design the entry to the Brand Highway so as to facilitate the containment and recovery of any spill which may occur.

12 Spill Contingency Plans

12-1 [10] Prior to commissioning, the proponent shall prepare contingency plans for spills occurring within and outside the plant boundary, to the requirements of the Department of Environmental Protection on advice of the Department of Minerals and Energy.

13 Environmental Management Programme

13-1 [11] The proponent shall prepare in stages an environmental management programme which addresses all aspects of environmental monitoring and management associated with the plant. The programme shall include monitoring for noise and air emissions (particulates including fugitive dust emissions, gases and odours), surface and ground water monitoring, and detailed management procedures for disposal of liquid (waste ponds) and solid wastes. This programme shall include submission of annual and comprehensive triennial reports to the Department of Environmental Protection.

13-2 [11a] The proponent shall implement the environmental management programme required by condition 13-1.

14 Time Limit on Approval

The environmental approval for the proposal is limited.

14-1 If the proponent has not substantially commenced the modified project within five years of the date of this statement, then the approval to implement the modified proposal shall lapse and be void. The Minister for the Environment shall determine any question as to whether the modified project has been substantially commenced.

Any application to extend the period of five years referred to in this condition shall be made before the expiration of that period to the Minister for the Environment.

Where the proponent demonstrates to the requirements of the Minister for the Environment on advice of the Department of Environmental Protection that the environmental parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding five years.

15 Decommissioning

15-1 [12]The proponent shall achieve the satisfactory decommissioning of the project, removal of the plant and installations and rehabilitation of the site and its environs.

15-2 [13]At least six months prior to decommissioning, the proponent shall prepare a (final) decommissioning and rehabilitation plan to achieve the objectives of condition 15-1.

15-3 [13a]The proponent shall implement the plan required by condition 15-2.

16 Compliance Auditing

To help determine environmental performance, periodic reports on progress in implementation of the proposal are required.

16-1 The proponent shall submit periodic Progress and Compliance Reports, in accordance with an audit programme prepared by the Department of Environmental Protection in consultation with the proponent.

Procedure

1 Unless otherwise specified, the Department of Environmental Protection is responsible for assessing compliance with the conditions contained in this statement and for issuing formal clearance of conditions.

2 Where compliance with any condition is in dispute, the matter will be determined by the Minister for the Environment.

Note

The proponent is required to apply for a Works Approval and Licence for this project under the provisions of Part V of the Environmental Protection Act.

7. References

Environmental Protection Authority, 1988. *Synthetic Rutile Plant, Muchea - Report and Recommendations of the Environmental Protection Authority. Bulletin No. 369.* Perth. Environmental Protection Authority.

TiO2 Corporation & Kerr-McGee Chemical Corporation Joint Venture, 1988. *Public Environmental Report - Synthetic Rutile Plant at Chandala.* Prepared by Maunsell & Partners Pty Ltd.

Appendix 1

Minister's Statement of Conditions of Approval (February 1989)

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MINISTER FOR ENVIRONMENT

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

SYNTHETIC RUTILE PLANT, MUCHEA

Cooljarloo Joint Venture

This proposal may be implemented subject to the following conditions:

1. The proponent shall adhere to the proposal as assessed by the Environmental Protection Authority and shall fulfil the commitments made in the Public Environmental Report and subsequent documents and listed in Appendix 3 of EPA Bulletin 369 (copy of Appendix 3 attached).

2. Prior to the commencement of groundwater extraction, the proponent shall include in the monitoring and management programme (required in condition 11) specific proposals for the protection of the groundwater resource and provision for the protection of wetlands and native vegetation in the area, to the satisfaction of the Environmental Protection Authority on advice from the Water Authority of Western Australia.

3. Prior to construction of the borefield, the proponent shall prepare and operate a management programme to prevent the introduction of the dieback fungus Phytophthora cinnamomi into the borefield area or along the pipeline and access route, to the satisfaction of the Environmental Protection Authority, on advice from the Department of Conservation and Land Management.

4. The proponent shall prepare in stages and subsequently implement, to the satisfaction of the Environmental Protection Authority (on advice from the Swan River Trust and the Water Authority of Western Australia):

   (1) A detailed drainage plan for the site; and

   (2) Design plans for the construction of the waste water disposal system.

5. Prior to construction, the proponent shall prepare and subsequently implement a detailed landscaping and planting programme designed to:

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7th Floor, May Holman Centre. Phone (09) 325 4133

(1) Screen the plant from neighbouring properties and roads;

(2) Lower the water table on the site; and

(3) Improve the fringing river vegetation.

This programme shall be to the satisfaction of the Environmental Protection Authority.

6. Prior to commissioning, the proponent shall prepare and implement a plan to minimise the wind-blown dust nuisance from the plant and prevent spillage of residue onto roads during transport of residue back to the mine site. This plan shall be to the satisfaction of the Environmental Protection Authority.

7. The proponent shall minimise noise impacts during construction and operation of the plant, to the satisfaction of the Environmental Protection Authority.

8. The proponent shall design the bridges crossing the Chandala Brook to minimise disruption to the banks of the Brook, on the advice of the Swan River Trust, to the satisfaction of the Environmental Protection Authority.

9. In addition to any Main Roads Department requirements, the proponent shall design the entry to the Brand Highway so as to facilitate the containment and recovery of any spill which may occur, to the satisfaction of the Environmental Protection Authority.

10. Prior to commissioning, the proponent shall prepare contingency plans for spills occurring within and outside the plant boundary, to the satisfaction of the Mines Department and the Environmental Protection Authority.

11. The proponent shall prepare in stages and subsequently implement an environmental management programme relating to all aspects of environmental monitoring and management, to the satisfaction of the Environmental Protection Authority. This programme shall include submission of annual and comprehensive triennial reports to the Environmental Protection Authority.

12. The proponent shall be responsible for decommissioning the plant and rehabilitating the site and its environs to the satisfaction of the Environmental Protection Authority.

13. The proponent shall, at least six months prior to decommissioning, prepare a decommissioning and rehabilitation plan to the satisfaction of the Environmental Protection Authority.

14. No transfer of ownership, control or management of the project which would give rise to a need for the replacement of the proponent shall take place until the Minister has advised the proponent that approval has been given for the nomination of a replacement proponent. Any request for the exercise of that power of the Minister shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the project in accordance with the conditions and procedures set out in the statement.

David Smith, MLA
MINISTER FOR ENVIRONMENT

27 FEB 1989

PROPOSED SYNTHETIC RUTILE PLANT

MUCHEA

Major commitments made by the Proponent in the PER (July, 1988), Revised Commitments (December, 1988) and in the Hydraulic and Hydrological Aspects of the Site and Operation at the Synthetic Rutile Plant, Muchea (November, 1988)

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6.1	General	14

1.0 INTRODUCTION

The commitments made by the Cooljarloo Joint Venture in the Public Environmental Report (PER) for the proposed synthetic rutile plant are detailed below. Additional commitments are also made as a result of findings from subsequent studies, and questions raised during the public review period.

In addition to the commitments further information is presented on atmospheric emissions.

Work has already commenced and will continue on obtaining data to provide detailed documentation about the proponent's plans for environmental management and monitoring of the site. This data will be incorporated into an Environmental Management Plan (EMP) which will be submitted to the Environmental Protection Authority (EPA) for approval prior to commissioning of the plant.

2.0 NATURAL ENVIRONMENT

2.1 Environmental Studies

The Cooljarloo Joint Venture is committed to minimising the environmental impact of the plant. To do this it is necessary to obtain baseline data for development of an effective environmental management programme. Site specific surveys of flora and vegetation, fauna, Phytophthora, Aboriginal sites and radiation, and assessments of local meteorlogical, and ground and surface water conditions by specialist consultants have been commissioned.

To date the flora and vegetation, fauna, Phytophthora, and Aboriginal site surveys have been completed.

The results of the flora and vegetation, and fauna surveys have been reported to the EPA as part of the Relocation of the Dry process Plant, Muchea Notice of Intent (NOI). No rare or endangered species were found on site.

The Phytophthora study revealed extensive infection by Phytophthora cinnamomi on the Muchea site and concluded that it is likely the entire Muchea area is affected or is vulnerable to infection (Appendix 1). The Dieback Reports recommended management strategy will be implemented by the proponent to prevent the introduction of Phytophthora cinnamomi to other sites. The proponent has already implemented site quarantine measures, installed a temporary vehicle washdown station at the entry to the site. A permanent washdown facility will be installed prior to major construction on site commencing.

The Aboriginal Site Survey has been submitted to the EPA and the Museum of Western Australia. Under the provisions of the W.A. Aboriginal Heritage Act this survey is confidential and therefore is not included here. The results of this survey are summarised and discussed in the NOI and the Section 3.1 Aboriginal Sites of this document.

The radiation, and ground and surface water studies have started and will be ongoing. At present background levels of radiation are being monitored on a monthly basis. The results from this testing will be reported to the EPA as part of the EMP. Site hydrology, and the plant water use and disposal are presently being studied in detail and the results of the study will be submitted to the EPA.

The proponent is committed to establishing a meteorological station on the site to acquire a better understanding of the atmospheric conditions in the area. Details of the monitoring station are outlined in the Section 4.5 Air Emissions.

2.2 Landscaping

A landscape architect will be employed to prepare a landscape plan for the site to ensure the plant has minimal visual and environmental impact on the surrounds. This report, involving strategic planting design, will be submitted to the EPA for approval and incorporated into the EMP.

Primary areas of focus for the programme will be the retention of existing flora and vegetation, and regeneration of the margins of Chandala Brook. Native flora will be used when additional vegetation is required and conditions are suitable.

3.0 SOCIAL ENVIRONMENT

3.1 Aboriginal Sites

An Aboriginal site survey has been conducted and submitted to the EPA. The results of the survey revealed two points of interest; the ethnographic significance of the Brook, and two archeological sites of minor significance.

In response to these findings the proponent is committed to minimising the impact of the possible area of the Brook and by minimising the area required for construction purposes.Crossing of the Brook will be limited to two bridges.The bridges crossing the Brook have been designed such that interference to the water flow or penetration of the bed of the Brook has been avoided. Details of the proposed bridge design have already been submitted to the EPA.

The identified Aboriginal sites on the property have been fenced and the areas declared out-of-bounds to all personnel.

3.2 Labour

The proponent is committed to employing local people whenever suitable applicants for positions are available and in this respect has already called for and received applications for employment from local people.

3.3 Transportation

There will be two bridge crossings of the Chandala Brook. These will be designed on advice of the Swan River Management Authority so as to have a minimal impact on the Brook and its environs. The final detailed design of the bridges has been submitted to the EPA for their approval.

To ensure maximum transport safety, all applicable rules and regulations will be implemented in the transport of plant raw materials and product.

The Cooljarloo Joint Venture is committed to pollution free transportation of the solid waste. That is, there will be no windblown iron oxide particles or spillage of iron oxide liquid slurry onto the roads during transportation.The solid waste will be safely transported to the mine site in covered side dump trucks.

Investigation into the blending of iron oxide waste solids with gypsum from the evaporation ponds and the solid waste from the pigment plant is being carried out. It is believed that through the mixing of the three waste products the iron oxide will be diluted, making for safer transport.

In the event that an environmentally responsible method of transportation of the iron oxide waste solids cannot be found, the proponent is committed to retaining the iron oxide on site in the ponds and covering the ponds with an appropriate layer of soil to prevent windblown dust on site. The proponent will continue to build new iron oxide ponds as required.

4.0 PLANT EMISSIONS

4.1 Introduction

Protection of the environment and human health is a primary consideration in all the company's activities; in planning of operations, in design and construction of the plant, and in management decisions. The proponent is committed to hiring a Manager, Environmental Health and Safety Affairs to ensure that these philosophies are maintained.The responsibilities of the Manager, Environmental Health and Safety Affairs will include the promotion of safe work practices and maintenance of safe working environments for its employees and others who may be impacted by the plant operations. Occupational health under the provisions of the Mines Regulations Act and the US Industrial Hygiene Practice will also be applied.

These objectives will be fulfilled through monitoring programmes (atmosphere, noise, groundwater, surface water, solid waste products, and radiation). The detailed design of these programmes parameters and reporting practices will be defined in the plant EMP.

The Manager, Environmental Health and Safety Affairs will be responsible for responding to the results of the monitoring programmes and will be required to see that the appropriate remedial actions are taken in the event of a process upset.The details of the remedial actions or possible process upsets will be outlined in the EMP.

4.2 Water

Plant water use will be minimised wherever possible by incorporating water recycle loops in the plant design. The details of water usage are included in the Hydraulic and Hydrological Aspect of the Site Operations at the Synthetic Rutile Plant at Muchea, Report.

The sewage system distribution will be designed to meet the nutrients loading specified in the PER. The sewage system will be designed as part of the detailed design phase and will be submitted to the EPA for approval, prior to construction.

Disposal of the Acid Leach Unit effluent has been updated. The effluent will be neutralised with lime prior to discharge into the evaporation ponds. Details of the updated design can be found in the Hydraulic and Hydrological Aspects of the Site and Operations at the Synthetic Rutile Plant, Muchea, Report.

The Hydraulic and Hydrological Aspects of the Site and Operations at the Synthetic Rutile Plant, Muchea contains the details of all other water related commitments.

4.3 Solid Waste Disposal

The proponent is committed to achieving a high standard of rehabilitation of the Cooljarloo mine site. The specifications of this commitment have been outlined in the Cooljarloo Mineral Sands Project ERMP. Details of the rehabilitation plan, including details for the disposal of the synthetic rutile solid waste, will be outlined in the mine site EMP which is to be submitted to the EPA prior to productive mining.

The proponent is committed to research into productive uses of the plant solid wastes. The solid waste from the evaporation and iron oxide basins has potential use as a soil conditioner The research will be done in conjunction with other synthetic rutile producers in W.A., through the University of Western Australia, and Murdoch University. Plot trials using the solid waste, will be conducted as part of the mine site rehabilitation programme. Details of the research programme will be outlined in the Cooljarloo Mine Site EMP and the progress of the work reported to the EPA.

The solid waste will be transported in an environmentally responsible manner. Details of solid waste transportation are given in Section 3.3, Transportation.

4.4 Noise

The proponent is committed to remaining within the EPA guidelines for noise emissions. To ensure this commitment is being met, monitoring of noise levels both on and off site, during construction and operation, will be done. The results of this monitoring will be reported to the EPA. The noise emissions monitoring programme will be developed in consultation with the EPA and will be included in the EMP.

4.5 Atmospheric Emissions

The proponent is committed to establishing a meteorological station on the plant site. The information gathered from this will provide a better understanding of atmospheric conditions in the Muchea area and will influence the design of a permanent atmospheric emissions monitoring programme.The station will monitor temperature, humidity, rainfall, evaporation, wind speed and wind direction.

Further refinements have been made to the atmospheric emissions control equipment since the PER.The kiln exhaust will be scrubbed for both particulate and sulphur dioxide in place of the electrostatic precipitator. The result will be significantly lower sulphur dioxide emissions.

The gas exhaust from the Product Drying Unit will be cleaned by means of a wet scrubber instead of a baghouse filter,resulting in greatly reduced particulate emissions.See Figure 1 for the updated process flow diagram.

The EPA has provided the proponent with an updated atmospheric emission modelling programme. Using this programme the ground level concentrations of the plant's atmospheric emissions have been recalculated as a function of distances from the stacks. Details of these calculations are contained in Appendix 2.

Atmospheric emissions from synthetic rutile plants that are of concern are: particulate, sulphur dioxide, sulphuric acid, and hydrogen sulphide.The proposed guidelines for maximum ground level concentrations for these compounds are as listed below:

Particulates	330 ug/m^3 for 3 min average	Vic EPA
SO_2	450 ug/m^3 for 1 hr average	Vic EPA
H_2SO_4	33 ug/m^3 for 3 min average	Vic EPA
H_2S	0.13ppm TLV for odour (139 ug/m^3)	NIOSH*

*NIOSH is the US National Institute of Occupational Safety & Health

There are two types of plant emissions: daily operational emissions and emergency emissions. There are three points of daily operational emission from the plant: kiln exhaust through Stack 1, separation unit exhaust through Stack 2, and product drying exhaust through Stack 3. Modelling using the updated model was performed on all three stacks. The recalculated maximum ground level concentrations and the distances from the stack at which they occur are as follows:

Stack 1		
	Particulates	25.5 ug/m^3 at about 1100m
	SO_2	11.2 ug/m^3 at about 1100m
Stack 2		
	Particulates	231 ug/m^3 at about 1100m
Stack 3		
	H_2SO_4	35.2 ug/m^3 at about 230m

Figures 2,3,4 and 5 show the ground level concentrates as a function for distance for the various air stability classes.

With the more efficient cleaning system the results for Exhaust Stack 1 are well within the guidelines as set by the EPA.

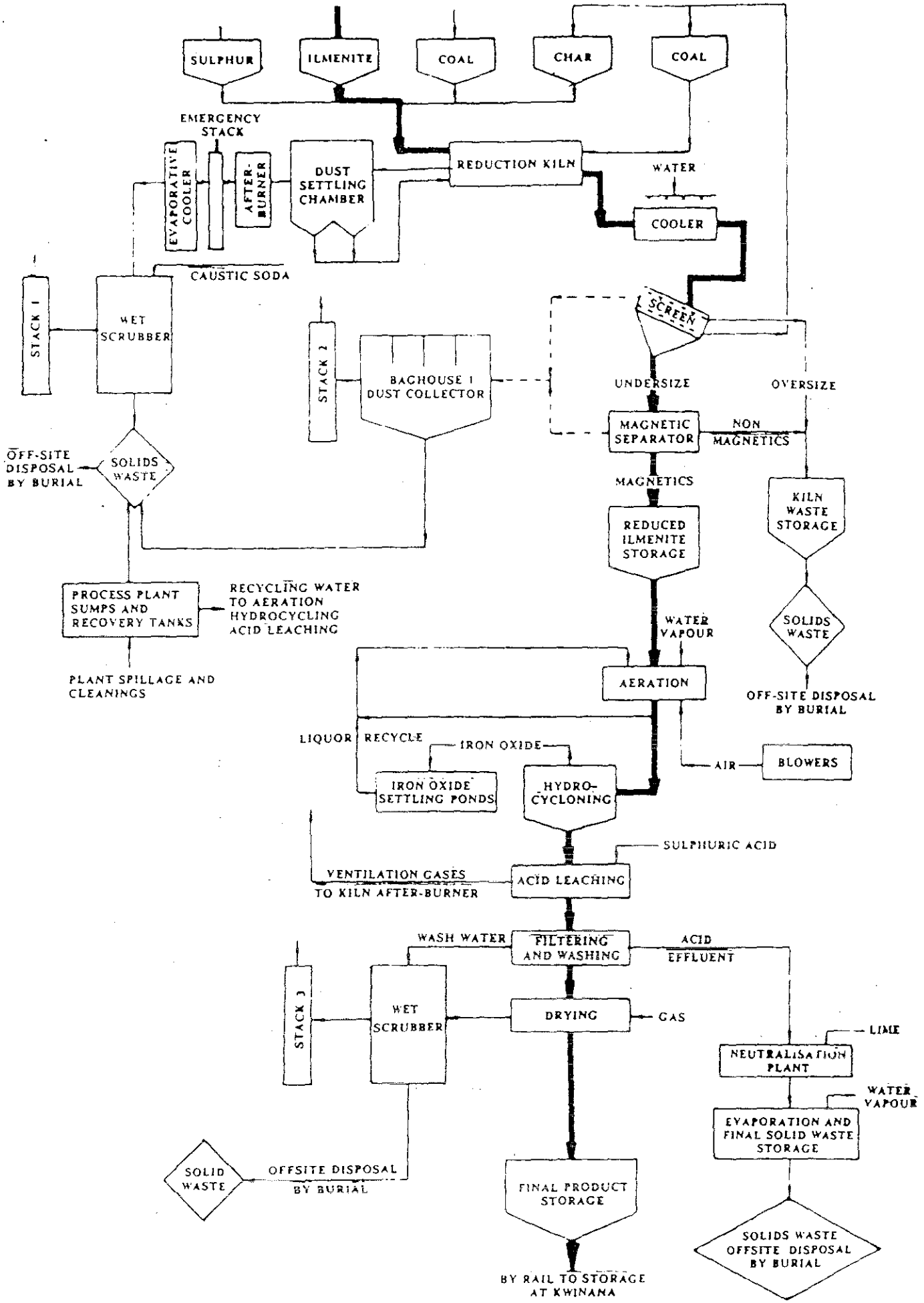
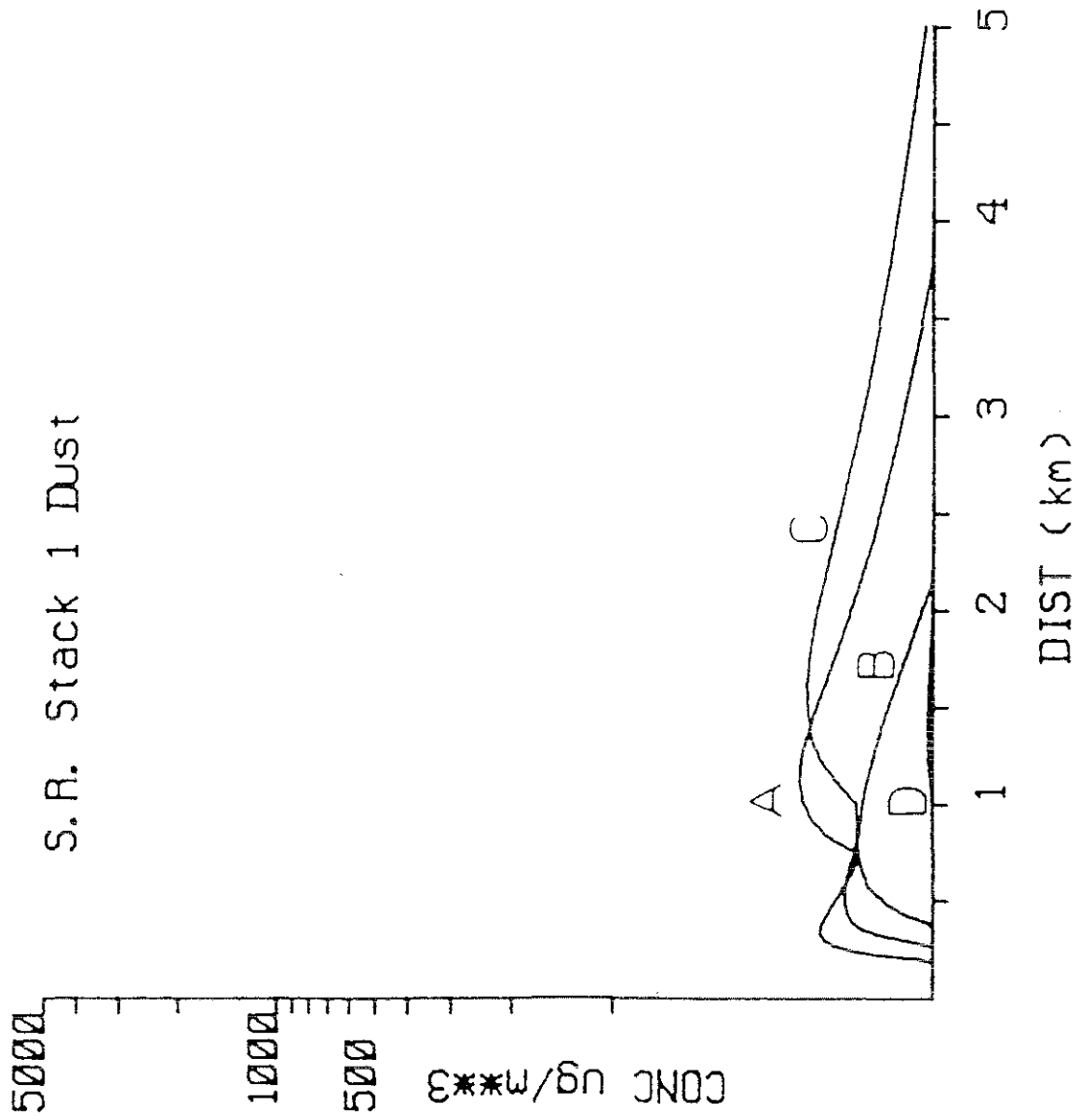
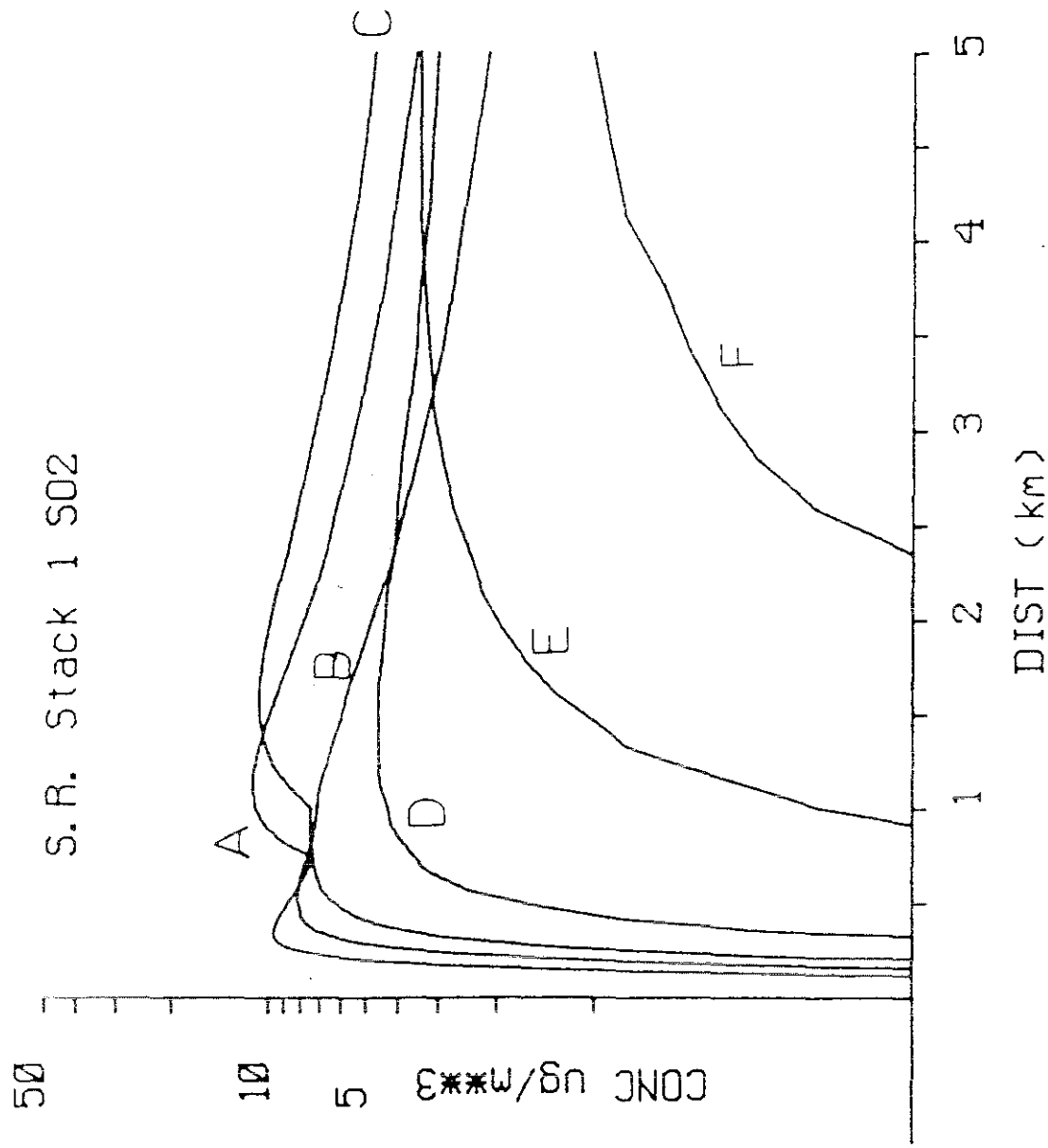

SULPHUR
ILMENITE
COAL
CHAR
COAL
EMERGENCY STACK
EVAPORATIVE COOLER
AFTER-BURNER
DUST SETTLING CHAMBER
REDUCTION KILN
WATER
COOLER
CAUSTIC SODA
STACK 1
WET SCRUBBER
STACK 2
BAGHOUSE 1 DUST COLLECTOR
SCREEN
UNDERSIZE
OVERSIZE
MAGNETIC SEPARATOR
NON MAGNETICS
MAGNETICS
OFF-SITE DISPOSAL BY BURIAL
SOLIDS WASTE
REDUCED ILMENITE STORAGE
KILN WASTE STORAGE
PROCESS PLANT SUMPS AND RECOVERY TANKS
RECYCLING WATER TO AERATION HYDROCYCLING ACID LEACHING
WATER VAPOUR
SOLIDS WASTE
PLANT SPILLAGE AND CLEANINGS
AERATION
OFF-SITE DISPOSAL BY BURIAL
LIQUOR RECYCLE
IRON OXIDE
AIR
BLOWERS
IRON OXIDE SETTLING PONDS
HYDRO-CYCLONING
SULPHURIC ACID
VENTILATION GASES TO KILN AFTER-BURNER
ACID LEACHING
WASH WATER
FILTERING AND WASHING
ACID EFFLUENT
STACK 3
WET SCRUBBER
DRYING
GAS
LIME
NEUTRALISATION PLANT
WATER VAPOUR
EVAPORATION AND FINAL SOLID WASTE STORAGE
SOLID WASTE
OFFSITE DISPOSAL BY BURIAL
FINAL PRODUCT STORAGE
SOLIDS WASTE OFFSITE DISPOSAL BY BURIAL
BY RAIL TO STORAGE AT KWINANA

FIGURE 1



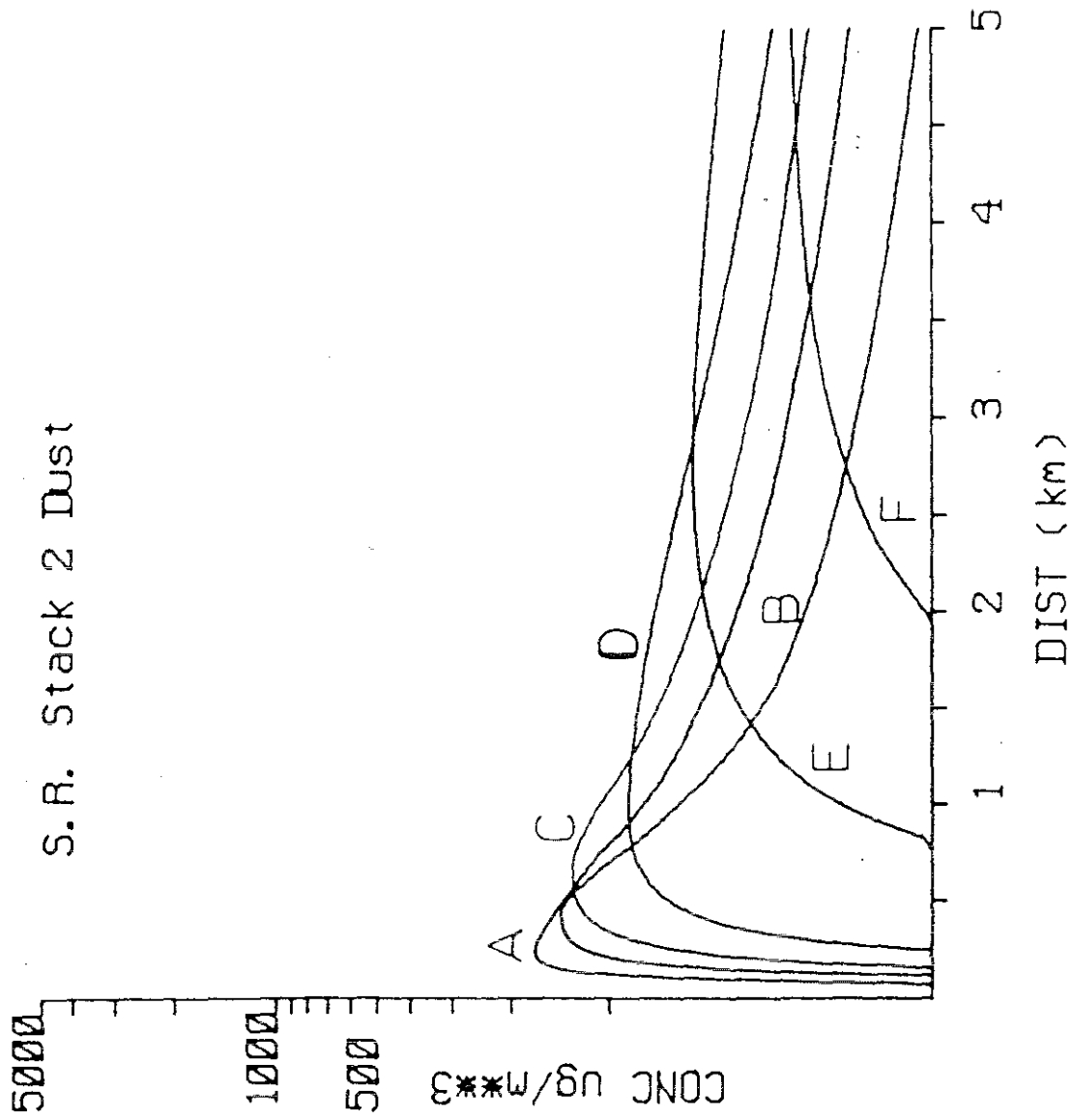
Dust concentration against distance downwind fo
Stack 1. Stability classes A to F are labelled.

FIGURE 2



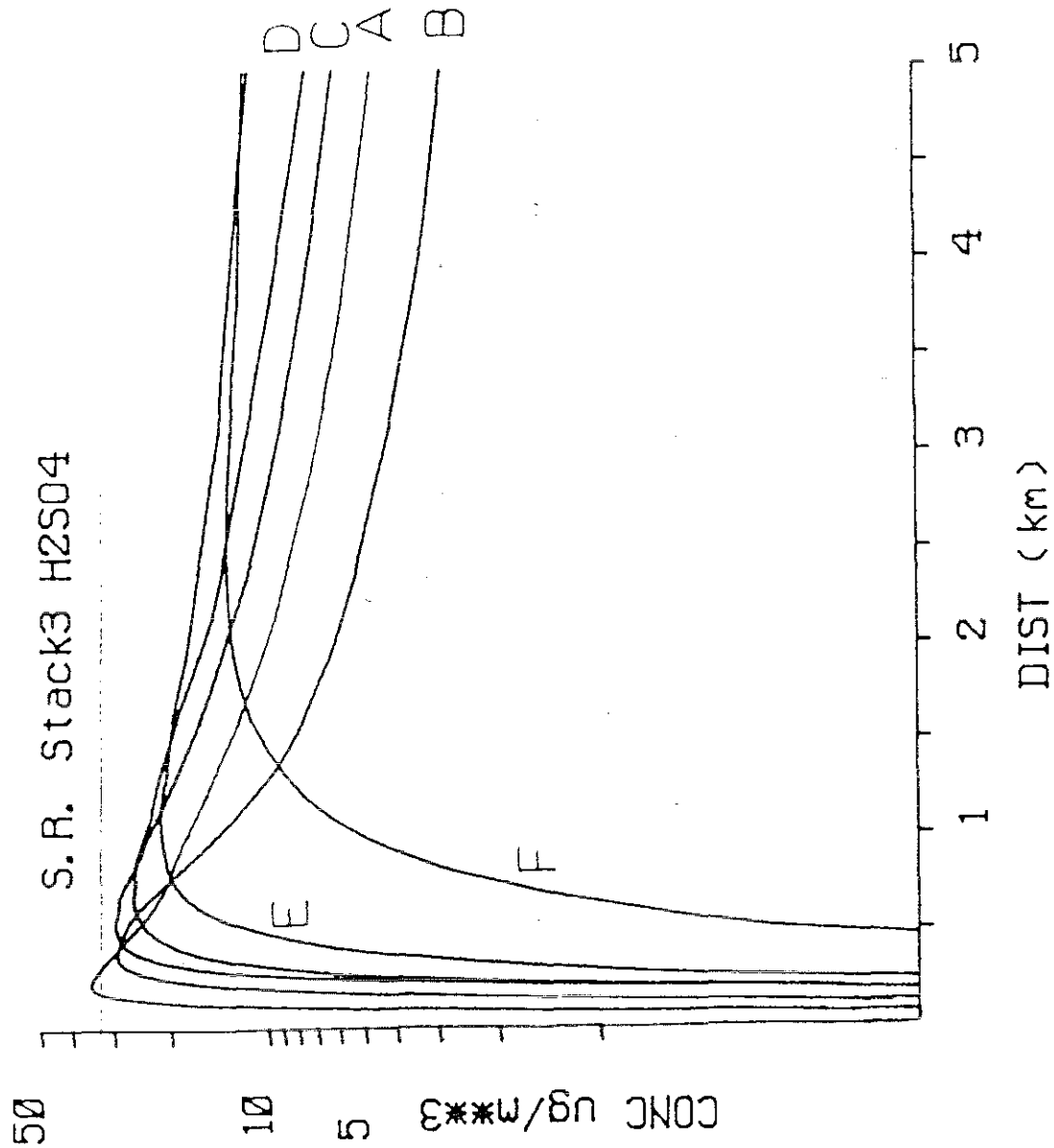
SO2 concentration against distance downwind for Stack 1, expanded scale. Stability classes A to F are labelled.

FIGURE 3



Dust concentration against distance downwind for Stack 2. Stability classes A to F are labelled.

FIGURE 4



H2SO4 concentration against distance downwind for Stack 3, expanded scale. Stability classes A to F are labelled.

FIGURE 5

The ground level concentrations of H_2SO_4 for Exhaust Stack 3 will be below the Victorian EPA guidelines of 33ug/m^3 outside the plant boundary. Ground level concentrations of H_2SO_4 are below the recommended guidelines for all stability classes 300m from the stack (see Figure 5) and the closest plant boundary is 500m to the east of the stack.

Within the plant, occupational health standards become relevant.The American Council for Government and Industrial Hygienists (ACGIH) recommended threshold limit value (TLV)oroccupational standard for H_2SO_4 is 1mg/m^3,8hour time weighted average.The predicted maximum ground level concentration for H_2SO_4 within the plant, is well within this standard.

The Cooljarloo Joint Venture is committed to meeting the recommended atmospheric emissions for emergency venting. Design details of the emergency stacks are being completed.The modelling of these emissions will be submitted to the EPA as soon as they become available.

5.0 WATER MANAGEMENT

5.1 General

It has been recognised that the hydraulic and hydrological aspects of the plant operation at Muchea give rise to the requirement for comprehensive and detailed monitoring and management programmes.

The monitoring programmes are aimed at quantifying any change to the local (and more regional) aspects of water discharges and discharge quality.

These programmes will be designed to provide an "early warning" system, should any detrimental impacts caused by the operations occur.

Management programmes are to be implemented in two ways. First, the plant process operations have been designed and are managed to preclude any discharge of contaminated effluents from the site.

Second, effluent waste water recovery and contingency spill operational plans have been defined.

In defining these programmes, it was seen that the operations have many features the same as other industrial projects in the south-west of Western Australia. Given the similar hydrological environment, these projects have provided a precedent on which to base the management alternatives applicable to the Muchea operation.

5.2 Monitoring Commitments

5.2.1 Process Flows

5.2.1.1 Plant Water Supply

A monitoring programme will be implemented to assess the impacts of water supply abstraction from the borefield to the west of the property.

This programme will be clearly defined following installation of exploration bores and their hydraulic testing.It is envisaged that shallow groundwater monitoring in conjunction with recording of bore abstraction rates will be carried out to assess and predict drawdown effects.Routine water quality analyses will be undertaken.

5.2.1.2 Acid Effluent

Monitoring of the neutralisation of the acid effluent stream will be undertaken routinely prior to disposal of the evaporation pond.

This monitoring will involve the measurement of water quality parameters such as pH and TDS. Selected samples will be analysed for specific contaminants.

5.2.1.3 Stormwater Runoff

Stormwater runoff from the plant site is to be stored in a stormwater pond for reuse within the plant.

The water stored within the pond will be monitored routinely to determine if any water quality changes have occurred in passing through the plant site.

5.2.2 Waste Water Disposal

5.2.2.1 Evaporation Ponds

The evaporation discharge ponds are underlain with a collector pipe network to intercept any leakage through the liner that may occur.

Routine monitoring of liquids collected by the pond underdrain system will be undertaken. Continuous assessment of these data in addition to shallow groundwater monitoring data will be carried out to determine any leakage.

Water quality parameters to be monitored will be those differentiating the evaporative pond liquors from the underlying groundwater.

5.2.2.2 Iron Oxide Ponds

The iron oxide ponds will also be underlain with a collector pipe network.

Routine monitoring of liquids collected by the iron oxide pond underdrain system will be undertaken and assessed as for the evaporation ponds. In addition, routine monitoring of levels and quality of effluent stored within the iron oxide ponds will be carried out for routine pond management.

5.2.3 Site Hydrology Monitoring

A monitoring programme has already been implemented to determine baseline data relating to "natural" surface and groundwater flows on the property.

This programme will be continued on a routine basis until the plant begins operation in order to obtain detailed quantification of water and material flows at the site.

Following commencement of the plant operations, it will be necessary to determine precise changes that have occurred, both during plant construction and following commencement of operations.

During plant construction, any changes in sediment discharge to Chandala Brook will be monitored such that management programmes can be implemented if required.

The detailed specification of these management programmes will be included in the Environmental Management Plan. (EMP)

Following commencement of plant operations, the routine monitoring of Chandala Brook in terms of water quality and flows will be undertaken. Reporting of these data (in conjunction with all other hydrological monitoring data) will be made at a frequency satisfactory to the relevant Authorities.

Any detrimental changes in water quality in Chandala Brook detected will result in the initiation of recovery or corrective management programmes.

A "cutoff" drain will be constructed to stop any surface water flows entering the plant site. The drain will channel water into Chandala Brook.

Routine sampling and chemical analysis of the directed water will be carried out and reported as part of the site hydrology documentation.

5.3 Management Commitments

5.3.1 Process Flows

Process vessels and pipelines will be constructed upon bunded concrete aprons which will contain process liquors, in the event of vessel failure, and contaminated washdown water, and divert the contaminated liquors to appropriate ponds or process channels.

Standby ponds will always be available for the containment of process liquors in the event of pond overflow or structural failure.

5.3.2 Waste Water Disposal

Bunding will be constructed at the evaporation ponds to detain contaminated surface runoff that may result from pond overflow or leakage.

A network of abstraction bores will be constructed for the recovery of contaminated groundwater occurring in the event of pond failure and collector network failure. The exact locations of the bores will be determined from hydraulic investigations to be undertaken.

5.3.3 Management of Site Discharge

Stormwater runoff from the site is to be directed to a stormwater runoff pond and subsequently used as plant process water.

Surface water and groundwater flows off the site will be reduced by replanting appropriate areas with suitable vegetation.

Contingency programmes for recovery of polluted groundwater or containment of chemical spills will be established to minimise the impact of accidental pollutant release into the Chandala Brook. Specification of these programmes will be made following discussion of requirements with relevant authorities.

6.0 DECOMMISSIONING

6.1 General

Currently available information suggests that sufficient mineral reserves are available to ensure a project life of 25 to 30 years. At least six months prior to the planned decommissioning of the plant a detailed decommissioning plan will be drawn up for discussion and approval by EPA prior to the decommissioning of the plant.

MINISTER FOR ENVIRONMENT

STATEMENT TO AMEND CONDITIONS APPLYING TO A PROPOSAL
(PURSUANT TO THE PROVISIONS OF SECTION 46 OF THE
ENVIRONMENTAL PROTECTION ACT 1986)

PROJECT : MINERAL SANDS DRY PROCESSING PLANT, MUCHEA

PROPONENT : T102 CORPORATION N.L.

CONDITIONS SET : 9 December 1988

Condition 7 has been amended so that the first three words of that Condition, which previously read "Prior to construction" now read "Prior to commissioning".

Bob Pearce, MLA
MINISTER FOR TRANSPORT & ENVIRONMENT

- 3 MAY 1989

Published on

- 4 MAY 1989

7th Floor, May Holman Centre Phone (09) 325 4133

Appendix 2

Conditions of Licence (Licence Number 5939)

WESTERN AUSTRALIA

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Environmental Protection Act 1986

LICENCE

LICENCE NUMBER: 5939 FILE NUMBER: L285/88

NAME OF LICENSEE:

TIWEST JOINT VENTURE

ADDRESS FOR CORRESPONDENCE:

PO Box 381
COMO 6152

NAME AND LOCATION OF LICENSED PREMISES:

TIWEST JOINT VENTURE - SYNTHETIC RUTILE & MINERAL SANDS SEPARATION PLANTS
Lot M1261 Brand Highway
MUCHEA 6501

CLASSIFICATION(S) OF PRESCRIBED PREMISES:

GRINDING AND MILLING WORKS [Schedule3-1(k)] (MINERAL SANDS)
CHEMICAL WORKS CLASS 2 [Schedule3-1(f)(i)] (SYNTHETIC RUTILE)

COMMENCEMENT DATE OF LICENCE: Sunday, 1 October 1995

EXPIRY DATE OF LICENCE: Wednesday, 30 September 1998

CONDITIONS OF LICENCE:

As described and attached:
DEFINITIONS
GENERAL CONDITION(S) - G1 TO G5
AIR POLLUTION CONTROL CONDITION(S): A1 TO A9
WATER POLLUTION CONTROL CONDITION(S): B1 TO B8
NOISE POLLUTION CONTROL CONDITION(S): N1 TO N1
SOLID WASTE CONTROL CONDITION(S): S1 TO S1

.....

PETER SKITMORE
MANAGER LICENSING SECTION
POLLUTION PREVENTION
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Officer delegated under Section 20
of the Environmental Protection Act

Receipt No: 148
Receipt Date: 6/9/95
Licence Fee: $4,800.00

Date of Issue: Thursday, 14 September 1995

WESTERN AUSTRALIA

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Environmental Protection Act 1986

CONDITIONS OF LICENCE

LICENCE NUMBER: 5939 **FILE NUMBER: L285/88**

PREAMBLE

The noise conditions of this licence are interim in nature in that they will be amended in accordance with the outcome of the review (pursuant to Section 46 of the Environmental Protection Act) of the conditions imposed by the "Statement That A Proposal May Be Implemented (Pursuant To The Provisions Of The Environmental Protection Act 1986)" dated 27 February 1989 if that outcome is inconsistent with the noise conditions. Until that time they shall be considered binding upon the licensee.

DEFINITIONS

In these Conditions of Licence, unless inconsistent with the text or subject matter:

"advise" means advise in writing from time to time by the Director;

"approved" means approved in writing from time to time by the Director;

"approval" means approval in writing from time to time by the Director;

"Director" means Director, Pollution Prevention Division of the Department of Environmental Protection for and on behalf of the Chief Executive Officer as delegated under Section 20 of the Environmental Protection Act;

"Director" for the purpose of correspondence means-

Director, Pollution Prevention Division
Department of Environmental Protection
141 St Georges Terrace
PERTH 6000

Telephone: (09) 222 7000
Facsimile: (09) 222 7099

"mg/m^3" means milligrammes per cubic metre, expressed as dry at 0 degrees Celsius and 1.0 atmosphere pressure (101.325 kilopascals)

"g/s" means grammes per second, expressed as dry at 0 degrees Celsius and 1.0 atmosphere pressure (101.325 kilopascals)

"Inspector" means a person appointed as an Inspector under Section 88 of the Environmental Protection Act.

GENERAL CONDITIONS

NOMINAL RATED THROUGHPUT

G1(a) The nominal rated throughput of the premises covered by this licence is in accordance with the following:

CONDITIONS OF LICENCE

LICENCE NUMBER: 5939 **FILE NUMBER: L285/88**

Total quantity of synthetic rutile produced:	165 000 tonnes per annum
Total quantity of mineral processed:	750 000 tonnes per annum

G1(b) Any significant increase (greater than 10 per cent) above the nominal rated throughputs listed in part (a) of this condition shall not occur unless the licensee has been granted prior approval in writing from the Director or the increase is in accordance with a works approval issued under the Environmental Protection Act.

PERSON IN CHARGE TO HAVE ACCESS TO CONDITIONS

G2(a) Any person in charge of the premises at any time shall be aware of these conditions of licence and have reasonable access at all times to these conditions of licence or copies thereof.

G2(b) A copy of these conditions of licence is to be kept in the Chandala Site Office at all times.

DISCHARGE POINTS (See Appendix 1)

G3 During normal operation, process wastes from the premises which cause or are likely to cause pollution, shall only be discharged to the environment in the following ways:

(i) major gaseous wastes through the:

- kiln exhaust stack (S1);
- inhouse dedusting plant stack (S2);
- dryer stack (S3);

(ii) solid wastes generated by the process, in accordance with condition S1 of this licence; and

(iii) gases which arise from emergency venting operations shall be discharged through the kiln emergency stack (E1).

REPORTING REQUIREMENTS

G4(a) Unless otherwise specified by any condition of this licence, the licensee shall provide to the Director a report containing such monitoring data as required by any condition of this licence

G4(b) Unless otherwise specified in these conditions of Licence, a report required by G4(a) shall contain all data collected over each 3-calendar month period and shall be provided no later than 21 days after the last day of the 3-month period to which the data relates or within such longer period of time as is approved by the Director.

CONDITIONS OF LICENCE

LICENCE NUMBER: 5939 **FILE NUMBER: L285/88**

REPORTING OF EXCEEDED LICENCE LIMITS

G5(a) The Director shall be notified of any measurement which indicates that any discharge limit specified in these conditions has been exceeded.

G5(b) The notification shall include:

(i) the date, time and duration over which the limit was exceeded;

(ii) where appropriate, the extent of the discharge over that duration;

(iii) reasons for the limit being exceeded;

(iv) corrective action taken or planned to mitigate adverse environmental consequences of the discharge; and

(v) corrective action taken or planned to prevent a recurrence of the event which led to the limit being exceeded.

G5(c) The notification together with any other relevant supporting information, shall be forwarded to the Director within 7 days of the licensee becoming aware of the exceedance.

AIR POLLUTION CONTROL CONDITIONS

KILN EXHAUST GAS SCRUBBER - OPERATION REQUIREMENT

A1(a) Exhaust gases from the kiln shall be treated through a thermal oxidiser (afterburner) and a venturi scrubber and released to the environment through the chimney stack (S1).

A1(b) When the kiln exhaust gas scrubber is operating the concentration of sulphur dioxide in the exit gases from the stack (S1) shall not exceed 85 grams per second when expressed dry at 273K and 101.325 kilopascals.

A1(c) When the kiln exhaust gas scrubber is operating the concentration of particulate matter in the exit gases from the stack (S1) shall not exceed 250 milligrams per cubic metre, expressed dry at 273K and 101.325 kilopascals.

A1(d) The pH of the discharge waters from the venturi scrubber shall be monitored and recorded. Records of the pH are not required to be reported under condition G4(a) but shall be kept for at least 12 months and shall be available to an Inspector at all times.

WESTERN AUSTRALIA

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Environmental Protection Act 1986

CONDITIONS OF LICENCE

LICENCE NUMBER: 5939 **FILE NUMBER: L285/88**

INHOUSE DEDUSTING PLANT - OPERATION REQUIREMENT

A2(a) Exhaust and ventilation gases from the inhouse dedusting plant shall be treated through a baghouse dust collector and released to the environment through the chimney stack (S2)

A2(b) When the inhouse dedusting plant is operating the concentration of particulate matter in the exit gases from the stack (S2) shall not exceed 150 milligrams per cubic metre, expressed dry at 273K and 101.325 kilopascals.

A2(c) The pressure drop across the baghouse unit shall be monitored and recorded continuously. Records of the pressure drop are not required to be reported under condition G4(a) but shall be kept for at least 12 months and shall be available to an Inspector at all times.

DRYER SCRUBBER - OPERATION REQUIREMENT

A3(a) Exhaust gases from the dryer shall be treated through a wet scrubber and released to the environment through the chimney stack (S3)

A3(b) The concentration of particulate matter in the exit gases from the wet scrubber servicing the dryer (S3) shall not exceed 250 milligrams per cubic metre, expressed dry at 273K and 101.325 kilopascals.

THERMAL OXIDISER (AFTERBURNER)

A4(a) Gases from the settling chamber and gases from the leaching plant shall be treated during normal operation in a thermal oxidiser (afterburner).

A4(b) The temperature in the afterburner combustion chamber shall be continuously recorded. Records of the afterburner temperature are not required to be reported under condition G4(a) but shall be kept for at least 12 months and shall be available to an Inspector at all times.

GROUND LEVEL CONCENTRATIONS

A5 Stack emissions of sulphur dioxide, dust and hydrogen sulphide shall be managed such that:

(i) the ground level concentration of sulphur dioxide never exceeds 450 micrograms per cubic metre (1 hour averaging period) at any location and never exceeds 350 micrograms per cubic metre (1 hour averaging period) at any residence or other odour sensitive premises; and

CONDITIONS OF LICENCE

LICENCE NUMBER: 5939 **FILE NUMBER: L285/88**

(ii) the ground level concentration of hydrogen sulphide and other reduced sulphur compounds is such that there is no detectable odour of reduced sulphur compounds outside the boundary of the licensed premises at any time;

when expressed in dry air of 273K and 101.325 kilopascals pressure.

STACK MONITORING

A6(a) The licensee shall monitor the in-stack concentrations of the following pollutants on a monthly basis in the indicated stack:

	S 1	S 2	S 3
Sulphur Dioxide	B		
Total Suspended Particulates	B	B	B
Hydrogen Sulphide	B		

A6(b) The results of each set of source tests shall include the following information:

(i) associated plant production rate, coal feed rate and sulphur feed rate relevant to the emissions at the time of the test,

(ii) in stack moisture content,

(iii) in stack volume flow rate,

(iv) in stack temperature,

(v) parameters monitored in the venturi scrubber system

- scrubbing liquor flow rate
- scrubbing liquor pH
- pressure drop across the system,

(vi) pressure drop across the baghouse unit connected to stack (S2),

(vii) sulphur dioxide, hydrogen sulphide and particulates concentrations, as defined in condition A6(a),

and any other information relevant to the test results.

DUST - GENERAL REQUIREMENT

A7(a) The licensee shall take all reasonable and practicable measures to prevent or minimise the generation of dust from all materials handling operations, stockpiles, open areas and transport activities.

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A7(b) All main trafficked areas shall be paved, sealed, or otherwise treated, and be maintained in a manner which prevents or minimises the generation of airborne dust. Where necessary these areas shall be swept, hosed or vacuumed clean to remove spillages.

A7(c) Routine maintenance and housekeeping practices shall be employed to ensure that there is no accumulation of waste materials in or around the premises which may lead to the generation of airborne dust.

PREMISES - AIRBORNE DUST LIMIT MONITORING

A8 The licensee shall monitor the level of dust both at the plant site and in the Muchea townsite on at least a quarterly basis using a method approved by the Director at locations as specified in Appendix 2 of this Licence.

OPENING OF EMERGENCY STACK

A9(a) The emergency stack will remain closed and sealed at all times during normal processing operations.

A9(b) The licensee shall immediately advise the Director when the emergency stack is opened and in so doing, provide the following information:

(i) time and date the stack is opened;

(ii) the reasons for opening the stack;

(iii) the projected duration of stack opening; and

A9(c) The licensee shall maintain a permanent log of the information required by part (b) of this condition, including the actual duration of opening of the emergency stack, and shall also contain for each event, any corrective action taken or planned to:

(i) avoid a repetition of any malfunction that may have been the reason for opening the emergency stack, and/or

(ii) minimise the adverse environmental consequences of any similar re-occurence.

NOISE POLLUTION CONTROL CONDITION

NOISE LIMIT

N1(a) Subject to part (b) of this condition, the premises shall be managed and operated such that the noise emissions from the premises do not cause or contribute to noise levels in excess of:

(i) 50 dB(A) Slow between 0700 hours and 1900 hours Monday to Saturday;

(ii) 45 dB(A) Slow between 1900 hours and 2200 hours Monday to Saturday;

(iii) and 45 dB(A) Slow between 0700 hours and 2200 hours Sundays Public Holidays; and

(iv) 40 dB(A) Slow between 2200 hours and 0700 hours always;

when measured:

(i) at any point on or adjacent to other premises not occupied by the licensee and used for residential or other noise sensitive purposes; and

(ii) at a height between 1.2 metres and 1.5 metres above ground level and greater than 3.5 metres from any reflecting surface other than the ground.

N1(b) Where the combined level of the noise emissions from the premises and the normal ambient noise exceeds the levels specified in part (a) of this condition, this condition shall be considered to be contravened only when the following criteria are also met at the measurement point:

(i) the noise emissions from the premises are audible to an Inspector; and

(ii) the noise emissions from the premises are identifiable by an Inspector as emanating from the premises.

N1(c) Noise emissions shall not cause unacceptable annoyance due to tonal or impulsive components. Those characteristics shall be assessed by an Inspector.

SOLID WASTE DISPOSAL CONDITION

DISPOSAL OF SOLID WASTE

S1(a) Solid wastes generated in the mineral sands separation, synthetic rutile and iron oxide pugging processes shall be disposed of by burial at the mine site operated by the licensee located at ML70/268SA unless specific approval for other arrangements has been obtained from the Director.

CONDITIONS OF LICENCE

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S1(b) The solid wastes described in clause S1(a) of this licence shall only be transported between the licensed premises and the disposal site in either side-tipping trucks or in end-tipping trucks that that are properly equipped for waste haulage.

S1(c) All solid wastes other than those described in clause S1(a) of this licence shall be disposed of off-site at an approved landfill site unless specific approval for other arrangements has been obtained from the Director.

WATER POLLUTION CONTROL CONDITIONS

LIQUID EFFLUENT

B1 All process water not expelled as steam or returned to the minesite as waste shall be treated and reused in the plant.

EMERGENCY EFFLUENT POND

B2 Liquid effluent generated due to a failure of the waste water treatment system shall be directed to the emergency effluent pond. The pond shall be lined with a high density polyethylene membrane.

STORMWATER

B3 The premises shall be drained such that contaminated stormwater is retained on the premises.

VEHICLE WASHDOWN AREAS

B4 Vehicle washdown areas shall be equipped with fuel/oil traps and provisions to ensure detergent or solvent contaminated waters are not discharged to the environment.

FUEL/OIL AND SILT TRAPS

B5 Any discharge of water from the premises, other than directly to sewer or septic systems, shall be via fuel/oil traps and silt traps.

WATER DISCHARGES - DISCOLOURATION/FLOATING MATTER CONTROL

B6 Waters discharged from the premises shall demonstrate no discolouration or contain any floating matter attributable to the licensee's operations on these premises.

PROTECTION OF WATER POLLUTION CONTROL SYSTEMS

B7 All settlement ponds, bunded areas and silt traps subject to clean out or solids removal shall incorporate protection from mechanical damage.

WESTERN AUSTRALIA

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Environmental Protection Act 1986

CONDITIONS OF LICENCE

LICENCE NUMBER: 5939 **FILE NUMBER: L285/88**

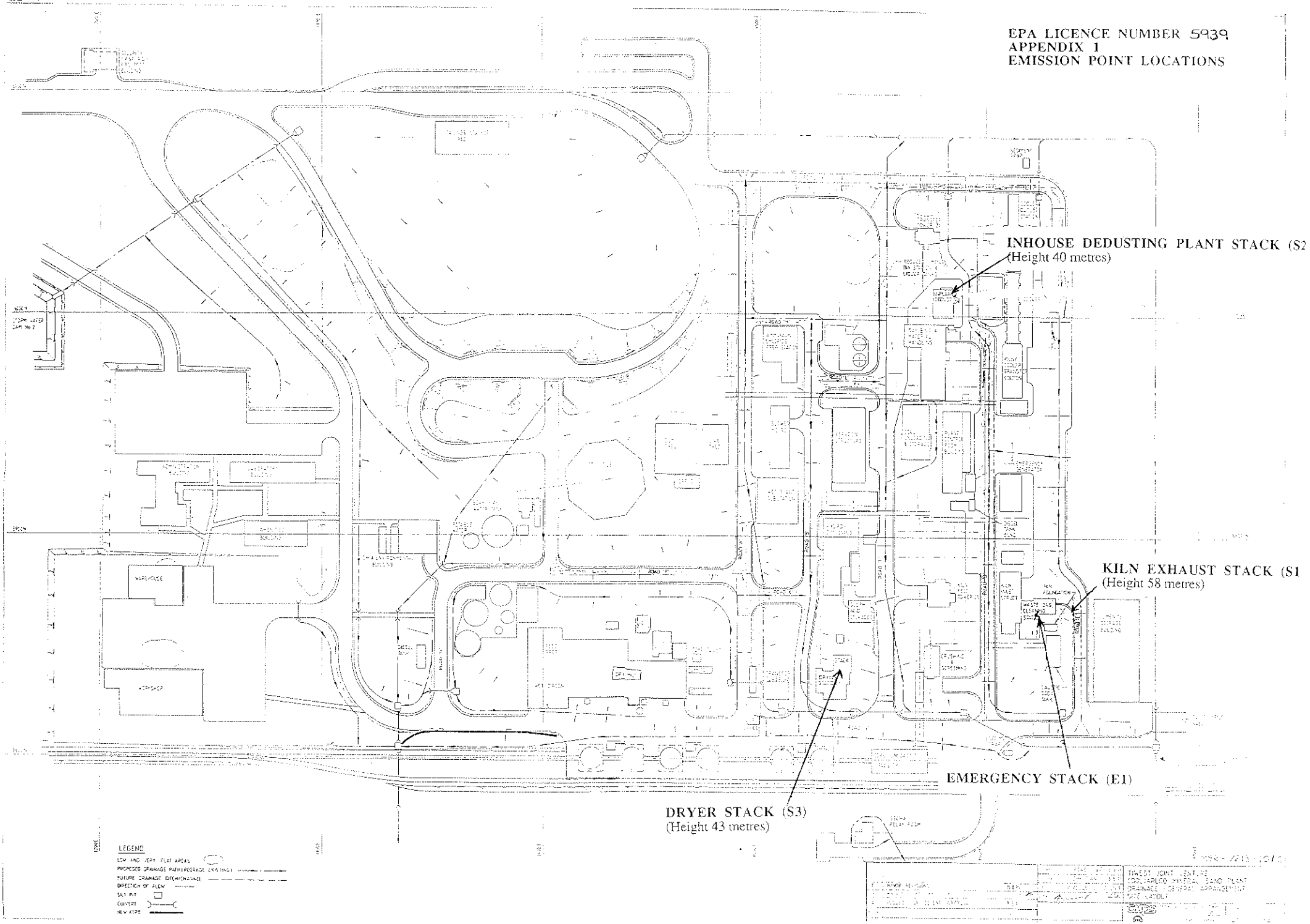
MAINTENANCE OF WATER POLLUTION CONTROL SYSTEMS

B8 All fuel/oil traps, silt traps and settlement ponds shall have an adequate schedule of inspection and maintenance so as to ensure their efficient operation to the reasonable requirements of the Director.

PETER SKITMORE
MANAGER LICENSING BRANCH
POLLUTION PREVENTION DIVISION
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICER DELEGATED UNDER SECTION 20
OF THE ENVIRONMENTAL PROTECTION ACT

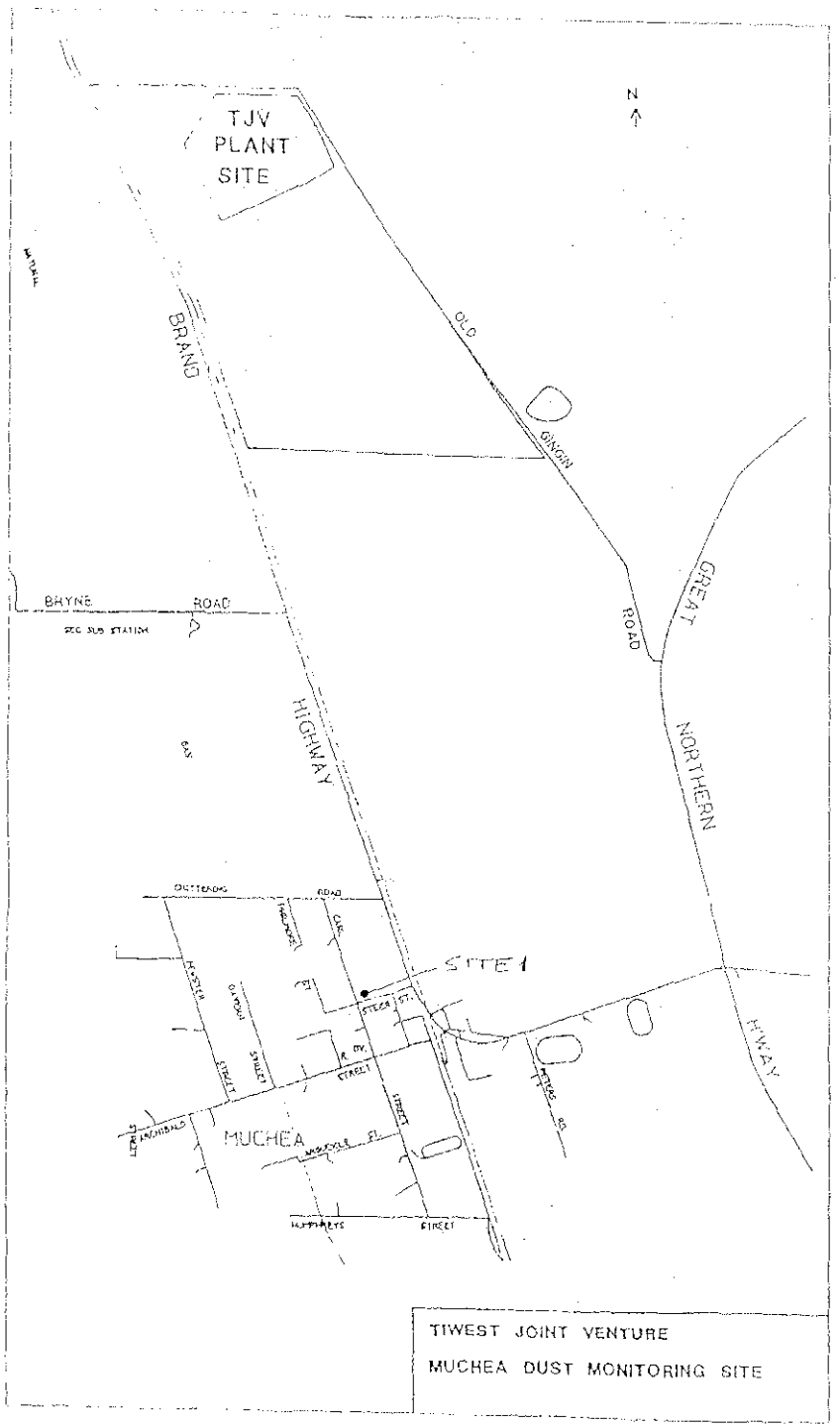
Date: Thursday, 14 September 1995

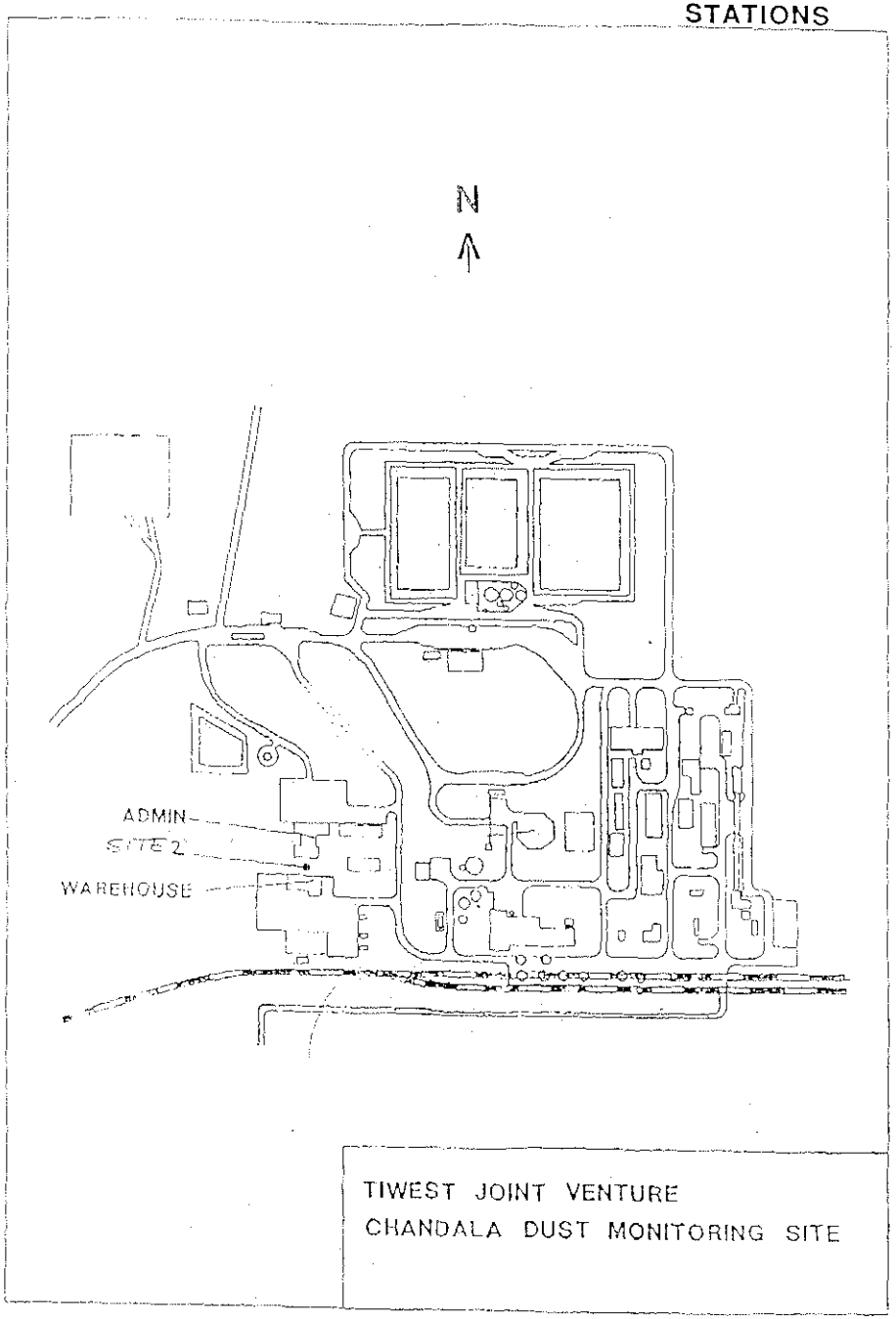
EPA LICENCE NUMBER 5939
APPENDIX 1
EMISSION POINT LOCATIONS



EPA LICENCE NUMBER 5939
APPENDIX 2

DUST MONITORING STATIONS





Appendix 3

Details of proposal

(Source: Tiwest's S46 Public Review Document, October 1995)

Part 1 - Description of proposed modifications

Part 2 - Current atmospheric emissions

Part 3 - Predicted atmospheric emissions & management

Part 4 - Predicted noise impacts & proposed management

Part 1 - Description of proposed plant modifications

3.3.1 Coal Preparation

The existing coal preparation and handling equipment is not designed to provide for variations in coal sizing as delivered.

The coal crushing and screening plant will be modified by re-positioning the existing crusher and installing a double deck screen. The resulting coarse and fine coal streams will be selectively blended onto the existing dry bin feed conveyor and a new injection coal conveyor. A bin bottom activator will be fitted to the feed and coal bin to provide constant coal feed.

3.3.2 Waste Gas Fan

The existing waste gas scrubber stack and silencers have adequate capacity for the increased gas flows. The waste gas fan will be inadequate at the projected rate.

The existing fan will be replaced with one suitable for the increased gas flows. The work will also include facilities to wash the fan impeller and instruments to monitor and control pressure through the system.

3.3.3 Scrubbing Liquor Clarifier

The existing liquor circulating system has a bleed stream to remove and control solids in the liquor. At increased gas flows, wear and cleaning problems may increase to an unacceptable extent.

A new clarifier and pump hopper will be installed in place of the recirculating tank. The clean clarifier overflow will be recycled to the waste gas scrubber and the underflow will be pumped to the waste management plant for solids removal, regeneration and recycling.

3.3.4 Kiln Shell Fan Flow Measurements and Shell Fan Upgrade

Eleven shell fans inject air into the kiln to support combustion. The higher throughput will increase the air demand above the maximum capacity of some of the fans.

The eleven shell fans will be replaced with increased capacity units each fitted with air flow measuring devices, connected to the Distributed Control System.

3.3.5 Kiln/Cooler Transfer

The existing arch bars at the kiln/cooler transfer point are subject to high maintenance. The arch will be modified to overcome this. The work will also include a winch mechanism for the easy and safe withdrawal of the transfer chute between the kiln and the cooler.

3.3.6 Screen Capacity Increase

Two additional screens will be installed allowing four screens to feed four magnetic separators. In addition, each screen will be re-arranged to provide two size fractions for char plus automatic bottom deck cleaning devices. The two size fractions of char will be treated separately by the two existing magnetic separators to recover Reduced Ilmenite and remove mineral from recycled char. In addition, the coarse material will be crushed and recycled to recover Reduced Ilmenite and to make the waste suitable for use as an absorbent in the pugging process.

3.3.7 Intermediates Bin Upgrade

Load cells will be installed under the existing intermediate bin to measure the weight of contained material. A tube conveyor will be installed to transfer recycled material from the head of the elevating conveyor to the screen feed pot.

3.3.8 Reduced Ilmenite Surge Bin

At higher throughputs the existing 250 tonne surge bin will not provide adequate surge capacity. A second 450 tonne storage bin will be installed, operating in parallel. The work will also include additional feed chutes and a duplication of the underbin system which consists of a belt weigh feeder, batching sump and pump, which feed a slurry of reduced ilmenite and ammonium chloride liquor to the aeration section.

3.3.9 Liquor System Upgrade

The existing ammonium chloride liquor preparation system includes a heat exchanger at the hot end of the rotary cooler and transfer pumps and tanks near the aeration section. The heat exchanger will be relocated to an area alongside the liquor tanks. The heat exchanger and pumps will be duplicated.

3.3.10 Additional Aerators

The batch aeration process using 10 aerators will have insufficient capacity. An additional two aerators will be installed on an extended structure immediately south of the existing vessels.

3.3.11 Hydrocycloning Section Upgrade

The existing hydrocycloning section acts as the bottleneck in the process chain and is operating at maximum capacity.

Two screw classifiers will be removed and replaced by cyclones and vacuum belt filters. The existing cyclone circuits will be upgraded with more cyclones in each cluster and larger, duplicate pumps.

3.3.12 Acid Leach Section Upgrade

The acid leach section has adequate capacity to accommodate the proposed increased throughput. The equipment is in a single process line which is not the most efficient arrangement.

The five acid leach tanks will be relocated in a staggered pattern so that any one tank can be by-passed to allow maintenance. Discharge pumps will be re-arranged to provide a duplicate pair.

3.3.13 Synthetic Rutile Drier

The existing drier is inadequate at higher throughputs and it will be necessary to increase the amount of hot air generated for drying. The natural gas burner, the combustion air fan and the fluidising air fan will be replaced with larger units. The exhaust gas scrubbing liquor circuit will also be upgraded by re-arranging tanks to improve access and drainage.

3.3.14 Waste Management Plant

The waste management plant has been continuously improved since commissioning in 1990. In this debottlenecking project, the two changes proposed will focus on improving the quality of the recycled waste gas scrubbing liquor and providing for a higher throughput of iron oxide.

The existing iron oxide thickener is inadequate for the increased throughput, and a new, larger primary thickener will be installed, designed for more efficient dewatering.

The waste gas scrubbing liquor bleed stream or Soda Regeneration Effluent circuit will not be changed. The thickener overflows from both circuits will be combined and the existing iron oxide primary thickener will be connected to act as a second reactor-clarifier which will ensure effective precipitation of calcium salts and reduce scaling in the scrubber liquor recycle system.

Part 2 - Current atmospheric emissions

4.3.1 Atmospheric Emissions

4.3.1.1 Licence Conditions and Emission Sources

Apart from a plan to control dust from the plant and standard monitoring requirements, the Ministerial conditions for the operation of the Synthetic Rutile Plant do not address atmospheric emissions from the plant. Within the Proponent's commitments Tiwest is committed to maintain air emissions below DEP limits and to regularly monitor emissions.

Detailed conditions are specified by the DEP licence (No. 5939). In the licence, the following requirements are detailed:

- the method of treating exhaust and ventilation gases;
- the concentration limits for sulphur dioxide (SO_2), hydrogen sulphide (H_2S) and particulates;
- the monitoring requirements for pH in discharge waters in the venturi scrubber, temperature of afterburner combustion chamber and pressure drop in the discharge chamber;
- the ground level concentration for SO_2, H_2S and particulates;
- the monitoring and reporting requirements for atmospheric emissions;
- emergency stack openings and reporting requirements following stack use; and
- the control and monitoring of airborne dust.

There are three point sources of atmospheric emissions from the Synthetic Rutile Plant under normal operations and one emergency stack. The height of the stacks and the installed pollution control equipment are stipulated in the operating licence.

Normal Operations

The main kiln stack (S1) is 58 m in height. Pollution control equipment in S1 includes an afterburner to convert all hydrogen sulphide (H_2S) emissions to sulphur dioxide, followed by a wet scrubber to remove the sulphur dioxide and particulates. The in-house dedusting plant stack (S2) is equipped with a baghouse dust collector to limit the release of particulate material through the stack. Exhaust gases released from the product drier stack (S3), are treated through a wet scrubber to reduce particulate material prior to release.

The locations of the stacks are shown on Figure 3.2. The stack dimensions and relevant licence conditions are provided in Table 4-1.

TABLE 4-1

STACK DIMENSIONS AND LICENCE CONDITIONS

Stack No.	S1		S2	S3
Control Device	Main Kiln Wet Scrubber		In-House Dedusting Plant	Product Drier Wet Scrubber
Height (m)	58		40	43
Pollutant	SO_2	Dust	Dust	Dust
Stack Concentrations: DEP Licence Max* (g/sec) (mg/m^3)	85	250	150	250

* Exhaust gas concentrations expressed dry at 273_K and 101.325 kilopascals.

The ground level licence conditions for stack emissions are as follows:

- one hour average ground level concentrations of SO_2 are never to exceed 450 $_g/m^3$ at any location and 350 $_g/m^3$ at any residence or odour sensitive premise; and
- the ground level concentrations of hydrogen sulphide and other reduced sulphur compounds are not to be detectable outside the boundary of the plant at any time.

As part of the licence conditions Tiwest is required to undertake monthly in-stack monitoring as indicated in Table 4-2. These are performed by an independent consultant and results are reported to the DEP quarterly or immediately if a licence condition has been exceeded.

TABLE 4-2

MONTHLY MONITORING PROGRAMME

Stack	Parameter
Main Stack (S1)	particulates hydrogen sulphide (H_2S) sulphur dioxide (SO_2)
In-House Dedusting Plant Stack (S2)	particulates
Product Drier Stack (S3)	particulates

Additionally, Tiwest is required to undertake ambient dust monitoring in the Muchea townsite. This is performed by Tiwest who obtain a 100 hour (4) day sample each month at both Muchea and at an onsite location near the administration building at the Chandala site.

The Proponent was also committed to establishing a meteorological station on the Chandala site (Figure 4.1). This data has provided a clearer understanding of the atmospheric

conditions in the Muchea area and complements the monitoring programme for atmospheric emissions.

Emergency Operations

Emergency stack cap lifts will emit SO_2 and dust from the emergency stack (E1) (Figure 3.1). There are no stack licence conditions for E1. The emergency stack is 40 m in height.

The emergency vent is used either during emergency situations or during planned maintenance shut downs when predominantly hot air is released. The short duration of any emergency occurrence eliminates the ability to take ground level measurements and the high temperatures preclude sampling at the emergency vent. During stack cap lift of the emergency stack, gases pass through the afterburner and only miss out on wet scrubbing prior to release.

Reporting Requirements

The operating licence requires that the DEP be notified of an exceedance of the licence conditions. Information is required on the date, time and duration of the exceedance, the extent of the discharge, the cause of the exceedance, corrective action taken or planned to mitigate adverse consequences of the discharge and corrective action taken or planned to prevent a recurrence of the exceedance.

4.3.1.2 Atmospheric Emissions Monitoring Results

Sulphur Dioxide

Figure 4.5 shows the monthly monitoring results for emissions of sulphur dioxide (SO_2) from the main kiln stack (S1). The results, though showing some variability, demonstrate that the level of SO_2 emissions is generally less than half the limit, with a distinct downward trend over the last six months. These levels, which are lower than originally proposed and modelled, are the result of plant modifications which have included:

- improvement in spray nozzle selection which has increased the efficiency of the wet scrubber in removing SO_2 and particulates;
- reduction of the use of raw sulphur by 30% in 1991, thereby lowering the potential for SO_2 emissions; and
- a change in the kiln process in October 1994 such that sulphur is fed into the product end of the kiln instead of the feed end, thereby halving the required input of sulphur and consequently decreasing the SO_2 emissions.

The decrease in the sulphur input to the kiln is reflected in the decrease in sulphur emissions from S1, as shown on Figure 4.5.

The three exceedances of sulphur dioxide (in 1992 and 1994), were due to the following:

(i) the incorrect installation of a recirculating liquor line valve and blocked scrubber nozzle;

(ii) aberrant pH control of the scrubber liquor; and

(iii) the contamination of the scrubber liquor with ammonium chloride due to an incorrectly opened valve.

Following each exceedance, the DEP was notified immediately and the fault quickly rectified.

Particulates

Figure 4.6 presents the average monthly results from the stack testing for particulates from the three stacks. These data show that the emissions from all three stacks have been generally well below the licence limits. One exceedance of the licence limit for S1 occurred in 1993. This exceedance was due to a failure in the scrubbing equipment caused by incorrect pH levels in the scrubber. Following the detection of the exceedance, the DEP was immediately notified and the malfunctioning equipment repaired.

Hydrogen Sulphide

Licence conditions require that, in addition to SO_2 and particulates, Tiwest monitor for H_2S emissions from the main kiln stack (S1). No H_2S emissions have been detected during emissions monitoring from S1. The afterburners, under normal operations, convert all the H_2S produced by the kiln and acid leaching baths to SO_2.

Airborne Dust

Dust monitoring stations were established at the Muchea townsite and on the Chandala site in 1988 in accordance with licence conditions. The original licence (No. 3512) required that 15-minute average concentrations of airborne dust from the Chandala site not exceed 1,000 _g/m^3. The existing licence (No. 5939) does not specify any criteria for airborne dust.

Ambient ground level concentrations of dust, measured as 4-day averages each month, are presented in Figure 4.7. There are no criteria based on 4-day averages, however, the annual average criteria for ambient dust is 90 _g/m^3. Over the period monitored, the results show that airborne dust is well below 90 _g/m^3 which is a conservative criteria to apply for four averages. Levels at Muchea are typically below 20 _g/m^3 with maximums of approximately 55 _g/m^3 occurring in summer.

Emergency Stack Use

The emissions from the emergency stack are not licenced. Instead the EPA requires that the resultant ground level concentrations be below the licence criteria (Section 4.3.1.1) and that any stack cap opening be reported to the EPA.

Stack cap openings of the emergency stack have been classified as scheduled stack cap lifts; unscheduled stack cap lifts due to power failures; and unscheduled stack cap lifts due to process related problems.

Scheduled lifts are required for scrubber inspections and cleaning, changing the shell air fan, tubes and the replacement of sprays. The kiln feed is shut down prior to the cap being lifted, so that essentially hot air is only emitted. This form of stack lift is proactive, and the DEP is notified prior to the event.

Tiwest has no control over unscheduled stack cap lifts due to power disruptions. As there is no warning prior to the event, the DEP is notified immediately afterwards. When the stack cap opens under these emergency conditions, the conveyors stop and cease to feed the kiln. The volume and quality of emissions at the time of the cap lift are dependant upon feed rates, air rates and liquor quality.

Unscheduled stack cap lifts due to process related problems or equipment malfunctions generally occur without warning. As with unscheduled cap lifts due to power failures, when there is a malfunction of equipment, the conveyors and kiln shut down. Any emissions during this time are due to natural ventilation and are of a relatively short duration as indicated in Figure 4.8. These stack cap lifts, due to process related problems, range from 10 minutes to four hours. The DEP is notified immediately after the stack cap lift.

Table 4-3 presents a summary of the stack cap lifts for the years 1993 to 1995. The data shows that on an annualised basis, there has been a large increase in 1995 over the previous two years.

TABLE 4-3

STACK CAP LIFTS

Period	Scheduled	Unscheduled		Annualised		
		Power Disruption	Process Disruption	Scheduled	Unscheduled	Total
01/01/95 - 25/07/95	16	16	14	28	53	81
23/02/94 - 31/12/94[1]	8	9	15	9	28	37
01/06/93 - 29/09/93[2]	6	9		18	27	45

1 The plant was shut down during January and February, with kiln warm-up commencing on 25 February 1995.

2 The procedure for notifying the DEP was implemented in mid-1993. The plant was shut down in September 1994 for economic reasons.

Appendix C presents the details of emergency stack cap lifts for 1995 (1 January to 25 July), with the causes of the cap openings and the action taken. The number of stack cap lifts in 1995 can be summarised as follows:

- 16 scheduled stack cap lifts ranging in duration from 26 minutes to 104 hours and 4 minutes;
- 16 unscheduled stack cap lifts due to power failures or disruptions ranging from 30 minutes to 3 hours and 2 minutes; and
- 14 unscheduled stack cap lifts due to process related problems or equipment malfunctions.

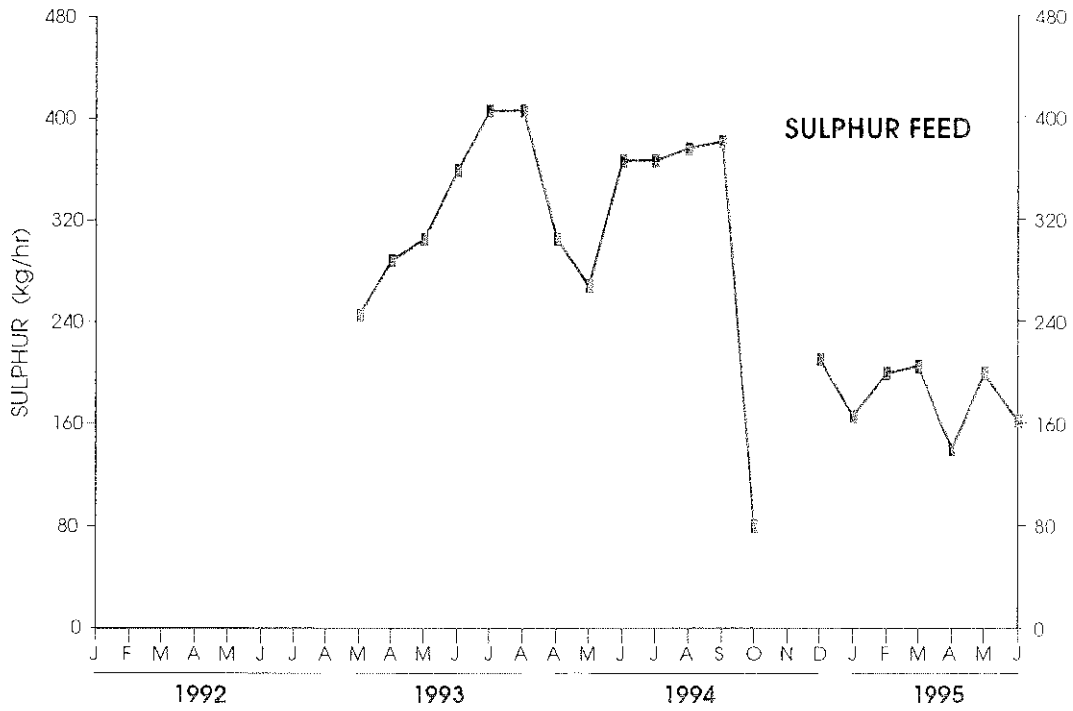
The length of stack cap lifts is typically one hour with a recorded minimum of ten minutes to a maximum of four hours. Figure 4.8, derived from modelling conducted for the initial PER document, shows a typical curve of SO_2 emission rate versus time from the emergency stack and shows that during cap openings, high levels of emissions occur only during the first few minutes. It also shows that for stack cap lifts over three minutes, the concentration of SO_2 is below 50 g/sec, which is well below the licence limit of 85 g/sec for SO_2 under normal operating conditions.

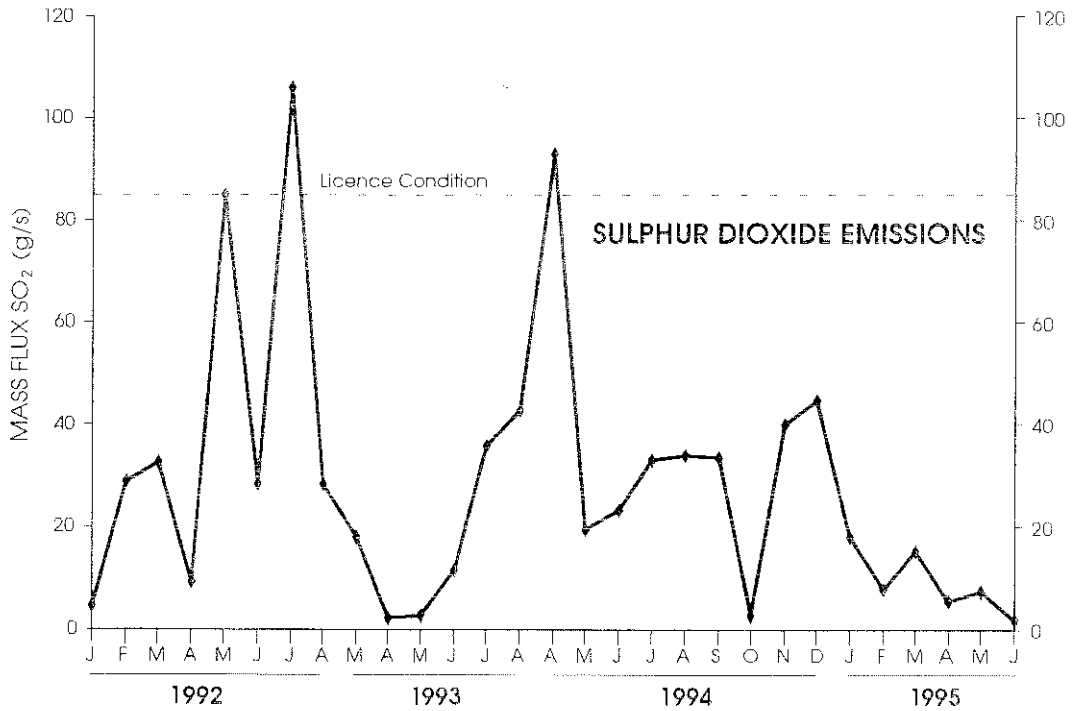
Ground level concentrations resulting from emergency stack cap lifts were originally predicted by Maunsells (1990) using mathematical models, prior operating experience of

similar operations, and assuming "worst case" atmospheric conditions. This modelling predicted that the highest 1 hour SO_2 concentration would be 747 _g/m^3 occurring 400 m from the stack which is slightly outside Tiwest's boundary. It was predicted that the maximum would decrease to below 450 _g/m^3 at a distance of 750 m from the stack and would be well below 350 _g/m^3 at the nearest residential area. Under more typical atmospheric conditions the concentrations were predicted to be less. Therefore, it was predicted that the licence conditions would always be met for distances further than 450 m from the stack and would only be exceeded at closer distances when the emergency stack cap opening occurs under certain atmospheric conditions. No ground level monitoring has been undertaken to verify the emergency stack emissions modelling due to the very short duration of elevated emissions following emergency stack cap lift.

The maximum particulate concentrations resulting from emergency stack cap lifts were originally predicted to be 1,200 _g/m^3 for a 15 minute average, occurring 200 m from the stack. This maximum concentration was predicted to decrease rapidly with distance, falling below 1000 _g/m^3 within 250 m of the stack. Under more typical atmospheric conditions, values a third to a half of these were predicted to occur. Therefore, it was predicted that ground level concentrations of particulates from emergency cap openings would meet the DEP requirements at the time that concentrations not exceed 1,000 _g/m^3 outside the plant boundary.

Recent tests of the exhaust of the afterburner under normal operation indicate that the original PER over-estimated the quantities of pollutants to be emitted. Under current operations, the SO_2 and particulate emissions are only 26% and 46% of those originally estimated. Therefore, the DEP ground level concentrations for SO_2 and particulates resulting from emergency stack usage are highly unlikely to ever be exceeded.





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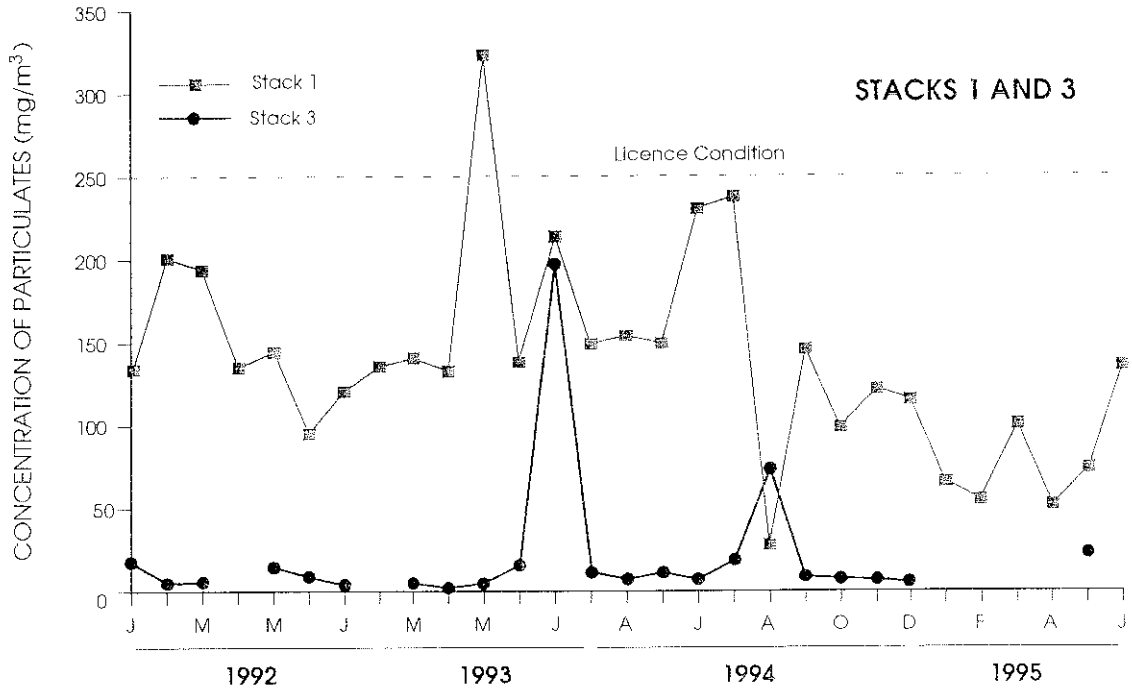
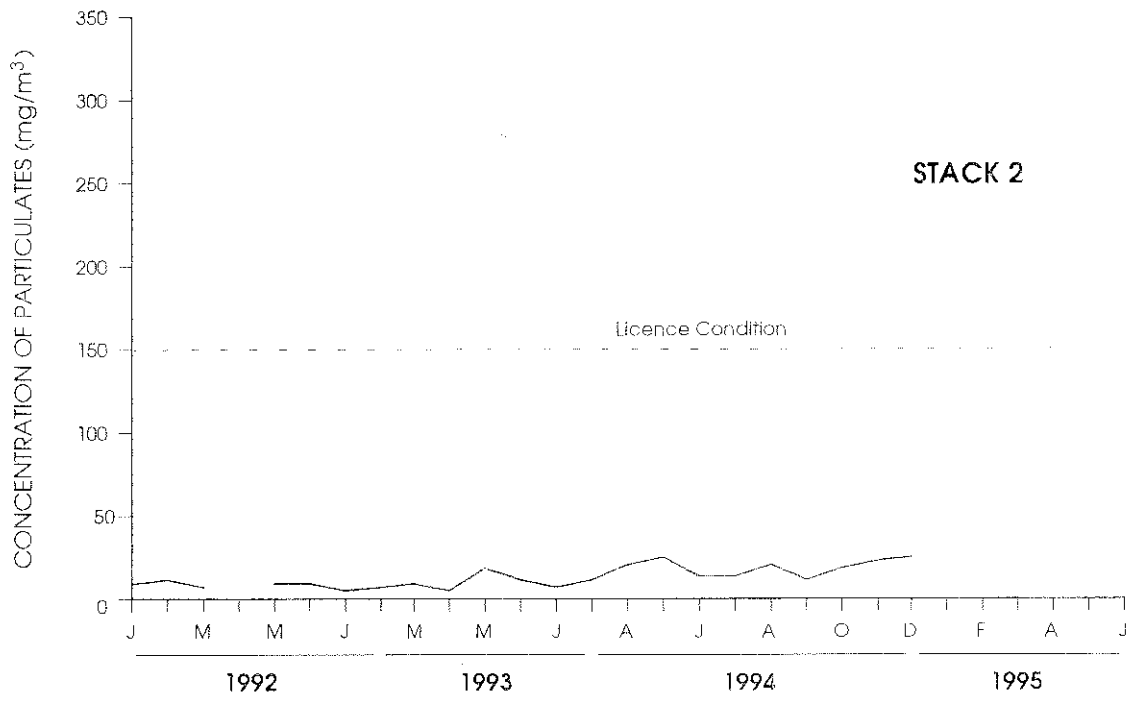
SULPHUR FEED TO KILN AND SO_2 EMISSIONS TO S1

FIGURE 4.5

A4 AGC5800_1\FIG4_6.DGN





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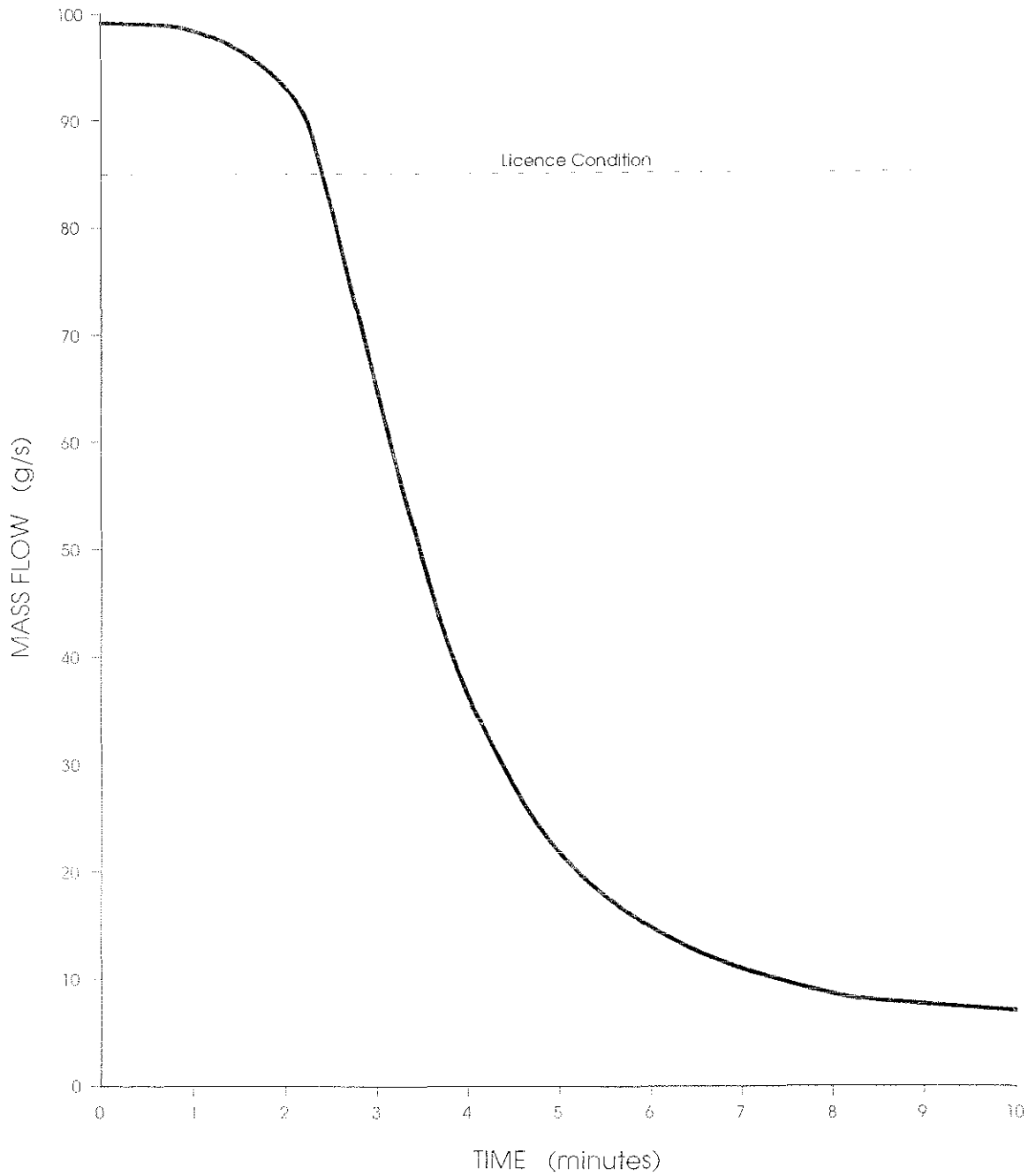
PARTICULATE EMISSIONS (S1, S2 AND S3)

FIGURE 4.6

Environmental Drafting Services (008) 40 8105



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PROJECTED SO_2 EMISSION FROM EMERGENCY STACK CAP LIFTS

FIGURE 4.8

TIWEST JOINT VENTURE

Woodward-Clyde

Environmental Drafting Services (098) 40 8105

Part 3 - Predicted atmospheric emissions (following proposed debottlenecking) & management

5.3.1 Changes to Emissions

Table 5-3 presents the projected emissions from the Synthetic Rutile Plant under normal operating conditions. These, and Figure 5.1, show:

- the proposed modifications to the plant will increase SO_2 and particulates emitted from S1 by 20%. These levels will be well below those proposed in the original PER and are below 50% of the current licence conditions; and
- there will be no change in particulate emissions from (S2) the baghouse stack and (S3) the product drier stack due to the modifications with the emissions remaining at approximately 17% and 3% of the licence conditions respectively.

The low levels of emissions in comparison with those predicted in the original PER have resulted from continual improvements made in the plant operations and pollution control equipment.

TABLE 5-3

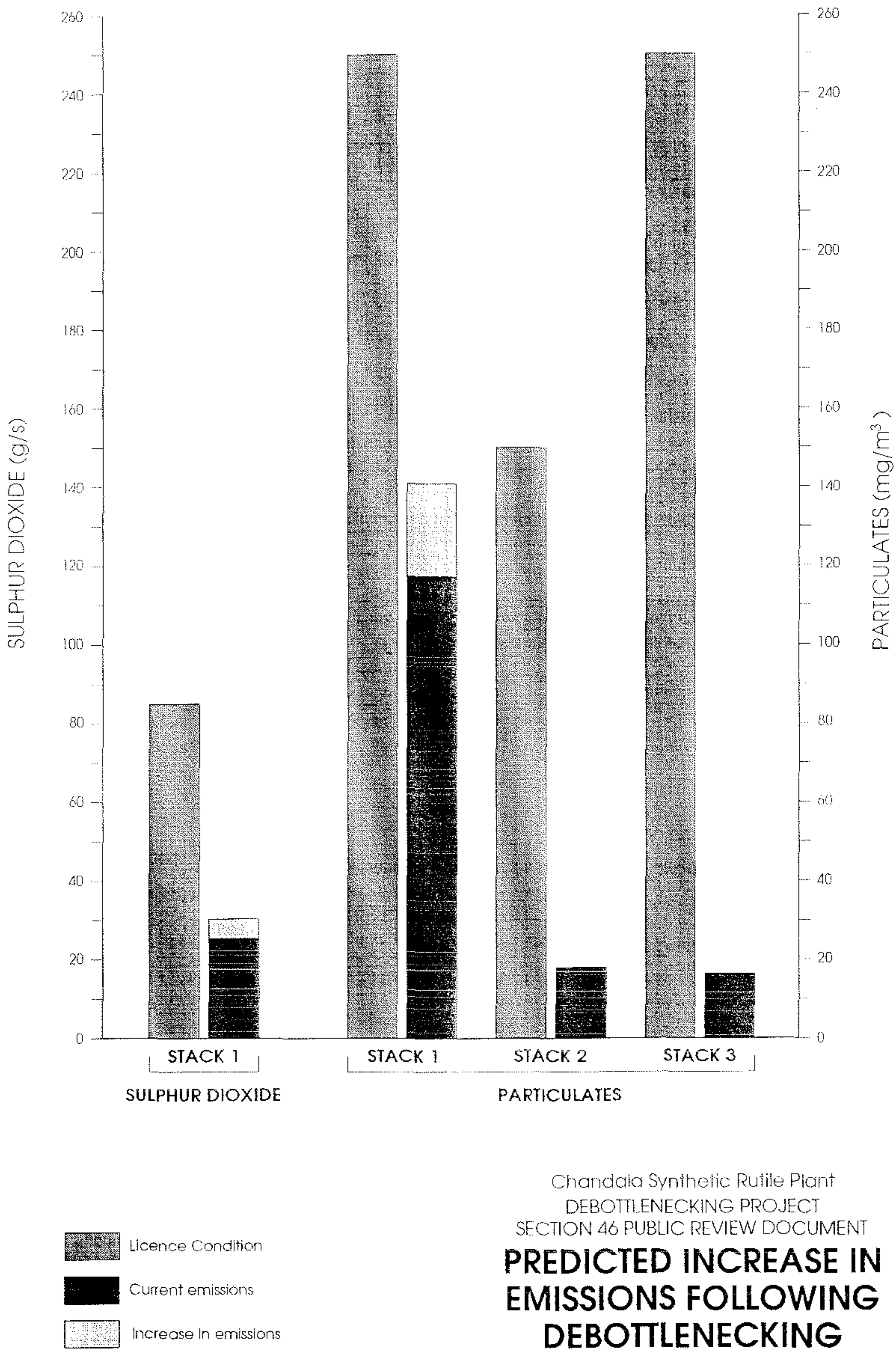
MAXIMUM POLLUTANT MASS FLUX AND CONCENTRATIONS FOR THE PROPOSED 200,000 tpa PLANT

Source	Exit Temp. (_C)	Exit Volume (m^3 s^{-1})	Mass Flux SO_2 (g s^{-1})	Mass Flux H_2S (g s^{-1})	Conc. Dust (mg m^{-3})	Conc. Dust (kg hr^{-1})
S1	82	48	44	<0.001	114	19.7
S2	45	29	0	0	25	2.6
S3	68	10	-	-	8	0.3

There will be no increase in the number of unscheduled stack cap lifts as a result of the increase in plant throughput. For the emergency stack, it is anticipated the number of cap lifts will remain the same at an annualised rate of approximately 80 per year. The majority of these are due to power disruptions, which is beyond Tiwest's control. The pollutant emissions under an emergency cap lift situation are expected to increase by approximately 20% over current levels. Even at these elevated levels, emissions will still remain 35% and 46% below the values of SO_2 and particulate used in the original modelling to gain licence approval. This also indicates that an emergency stack cap lift will not cause an exceedance of licence conditions.

5.3.2 Management

The emissions of sulphur dioxide, particulates and hydrogen sulphide from the upgraded facility will continue to comply with the existing DEP licence conditions. No additional management measures are proposed.



Chandala Synthetic Rutile Plant
DEBOTTLENECKING PROJECT
SECTION 46 PUBLIC REVIEW DOCUMENT

PREDICTED INCREASE IN EMISSIONS FOLLOWING DEBOTTLENECKING

FIGURE 5.1

Part 4 - Predicted noise impacts & proposed management

5.4.1 Impacts

SVT has undertaken an environmental noise assessment of the proposed upgraded Synthetic Rutile Plant.

5.4.1.1 Sound Power Level for the Upgraded Plant

In general, the project is replacing noise emitting equipment with lower noise emitting equipment, with some additional low noise equipment being added to the plant. Table 5-4A lists the sound power levels of the principal noise sources associated with the operation of the existing Synthetic Rutile Plant. Table 5-4B lists the sound power levels of the noise sources associated with the operation of the debottlenecking plant. A review of the noise implications for the various equipment modifications proposed for the plant upgrade is summarised in Appendix E. The major plant items whose noise levels are being reduced in level include:

- SR waste gas ID fan. This fan is being replaced with an improved design fan, and the suction and discharge ducting will be acoustically lagged;
- Shell cooling fans. These fans are being replaced with low noise emitting fans;
- Drier fan and fluidising and combustion fans. These fans are being replaced with low noise fans.

Table 5-1 anticipates that noise emissions from some components of the programme will increase while others will fall. The overall result of the programme is that the plant sound power level will be decreased slightly. SVT's analysis of noise emission from the proposed upgraded plant indicates that the changes being made to the plant will result in a 0.4 dB reduction of the overall sound power level from the SR plant, as shown in Table 5-4 (A and B).

5.4.1.2 Predicted Noise Levels

SVT has predicted noise levels for the operation of the existing and the proposed plant under various prevailing wind conditions. The acoustic modelling results have been used to predict the impact on environmental noise that the upgraded plant will have. SVT has also undertaken detailed environmental noise measurements around the plant to help assess the validity of the modelling.

The previous section shows that noise emission from the upgraded plant will be slightly less than the existing plant. For both the upgraded plant and the existing plant, the noise levels experienced to the south-east at the properties tested is predicted to be always less than 40 dB(A) for all meteorological conditions. There are areas on the east, west and north side of the Tiwest boundaries where noise levels are predicted to exceed 40 dB(A) on some occasions.

5.4.1.3 Validation of the Modelling

Continuous background noise levels have been taken at six different locations around the plant, with the measurement locations being taken at between 1 km and 2 km from the plant centre. These noise measurements were used to validate predictive noise modelling for the existing plant. The predicted noise levels are always less than those measured, hence the acoustic modelling is conservative, with an estimated variation of +5 dB, i.e. the predicted noise levels can be up to 5 dB higher than actual.

5.4.2 Management

Noise levels will not increase as a result of the proposed upgrade.

Tiwest will conduct ongoing routine monitoring for noise. The results of the ongoing monitoring will be reported in the annual reports, although results are available for DEP scrutiny and discussion at all times.

TABLE 5-4 A AND B
COMPARISON OF SOUND POWER LEVELS FOR THE EXISTING AND PROPOSED UPGRADED SYNTHETIC RUTILE PLANT

Table 5-4A - Sound Power Levels for the Existing Synthetic Rutile Plant

Equipment Item	Sound Power Level dB(A)									
	31.5	63	125	250	500	1k	2k	4k	8k	O/A
1. Waste Gas Stack	94	72	91	93	86	79	68	61	61	96
2. Aeration agitator, pump and piping	60	84	94	107	112	109	104	95	79	115
3. Blower house breakout	36	60	70	83	88	85	80	71	55	91
4. SR dedusting stack	89	97	97	105	107	102	99	92	92	111
5. Shell cooling fans	74	82	89	89	94	89	90	86	79	98
6. Shell cooling fans	74	82	89	89	94	89	90	86	79	98
7. Waste gas induction fan	82	90	97	102	96	92	92	85	85	102
8. Cooling fans	72	91	89	95	100	100	94	86	79	105
9. Product drier fan	62	76	86	97	99	97	93	90	93	104
10. Waste gas stack-breakout	89	67	86	88	81	74	63	56	56	91
11. Product drier	78	82	86	98	92	78	69	59	64	99
12. SR dedusting fan	83	90	88	96	94	91	84	80	76	100
13. Dilution fan	66	77	87	97	99	98	95	94	92	104
14. Fan drier combustion	67	78	88	97	100	98	96	94	89	105
15. Kiln suction cooling fans	55	69	81	90	90	90	89	85	74	96
16. Aeration tank steam vent	50	66	76	83	87	91	88	83	73	95
17. Main kiln drive motors	68	75	69	85	87	87	85	81	74	93
18. Centrifugal bore water pumps	65	75	70	86	89	89	87	82	76	94
19. Coal storage	87	65	84	86	79	72	61	54	54	89
20. Bin station breakout	70	78	78	86	88	83	80	73	73	92
Total for Existing Plant	**97.1**	**99.7**	**102.9**	**111.2**	**114.2**	**111.2**	**107.1**	**101.2**	**98.3**	**118.0**

Table 5-4B - Sound Power Levels for the Upgraded Synthetic Rutile Plant

Equipment Item	Sound Power Level dB(A)									
	31.5	63	125	250	500	1k	2k	4k	8k	O/A
1. Waste Gas Stack	89	67	86	88	81	74	63	56	56	91
2. Aeration agitator, pump and piping	60	84	94	107	112	109	104	95	79	115
3. Blower house breakout	36	60	70	83	88	85	80	71	55	91
4. SR dedusting stack	89	97	97	105	107	102	99	92	92	111
5. Shell cooling fans	69	77	84	84	89	84	85	81	74	93
6. Shell cooling fans	69	77	84	84	89	84	85	81	74	93
7. Waste gas induction fan	77	85	92	97	91	87	87	80	80	100
8. Cooling fans	72	91	89	95	100	100	94	86	79	105
9. Product drier fan	62	76	86	97	99	97	93	90	93	104
10. Waste gas stack-breakout	84	62	81	83	76	69	58	51	51	86
11. Product drier	73	77	81	93	87	73	64	54	59	94
12. SR dedusting fan	83	90	88	96	94	91	84	80	76	100
13. Dilution fan	66	77	87	97	99	98	95	94	92	104
14. Fan drier combustion	62	73	83	92	95	93	91	89	84	100
15. Kiln suction cooling fans	55	69	81	90	90	90	89	85	74	96
16. Aeration tank steam vent	50	66	76	83	87	91	88	83	73	95
17. Main kiln drive motors	68	75	69	85	87	87	85	81	74	93
18. Centrifugal bore water pumps	65	75	70	86	89	89	87	82	76	94
19. Coal storage	90	68	87	89	82	75	64	57	57	92
20. Bin station breakout	73	81	81	89	91	86	83	76	76	95
Total for Upgraded Plant	**95.0**	**99.2**	**101.3**	**110.5**	**114.0**	**111.0**	**106.6**	**100.3**	**97.7**	**117.6**

APPENDIX E
REVIEW OF THE PROPOSED UPGRADED PLANT WITH RESPECT TO NOISE EMISSIONS

SVT has reviewed the impact of the project on environmental noise emission from the plant. The review was undertaken on an area by area basis and identified whether each modification will increase or decrease environmental noise.

Coal Preparation (refer Section 3.3.1)

The existing single deck screen with wire mesh panels will be replaced by a double deck screen with one quiet polyurethane deck and one wire mesh deck. This change will not effect noise levels.

The bin bottom activator is inherently a quiet machine and is also vibration isolated from the bin. The noise generated is an insignificant addition to the background levels in the day bin building.

Waste Gas Fan (refer Section 3.3.2)

The existing fan is being replaced with a low noise fan. A detailed review of the manufacturers data for the replacement fan indicates that noise levels will decrease. In addition, breakout noise from the fan casing and from the inlet and outlet ducting will be further reduced by the addition of acoustic lagging to the fan casing and to the discharge and suction ducting. Anticipated noise breakout from the fan will be below 85 dB(A). Currently the breakout noise from the fan casing is between 90 dB(A) and 95 dB(A).

These changes will significantly reduce noise levels at the access points around the fan and surrounding area, and will also reduce the overall environmental noise emissions from the plant.

Waste Gas Scrubber Upgrade (refer Section 3.3.3)

There will be no impact on environmental noise emission from this upgrade since a lower speed motor is being used.

Shell Fan Upgrade (refer Section 3.3.4)

Noise emission from the shell fans will be reduced by 10 dB(A) from existing shell fans noise levels. The new shell fans will achieve 85 dB(A) at 1 m from the inlet. This reduction will significantly reduce noise levels at the access walkway of the kiln area, and also reduce the environmental noise emission from the kiln area.

Kiln Cooler Transfer (refer Section 3.3.5)

There will be no impact on environmental noise emission from this upgrade.

New Screens and Storage Bin (refer Section 3.3.6, 3.3.7, 3.3.8)

New equipment is being added to the area. The only significant noise contributor is the Hammer Mill. The Hammer Mill and noise from material handling will add a new noise source to this area. The Hammer Mill's contribution to environmental noise can be controlled by enclosing the mill and restricting breakout noise from the mill to below 85 dB(A) at 1 m.

Liquor Recovery System (refer Section 3.3.9)

This upgrade is unlikely to make any impact on noise emissions from the plant.

Aeration Vessel Gear Box Upgrade (refer Section 3.3.10)

The addition of two new aerator vessels with gearbox and motor will result in a small increase in the area of plant with high noise levels, i.e. the area of high noise levels will be extended to the new tank area. However, there will not be significant increase in noise levels on the access areas of adjacent tank tops. The addition of the new tanks and aerators will result in a slight increase in the environmental noise from the plant.

Hydrocycloning (refer Section 3.3.11)

This will involve deleting existing pumps and installing new pumps. After completing the work there will be an additional two pumps in the area.

It is unlikely that this work will result in an increase in environmental noise if the additional pump's noise emission levels is restricted to less than 80 dB(A) at 1 m.

Synthetic Rutile Dryer Upgrade (refer Section 3.3.13)

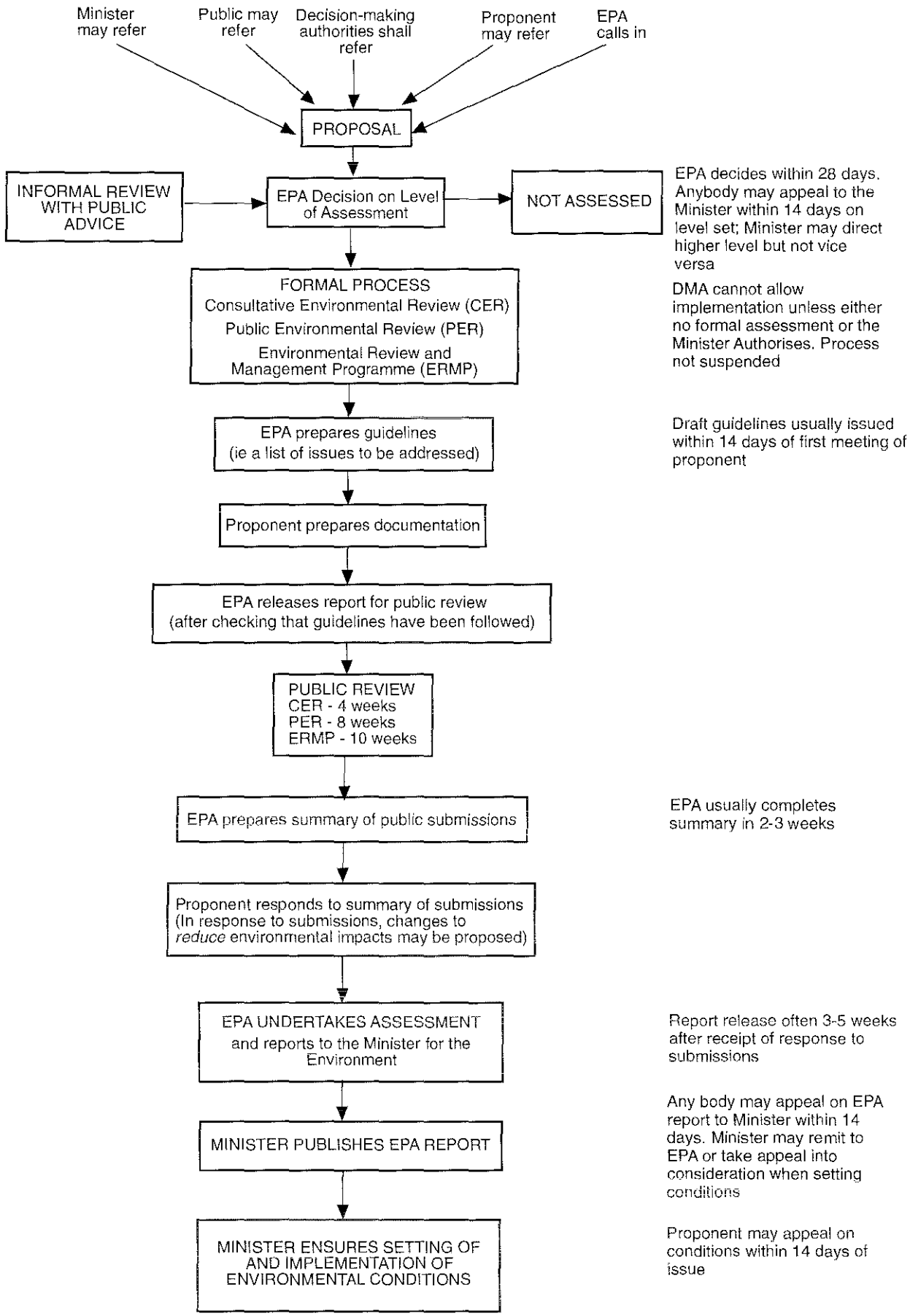
The replacement of the fluidising and combustion fans with slower speed fans will reduce the local noise levels around these fans. To ensure that this item does not contribute to overall higher noise levels, the noise breaking out from the fans will be kept below 80 dB(A).

Waste Management Plant (refer Section 3.3.14)

An additional thickener will be added as part of the Project. The main noise sources associated with the thickeners will be due to the operation of discharge and slurry feed pumps. If noise levels from both of these pumps is restricted to less than 85 dB(A) at 1 m, then the environmental noise contribution from this equipment item will be insignificant.

Appendix 4

Environmental impact assessment flow chart


Minister may refer
Public may refer
Decision-making authorities shall refer
Proponent may refer
EPA calls in
PROPOSAL
INFORMAL REVIEW WITH PUBLIC ADVICE
EPA Decision on Level of Assessment
NOT ASSESSED
EPA decides within 28 days. Anybody may appeal to the Minister within 14 days on level set; Minister may direct higher level but not vice versa
FORMAL PROCESS
Consultative Environmental Review (CER)
Public Environmental Review (PER)
Environmental Review and Management Programme (ERMP)
DMA cannot allow implementation unless either no formal assessment or the Minister Authorises. Process not suspended
EPA prepares guidelines (ie a list of issues to be addressed)
Draft guidelines usually issued within 14 days of first meeting of proponent
Proponent prepares documentation
EPA releases report for public review (after checking that guidelines have been followed)
PUBLIC REVIEW
CER - 4 weeks
PER - 8 weeks
ERMP - 10 weeks
EPA prepares summary of public submissions
EPA usually completes summary in 2-3 weeks
Proponent responds to summary of submissions (In response to submissions, changes to *reduce* environmental impacts may be proposed)
EPA UNDERTAKES ASSESSMENT and reports to the Minister for the Environment
Report release often 3-5 weeks after receipt of response to submissions
MINISTER PUBLISHES EPA REPORT
Any body may appeal on EPA report to Minister within 14 days. Minister may remit to EPA or take appeal into consideration when setting conditions
MINISTER ENSURES SETTING OF AND IMPLEMENTATION OF ENVIRONMENTAL CONDITIONS
Proponent may appeal on conditions within 14 days of issue

Appendix 5

Submissions and proponent's response to questions

Part 1 - Summary of submissions

Part 2 - Proponent's response

Part 3 - Copy of submissions from government agencies

Part 1 - Summary of submissions

Department of Resources Development:

1. Any consideration of buffer zone to the plant needs to be reviewed in the context of land use planning issue, and should be considered with the State Industrial Buffer Policy being developed.

Water Authority of WA:

2. The pond seepage is being adequately dealt with. The actions taken by Tiwest in terms of remedial action and reporting are considered satisfactory. However, if the underpond drainage had been designed and/or worked correctly, the leak may have been discovered earlier, with less contamination occurring.

3. The leakage issue is should be dealt with separately from the assessment of this proposal, and should not impact on the approval of the proposal.

Department of Minerals and Energy:

4. There would be minimal impacts on the workforce and on the environment from the proposal.

Radiological Council/Health Department of WA:

5. Radiation Management Plan should include an inspection schedule to check for build-up of radionuclides in pipes, tanks, filters etc.

Waterways Commission/Swan River Trust:

Advice was sought but no comment received.

Shire of Chittering:

Comment was sought but no submission received.

Chittering Ratepayers Association Inc:

Noise impacts:

6. The submission expressed concern about the plant being allowed, under the licence conditions, to operate at higher noise levels than the levels originally set in the environmental conditions, ie. the noise levels specified in the existing noise regulations.

7. The submission also made reference to previous non-compliances and the unsuccessful attempts to date by Tiwest to comply with the noise levels set in the original conditions.

Buffer zone:

8. The submission strongly opposes any claim by Tiwest for an exclusion zone outside the site boundaries, as it is not an acceptable mechanism to control noise impacts.

Air emissions:

9. Concern about odours and particularly visible plumes from the emergency stack and the main stack currently, which could be detected at long distances (more than 10 km) from the plant site under both normal and abnormal operations.

10. The submission claimed that the frequency of the emergency stack cap lifts and the number of the reported cap lift incidents are understated by Tiwest in its Public Review Document.

11. Concern about the damaging effects to foliage within and outside Tiwest's boundaries, from heavy black dust deposits on flora.

Liquid waste disposal:

12. Concern about the waste pond leakage incident which was caused by a failure in the pond liner, and the management of the leakage after its discovery in 1994.

Solid waste disposal:

13. Concern about spillage incidents associated with transportation of solid waste for disposal at Cooljarloo mine site, and the effects of these spillages on grazing pasture for livestock and subsequently on meat used for human consumption.

Radiological impacts:

14. The submission believed that Tiwest should be required to further reduce the radiological impacts as a result of the proposal.

Community consultation:

15. Concern about the Muchea Area Consultative (MAC) Committee, in regard to its (lack of) impartiality and effectiveness as a communication vehicle to the local population.

Part 2 - Proponent's response

Overall, Comments

During the four week public review of the Section 46 document to debottleneck the SR Plant, Tiwest advertised widely the availability of the document, and invited comment and submission on the project.

In addition, a public open day at the Chandala site was conducted on 4 November, 1995, following advertisements in local newspapers and a letter drop to over 2000 local residences.

Only 60 members of the public attended the open day, and there were no requests for additional information on the debottlenecking project, even though several display boards had been prepared for public scrutiny.

Tiwest believes that the very low level of public interest in the proposed debottlenecking project confirms that the sincere community information and support programmes conducted locally during the past four years has been successful.

Tiwest believes that its presence at Chandala is now valued by almost the entire local population as an asset in the community.

DEP, Comments

Tiwest has been advised it is not required to respond to queries on greenhouse gas emissions, their management or control.

Tiwest undertakes to conduct a survey of noise emissions from the Chandala site following the debottlenecking project. Tiwest further undertakes to ensure that noise emission levels from the site do not increase as a result of the project.

Tiwest will ensure that the measures and assumptions detailed in Appendix E (Review of the Proposed Upgraded Plant with Respect to Noise Emissions) of the Section 46 Public Review Document for Production Debottlenecking to 200,000 tpa, are implemented.

Water Authority of WA, Comments

The Water Authority confirms that the process of investigation, contaminated groundwater abstraction and reporting to statutory authorities is satisfactory, and is being dealt with separately to the assessment of this debottlenecking project.

Health Department of WA, Comments

The Radiological Council points out that thorium (or in some cases uranium) concentrates in solid waste are higher than background, and that radionuclides may buildup in certain parts of the plant (pipes, tanks, filters etc.)

All solid process waste from the SR Plant is disposed of by burial in clay lined pits at the Cooljarloo minesite. Once filled, the pits are covered by several metres of clay and revegetated. This disposal method is in accordance with EPA operating licence, and is described comprehensively in the Radiation Management Plan.

Tiwest has committed to review the current Radiation Management Plan for Chandala within three months of approval of the project. Solid waste disposal and regular plant surveys to check for possible build-up of radionuclides will be included in the report.

Department of Minerals and Energy, Comment

No comment was received from the Department of Minerals and Energy of WA.

Department of Resources Development, Comments

DRD comments that the issue of a buffer zone around the Chandala plant has been contentious with the Shire of Chittering.

Tiwest confirms that a buffer zone around the Chandala plant is not sought as a consequence of the debottlenecking project.

Tiwest is aware that the generic guidelines for the protection and long term security of industrial activity in Western Australia is currently under consideration within Government. These discussions may lead to development of a State Industrial Buffer Policy, and Tiwest will comment upon proposals once a document is released for scrutiny.

Chittering Ratepayers Association, Comments

Air Quality

Tiwest is obliged under EPA licence to inform the Director immediately the emergency stack is opened. A procedure is in place at Chandala to ensure that this notification occurs.

Tiwest maintains an independent history of community complaints that are received directly or via DEP. The record of complaints from each source is presented in Table 4-12 of the assessment report.

Whenever a complaint is received, Tiwest investigates the circumstances and responds with factual information direct to the complainant or to DEP as quickly as possible.

Tiwest undertakes a programme of monthly stack monitoring in accordance with licence requirements, and the historic record of these monitoring results is shown in Figure 4.5 and 4.6 of the assessment report. The results show a marked reduction in emission levels and steady-state conditions that are well within licence limits. The studies that have been undertaken provide assurance that stack emissions at the increased production rate will remain well within existing licence conditions.

Production of high quality synthetic rutile product from the kiln demands steady-state operation, and hence consistency of operation both night and day, seven days a weeks considered a necessity.. Alteration of kiln operating parameters to avoid environmental controls under "cover of darkness" would result in poor or variable quality synthetic rutile product, due to the kiln residence time of 14 - 16 hours.

Records of key parameters to demonstrate the continuous and efficient functioning of environmental controls on stack emissions are maintained in accordance with licence requirements.

Noise

Investigations undertaken by Tiwest show that the installation of new equipment proposed as part of this debottlenecking project will not result in increased noise emission levels from the Chandala site. Tiwest has committed to a post-commissioning survey to demonstrate that noise levels have not increased.

Currently noise emissions from the Chandala site as measured at two neighbouring premises are considered to meet the tonal and total noise level requirements specified in the EPA licence. Work undertaken as part of the debottlenecking project assessment show that noise levels experienced at these two neighbouring premises will always be less than 40 dB(A) for all meteorological conditions. This complies with current licence requirements.

Noise emissions from the Chandala site have been progressively reduced since plant commissioning and this process of continuous improvement, and associated noise surveys will continue.

Solid Wastes

Tiwest transports solid process wastes from Chandala to the Cooljarloo minesite for burial. Rigorous procedures are in place to ensure that the potential for road spillage of waste is minimised. A programme for early notification, rapid response and effective cleanup is in place to cater for accidental spillages.

During 1992 - 1993, the University of Western Australia conducted a series of research trials using synthetic rutile wastes as a soil amendment on pasture. Tiwest was a supplier of waste for the trials.

As expected, uptake of insoluble metal compounds from the waste by pasture plant species was very low. The trials were able to demonstrate that the waste was quite effective in retaining phosphorous in the plant root zone and preventing it from leaching

Tiwest believes that uptake of metal compounds into pasture grasses following road spillage of waste enroute to Cooljarloo, is negligible.

Liquid Wastes

Tiwest detected an apparent anomalous result at MB7 in its groundwater monitoring programme in September 1994. Once confirmation checks had been re-evaluated, the DEP and WAWA were advised on 17 November, 1995. At this time, a recovery programme was established and agreed.

Tiwest reports results of this programme monthly to DEP and WAWA. Each pond is being progressively cleared, the integrity of the liner checked, and repairs effected when holes are located. The contamination plume has been contained and is being progressively reduced. The additional monitoring bores provide a very clear picture of management effectiveness.

The comprehensive programme for regular assessment of groundwater and surface quality around the Chandala site has provided data to demonstrate that impact is minimal. In the one instance where contamination has been shown, response was swift and an agreed programme of recovery implemented.

Other On-site Problems

Handling of coal char fines as a waste product from the SR kiln is dusty and at times has caused fugitive dust emissions that settle out on vegetation in close proximity to the plant.

Tiwest has no evidence of damage to any vegetation resulting from deposition of this dust on leaves.

Arrangements are now in place to utilise the waste char as a "pugging" additive for the moist process solids waste.

Rather than dropping the waste char from bins into trucks for transport to Cooljarloo, the char waste is now transferred in enclosed pneumatic tankers to the waste management plant. Here the char is pumped to enclosed bins fitted with a bag house dust collector, and metered into the stream of moist process solid waste for "pugging".

This process effectively reduces the possibility of fugitive dust emissions of char waste at the Chandala site.

Dust Complaints

Tiwest has discussed this matter previously. All complaints from the community or received via the DEP are logged, investigated and responded to promptly.

Community Liaison

The M.A.C. Committee is the official forum for community consultation. Its membership is democratic and not determined by Tiwest.

Tiwest's open door policy is genuine, but is rarely utilised by the community.

An open day is held annually and provides another means of access and consultation available to "interested residents".

Part 3 - Copy of submissions from government agencies

10/11/95 15:35 NO. 453 P001/001

Department of Minerals & Energy
Western Australia
Mining Operations Division
MINERAL HOUSE, 100 PLAIN STREET,
EAST PERTH, Western Australia 6004

FACSIMILE TRANSMISSION

NUMBER OF PAGES (including this page)	1	URGENT		ROUTINE	X

SEND TO:

NAME/TITLE	Ms Xuan Nguyen
BRANCH	
ORGANISATION	Department of Environmental Protection
FACSIMILE NO.	322 1598

SENT BY:

NAME	Mr Ian Marshman
BRANCH	RESEARCH & TECHNICAL SERVICES
FACSIMILE NO	61 9 222 3441
TELEPHONE NO	61 9 222 3651

TIWEST Chandala Synthetic Rutile Plant Debottlenecking

Officers from this Department have reviewed, for any radiological significance, the Section 46 Public Review Document on the above matter. The officers have concluded that there will be minimal radiological impact on the workforce and the environment from the proposed increased throughput in the plant as well as the proposed modifications to the plant.

Ian Marshman
Senior Scientific Officer
10 November, 1995

Western Australia
Health Department of Western Australia

RADIATION SAFETY ACT
RADIOLOGICAL COUNCIL
Address all correspondence to The Secretary

Your ref
Our ref 51103lt1.doc RS 381/89 - [6049]
Enquiries L F Toussaint

Chairman
Environmental Protection Authority
8th Floor Westralia Square
141 St George's Terrace
PERTH WA 6000

DEPARTMENT OF ENVIRONMENTAL PROTECTION
10 NOV 1995
File No 176/85/1 Initials XNG

Attention: Ms Xuan Nguyen

Dear Sir/Madam

PRODUCTION DEBOTTLENECKING TO 200Ktpa - TIWEST SR PLANT AT CHANDALA

Thank you for the Public Review Document relating to the above proposal. The points I would like to note (relating only to radiological aspects of the proposal) are as follows:

1) Page 4 -39 (Table 4-9) WASTE STREAMS

The thorium (and some cases uranium) concentrations in

a) Course rejects
b) Black tails
c) Jurien Coarse rejects

are much higher than normal background concentrations. This material must be disposed of in an acceptable manner.

2) Build-up of radionuclides in pipes, tanks, filters etc.

It will be necessary to check for any possible build-up of radionuclides (particularly in areas which are acidic) in pipes, tanks, filters, etc.

The above points should be part of a Radiation Management Plan.

Yours faithfully,

Mr D E Hutchinson
Secretary, Radiological Council
6 November 1995

c.c Mr Greg Hewson DOME

091218

Letters: Locked Bag 2006 Nedlands WA 6009
10 Verdun Street Nedlands WA 6009 Tel (09) 346 2260 Fax (09) 381 1423

FACSIMILE TRANSMISSION

Your Ref: 186/85
Our Ref: P9531301.DOC
Enquiries: Jeff Waddington
Direct Tel: (096) 22 4833 or 015 42 0902

Water Authority of Western Australia

629 Newcastle Street
Leederville 6007
Western Australia

PO Box 100
Leederville WA 6902

Tel (09) 420 2420
Fax (09) 420 3200

TO: **Ms Xuan Nguyen**
Department of Environmental Protection

FAX: (09) 322 1598

FROM: **Jeff Waddington**
Manager, Water Resource Management
Goldfields & Agricultural Region

SUBJECT: **TIWEST CHANDALA:**
SYNTHETIC RUTILE PLANT DEBOTTLENECKING PROJECT

DATE: **10 November, 1995**

TOTAL NO. OF PAGES (INCLUDE THIS PAGE): 1

Dear Xuan

These notes confirm discussions held with you previously in relation to the proposed Tiwest SR Plant Debottlenecking project at Chandala.

The proposal does not have any adverse impact on water resources, and I am happy with the level of consultation undertaken by Tiwest in relation to these issues.

The issue of the leakage from the effluent lagoons is a separate issue, and is being dealt with separately. The actions of Tiwest in relation to that matter in terms of remedial action and reporting is satisfactory. I would comment however, on the effectiveness of the monitoring system that detected the leak from the effluent lagoons. The comment at 5.5.3.2 that the monitoring programme proved very effective conflicts with comments on the underpond drainage system at 4.3.3.4 (para 2 page 4-33). If the underpond drainage had been designed and/or worked correctly, the leak may have been discovered earlier, with less contamination occurring.

As previously mentioned, the leakage issue is separate, is being adequately dealt with, and should not impact on the approval of this project.

Regards,

DEPARTMENT OF RESOURCES DEVELOPMENT

170 St George's Terrace
Perth, Western Australia

Postal Address:
PO Box 7606, Cloisters Square,
Perth, Western Australia 6850

Telephone (09) 327 5555
Fax (09) 327 5500

Your Ref: 186/85
Our Ref: R0330/93

Chief Executive
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Attention: Ms Xuan Nguyen

PRODUCTION DEBOTTLENECKING TO 200,000 TPA - TIWEST SYNTHETIC RUTILE PLANT

I refer to your letter of 12 October 1995 in relation to the Section 46 public document for the above proposal.

The Department of Resources Development supports the proposal, as it accords with Government policy to add value to the State's mineral resources through further processing. The proposed expansion will facilitate possible further investment in the Company's titanium dioxide pigment plant at Kwinana, which was recently authorised to increase capacity by 25% to 80,000 tpa.

Under the terms of the Mineral Sands (Cooljarloo) Mining and Processing Agreement Act 1988, Tiwest must seek the approval of the Minister for Resources Development for any significant expansion of its activities. That approval is, however, contingent on prior approval under the Environmental Protection Act.

DRD understands that Tiwest is complying with its licence conditions for the Chandala plant, and has given a commitment to continue to meet those conditions following the debottlenecking process.

The issue of a buffer area around the Chandala plant has been contentious in the Shire of Chittering. While a formal buffer has not been sought by Tiwest, it would be prudent to ensure there is no incompatible development in proximity to the plant in the future. DRD is a member of the Infrastructure Co-ordinating Committee, set up under the auspices of the WA Planning Commission, which is developing a State Industrial Buffer Policy. This policy will provide guidelines for the protection and long term security of the industrial activity at Chandala (which is located on rural zoned land), as well as for industry at other

locations around Western Australia. Any consideration of this matter in relation to the Tiwest plant at Chandala needs to be viewed in the context of a land use planning issue, and should be consistent with the general policy that is being developed for the State as a whole.

It is anticipated that a draft industrial buffer policy will be distributed to relevant agencies and organisations for comment in the near future.

Noel Ashcroft
DIRECTOR, SOUTH-WEST DIVISION

9 November 1995 (MIJA3016)

Appendix 6

List of submitters

NB Numbers in brackets are the original commitment numbers in the DEP's Audit Table of 27 November 1995.

Environmental Management Programme/Plan (EMP)

1. Within three months of approval of the 200,000 tpa debottlenecking project, Tiwest will submit a revised Environmental Management Plan (EMP) to the Minister for the Environment. The programme will include management procedures for noise and air emissions (particulates including fugitive dust emissions, gases and odours), surface and ground water monitoring, and disposal of liquid (waste ponds) and solid wastes, and monitoring where appropriate.
2. Tiwest will implement the EMP for the Chandala plant site, and will revise the EMP as necessary, in consultation with the Department of Environmental Protection (DEP).

Radiation Management Plan (RMP)

3. Within three months of approval of the 200,000 tpa project, Tiwest will revise the existing Radiation Management Plan (RMP) to the requirements of the Radiological Council of WA, Department of Minerals and Energy and the DEP.
4. In the revised RMP, Tiwest will include an inspection schedule to check for build-up of radionuclides in pipes, tanks, filters etc.
5. Tiwest will implement the RMP for the Chandala Plant site and will revise the RMP as necessary in consultation with the DEP, on advice from the Department of Minerals and Energy and the Radiological Council of WA.

Noise

6. Tiwest will continue with its noise monitoring programme and a programme of continuous improvement to reduce plant noise levels, in consultation with the DEP. The planned activities and results of these programmes will be reported in the annual and trienniel reports.
7. Tiwest will conduct a survey of noise emissions from the Chandala site following the debottlenecking project, and will ensure that noise emission levels form the site do not increase as a result of the project, in consultation with the DEP.
8. Tiwest will ensure that all the measures stated and assumptions made in Appendix E of the S46 Public Review Document (October 1995) are appropriately implemented.

Atmospheric Emissions (gases, particulates and odours)

9. Tiwest will continue to monitor the atmospheric conditions of the Muchea area for temperature, humidity, rainfall, evaporation, wind speed and wind direction, in accordance with the Meteorological Monitoring Plan as approved by the DEP (59:P2.1:5).
10. In the event of a process upset, Tiwest will undertake remedial action, as outlined in the EMP to the requirements of the DEP (59:P4.1:2).
11. The approved system of waste gas incineration and associated scrubbing equipment will be operated and maintained to reduce emissions of airborne contamination from the site to the requirements of the DEP.

Surface and ground water monitoring

12. Tiwest will include bicarbonate analysis in the existing surface and ground water monitoring programme at Chandala to enable the calculation of Total Dissolved Solids (TDS).

Liquid wastes

13. Tiwest will monitor the neutralisation of the acid effluent stream routinely prior to disposal of the evaporation pond, to the requirements of DEP. Measurements of water quality parameters will include pH, TDS, and select samples for specific contaminants (59:P5.2:3).

14. Tiwest will monitor stormwater runoff quality routinely to determine if any water quality changes have occurred in passing through the plant site, to the requirements of the DEP (59:P5.2:4).

Waste ponds

15. Tiwest will monitor the pond underdrain system routinely, in conjunction with shallow ground water monitoring, to differentiate the pond liquors from the underlying ground water, and monitor the quality of effluent stored within the iron oxide ponds for routine pond management to the requirements of DEP (59:P5.2:6).

16. Tiwest will construct evaporation ponds, to be underlain with a collector pipe network to intercept any leakage through the liner to the requirements of DEP (59:P5.2:5).

Management of Site Discharge

17. Tiwest will implement the approved Contingency Programme for the recovery of polluted ground water and the containment of chemical spills to the requirements of DEP (59:P5.3:8).

Solid wastes

18. Tiwest will continue with research into productive uses of the plant solid wastes, in conjunction with other synthetic rutile producers in WA, University of WA and Murdoch University in consultation with the DEP (59:P4.3:2).

19. Tiwest will dispose of synthetic rutile solid waste at the Cooljarloo mine site, as detailed in the approved Rehabilitation plan (refer Cooljarloo Mineral Sands Project ERMP) to the requirements of DEP (59:P4.3:1)

20. Tiwest will continue the transport and disposal methods for the plant solid wastes as approved by the DEP and Department of Minerals and Energy.

Site Hydrology Monitoring

21. Following commencement of plant operations, Tiwest will determine site hydrology changes that have occurred during plant construction, to the requirements of DEP (59:P5.2:9).

22. Following the commencement of plant operations, Tiwest will monitor water quality and flows of Chandala Brook as detailed in the approved plan, to the requirements of the DEP (59:P5.2:11).

23. Tiwest will report monitoring results in conjunction with all other hydrological monitoring data as required by EPA, to the requirements of DEP (59:P5.2:12).

24. Tiwest will implement contingency plans so as to recover or correct detrimental changes in water quality, to the requirements of the DEP (59:P5.2:13).

25. Tiwest will construct a "cutoff" drain so as to stop any surface water flows entering the plant site by diverting water to Chandala Brook, to the requirements of DEP (59:P5.2:14).

26. Tiwest will monitor redirected water (in P 5.2:14) including routine sampling and chemical analysis, and report results in conjunction with all other hydrological monitoring data as required by EPA, to the requirements of DEP (59:P5.2:15).

Water consumption

27. Tiwest will minimise water consumption as appropriate, including incorporating water recycle loops, to the requirements of the DEP (59:P4.2:1)

Aboriginal sites

28. Tiwest will protect aboriginal sites of significance by maintaining fencing and declaration of out of bounds areas (59:P3.1:2).

Appendix 7

Proponent's consolidated list of commitments

1. Department of Resources Development
2. Water Authority of WA
3. Department of Minerals and Energy
4. Radiological Council/Health Department of WA
5. Chittering Ratepayers Association Inc.