Brickworks Lot 6 Bushmead Road & Lots 6, 103 &151 Lakes Road, Hazelmere

Saracen Properties Pty Ltd

Report and recommendations
of the Environmental Protection Authority

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Summary and recommendations

Saracen Properties Pty Ltd propose to construct and operate a brick and tile manufacturing plant in Hazelmere, south of the Midland town centre, approximately 16 km north-east of the Perth metropolitan area. This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for the Environment on the environmental factors, conditions and procedures relevant to the proposal.

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

Relevant environmental factors

Although a number of environmental factors were considered by the EPA in the assessment, it is the EPA's opinion that the following are the environmental factors relevant to the proposal, which require detailed evaluation in the report:

(a) Vegetation communities (including Rare and Priority Flora);

(b) Hydrogen fluoride emissions;

(c) Ambient fluoride levels;

(d) Other atmospheric emissions including dust and odour;

(e) Surface and groundwater quality; and

(f) Noise.

The EPA has also provided advice in relation to ambient hydrogen fluoride levels in the Swan Valley.

Conclusion

The EPA has considered the proposal by Saracen Properties to construct a brick and tile manufacturing facility in Hazelmere.

The EPA has concluded that the proposal can be managed to meet the EPA's objectives, and thus not impose an unacceptable impact on the environment, provided there is a satisfactory implementation by the proponent of the proponent's commitments and the recommended conditions set out in Section 4 and Appendix 3.

In reaching this conclusion, the EPA has taken into consideration the fact that the environmental impacts of this proposal are manageable, and the proposed management is consistent with levels in "best practice" environmental management.

The EPA recognises that reported ambient concentrations of hydrogen fluoride in the Swan Valley have at times exceeded the EPA's *Fluoride in the Swan Valley Environmental Strategy* (EPA, 1993). However the EPA is satisfied that while this proposal will contribute to the cumulative concentrations of hydrogen fluoride in the region, the predicted contribution is likely to be very small.

The EPA recognises that the DEP will carry out investigations into the Swan Valley airshed with a view to ensuring that goals for the protection of human health and vegetation are met with respect to the operation of both existing and this proposed brick and tile plant. The conclusions of this work will be reported back to the EPA.

Recommendations

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister considers the report on the relevant environmental factors of vegetation communities including rare and priority flora; hydrogen fluoride; other atmospheric emissions including dust and odour; surface and groundwater quality; and noise as set out in Section 3.
2. That the Minister notes that the EPA has concluded that the proposal can be managed in an environmentally acceptable manner, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Section 4.
3. That the Minister imposes the conditions and procedures recommended in Appendix 3 of this report.
4. That the Minister notes that the DEP is carrying out investigations into the Swan Valley airshed with a view to ensuring that goals for the protection of human health and vegetation are met with respect to the operation of both existing and this proposed brick and tile plant. The DEP will report its findings to the EPA.

Conditions

Having considered the proponent's commitments and information provided in this report, the EPA has developed a set of conditions which the EPA recommends be imposed if the proposal by Saracen Properties to construct a brick and tile manufacturing facility is approved for implementation. These conditions are presented in Appendix 3. Matters addressed in the conditions include the following:

(a) the proponent shall fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 3; and

(b) In order to manage the environmental impacts of the project, and to fulfil the requirements of the conditions and procedures in this statement, prior to construction, the proponent shall demonstrate that there is in place an environmental management system which includes the following elements:

- environmental policy and commitment;
- planning of environmental requirements;
- implementation and operation of environmental requirements;
- measurement and evaluation of environmental performance; and
- review and improvement of environmental outcomes.

Contents

Tables

Figures

Appendices

1. Introduction and background

This report provides Environmental Protection Authority (EPA) advice to the Minister for the Environment on the environmental factors relevant to the proposal by Saracen Properties Pty Ltd, to construct and operate a brick and tile manufacturing plant in Hazelmere, south of the Midland town centre, approximately 16 km north-east of the Perth metropolitan area (Figure 1).

Saracen Properties originally submitted a proposal for a similar brick and tile plant on a site fronting Stirling Crescent and Central Avenue and located in the vicinity of the Hazelmere townsite. As a consequence of issues raised by the DEP in consultation with members of the public, the proponent selected the site considered in this report which is further from residential areas.

Following referral of the proposal at the new site to the EPA on 6 April 1998, the level of assessment was set at Consultative Environmental Review (CER). Formal assessment of the proposal was considered necessary due to the high level of public concern demonstrated in connection with the proposal at the previous site, and the potential for cumulative impacts of hydrogen fluoride emissions from existing brick and tile manufacturing plants, and this proposed plant. The CER prepared by the proponent (BSD Consulting, 1998a) was released for public review on 3 August 1998 till 31 August 1998.

A number of other brick and tile manufacturers are located in the Midland area. Current ambient air quality in Midland, and cumulative impacts of atmospheric emissions were not required to be addressed in the proponent's CER document, but were considered separately by the DEP in a report entitled *Review of ambient and cumulative studies of fluoride in the Swan Valley - A report to the Environmental Protection Authority* (DEP, 1998). This report was released for public review concurrently with the proponent's CER document.

In compiling this report, the EPA has considered the relevant environmental factors associated with the proposal, issues raised by the public, specialist advice from government agencies, the proponent's response to issues raised and the EPA's own research and expertise.

Further details of the proposal are presented in Section 2 of this Report. The environmental factors relevant to the proposal are discussed in Section 3. Conditions and procedures to which the proposal should be subject if the Minister determines that it may be implemented are set out in Section 4. Other advice, relating to existing air quality in the Swan Valley, and cumulative impacts, are discussed in Section 5. Section 6 presents the EPA's conclusions, with EPA's recommendations to the Minister presented in Section 7.

Appendix 1 contains a list of people and organisations that made submissions; references are listed in Appendix 2; recommended environmental conditions and the proponent's consolidated commitments are included in Appendix 3; and Appendix 4 includes advice from the DEP to the EPA, providing information on its review of monitoring from the existing brick and tile manufacturing operations, and further actions to be taken.

The DEP's summary of submissions and the proponent's response to those submissions has been published separately and is available in conjunction with this report.

2. The proposal

The proposed site is situated within the Hazelmere Industrial Area and is bordered by the Roe Highway, Great Eastern Highway Bypass, Bushmead Road and Stirling Crescent (Figure 1). The nearest single residences are situated 100 m to the north and west of the site and the nearest urban residential areas 1.4 km to the east and 1.5 km to the west of the site.

The proposal consists of a raw materials stockpile, a building for clay storage and mixing, a building for clay preparation (crushing and grinding), a building for storage of ground clay material, a brick and tile production building, a drainage basin, a fuel storage area, areas for

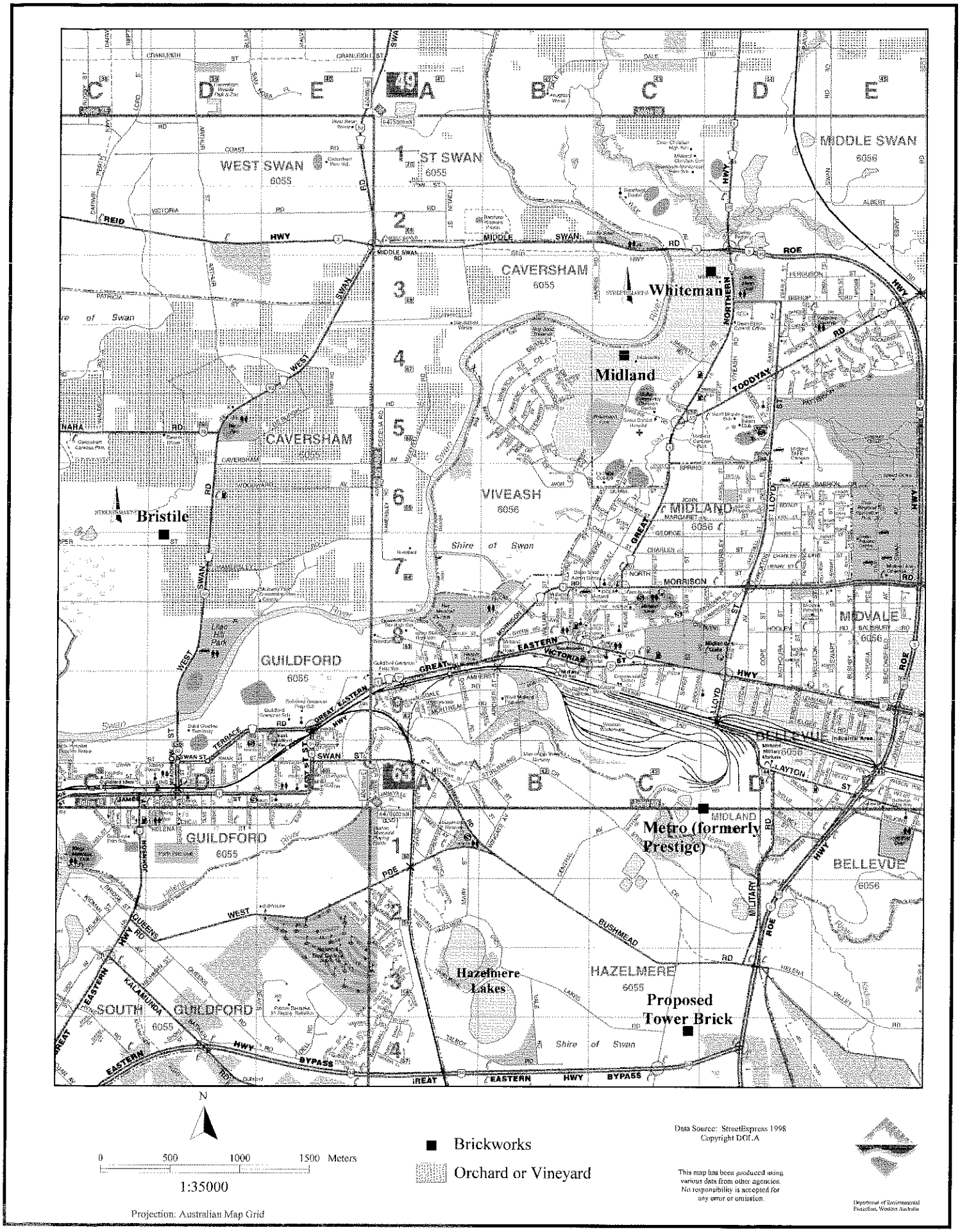


Figure 1. Proposal Location

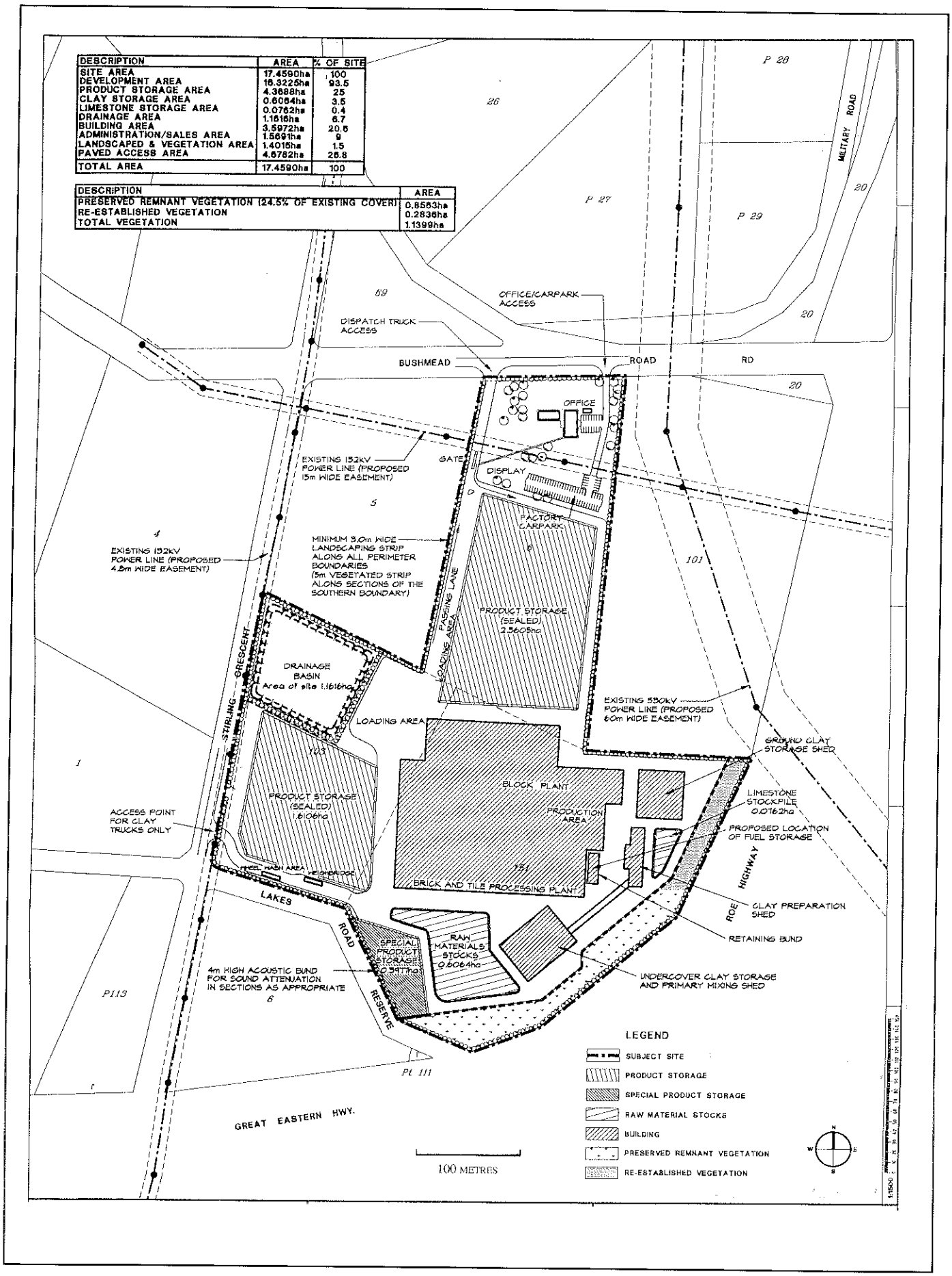


Figure 2. Plant layout.

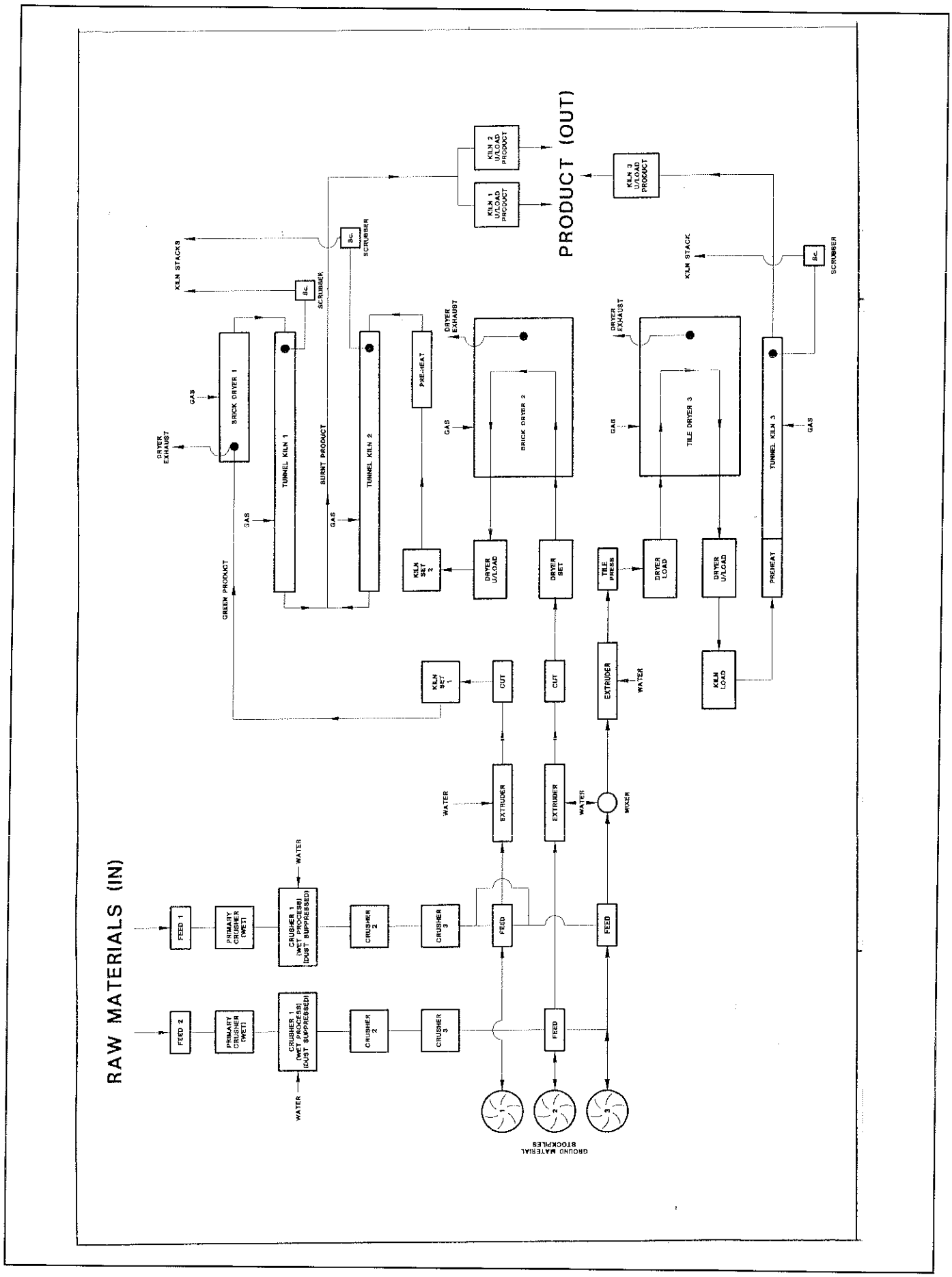


Figure 3. Process flow diagram.

product storage, carparks, weigh bridge and wheel wash facility and office buildings (Figure 2).

Plant includes up to eight crushers, three tunnel kilns and drier units, six drier stacks and three scrubber stacks equipped with dry fluoride cascade scrubbers.

The proposed plant would operate seven days a week, with kilns operating 24 hours per day. Full production would occur for only 20 hours per day, and production would cease between 2 am and 6 am each day to allow for servicing of equipment.

Total area of the site is approximately 17.5ha. The proponent has not included Lot 6 Lakes Road in the subject site.

In order to accommodate the proposal on the site, approximately 2.7 hectares of remnant vegetation to the south of the site would require clearing. An area of 0.86 hectares of the remnant will remain on the site, with a further contiguous area of approximately 1.4 hectares of remnant outside the site boundary, in the control of Main Roads WA.

The proposed development is modelled on German plants incorporating the latest technology and designs. The process involves the stockpiling of wet clay (10-15% water content), crushing, grinding and mixing of the clay, the formation of the product, initial drying of the product in two-chamber driers, which utilise heat recycled from the kilns, and gradual heating of the product to a maximum temperature of approximately 1200°C in the natural gas powered kilns.

During the firing of the clay, hydrogen fluoride, hydrogen chloride and oxides of sulphur are released. Gases from the furnaces will be passed through a Hellmich limestone cascade scrubber (or equivalent environmental performance) to reduce the concentration of hydrogen fluoride, hydrogen chloride and oxides of sulphur before being exhausted to atmosphere. Solid waste from the limestone scrubbers will be removed from the site by a contractor and disposed of at an appropriate licensed landfill. Water vapour will be exhausted to atmosphere from the drier stacks. Other minor gaseous emissions will be carbon monoxide, carbon dioxide, nitrogen oxides and volatile organic compounds.

Dust from the clay stock pile will be controlled by the use of sprinklers.

Surface water runoff from the site will be diverted to a drainage basin to precipitate sediment before discharge to the Helena River. Waste water from the wheel wash will be passed through an oil/sediment separator, from which clay and water will be recycled. Sewage will be treated on-site using aerated treatment units (ATUs) until connection with the sewer network becomes possible. All chemicals will be stored in bunded areas in case of spillage.

Noise from the site will be controlled by noise suppression measures and a sound barrier at the southern boundary of the site to reduce impacts of noise generated by mobile equipment in the clay stockpile area.

The site has been designed to allow ease of access for trucks, and major highways are adjacent to the site.

Electricity, gas and water supply services are available to the site.

The proposed development would produce 140-180 million bricks, tiles and pavers per annum which equates to an approximate daily production of 1600 tonnes of bricks, tiles and pavers. A process flow diagram for the brick and tile processing operation is presented in Figure 3.

The main characteristics of the proposal are summarised in Table 1 below.

Since the release of the CER, a number of modifications to the proposal have been made by the proponent. These include:

- increasing the stack heights to 35 metres;
- modifying the plant layout to retain a vegetation strip at the south of the site and plant an additional area of local vegetation on the eastern perimeter of the site (see Figure 3); and

- additional commitments concerning environmental management and testing and monitoring of materials and emissions.

The potential impacts of the proposal initially predicted by the proponent in the CER document (BSD Consultants 1998a) and their proposed management are summarised in Table 3.

Table 1: Summary of key proposal characteristics

Proposal Aspect	**Description**	
Site Location and area	Lot 6 Bushmead Road and Lots 103 and 151 Lakes Road, Hazelmere, Shire of Swan. Approximate area 17.5 ha.	
Timing	Construction will take approximately 15 months. Production expected to begin in June 2000.	
Plant	• 3 Tunnel Kiln and Drier units	Natural gas fired kilns fitted with waste heat recovery heated driers
	• 3 Scrubber Stack units	"Product of Combustion" exhaust stacks
	• 6 Drier Stack units	Water vapour exhaust stacks
	• 6 Drier Fan units	Low speed, centrifugal, axial controlled fans
	• 3 Fluoride Cascade Absorber units •	Calcium carbonate cascade absorbers
	• Conveying Crushing Equipment	Plant process controlled
Inputs		
Raw Materials:	• Clay soils	1800 tonnes per day
	• Manganese dioxide	100 tonnes per annum
	• Liquid fructose	300 tonnes per annum
	• Limestone	730 tonnes per annum
Utilities:	• Natural Gas	150 GJ/h
	• Electricity (operating 20 hrs/day)	8 MW
	• Electricity (operating 4 hrs/day)	4 MW
	• Scheme Water	10,000 litres per hour
	• Sewage treatment	Aerated Treatment Units (ATUs)
	• Drainage basin	25,650 cubic metres volume
	• Fuel storage in double skinned, bunded tanks	15,000 litres diesel 1500 litres various lubricants
	• Wheel wash and oil separation facility	
Outputs		
Product	Bricks, tiles and pavers	1600 tonnes per day
Solid waste	Calcium fluoride	0.5 tonnes per day
Gaseous Waste	HF	< 0.005 tonnes per day
	HCl	0.389 tonnes per day
	NO_x	0.123 tonnes per day
	SO_2	0.037 tonnes per day
	SO_3	0.003 tonnes per day
	CO	2.944 tonnes per day
	VOC	0.084 tonnes per day
	CO_2	99,000 tonnes per annum
	100% scheme water input lost through process evaporation	

3. Environmental factors

3.1 Relevant environmental factors

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

It is the EPA's opinion that the following are the environmental factors relevant to the proposal, which require detailed evaluation in this report:

(a) Vegetation Communities (including Rare and Priority Flora);

(b) Hydrogen fluoride emissions;

(c) Ambient fluoride levels;

(d) Other atmospheric emissions including dust and odour;

(e) Surface and groundwater quality; and

(f) Noise.

The above relevant factors were identified from the EPA's consideration and review of all environmental factors (preliminary factors) generated from the CER document and the submissions received, in conjunction with the proposal characteristics (including significance of the potential impacts), the adequacy of the proponent's response and commitments, the effectiveness of current management and alternative approval processes which ensure that the factors will be appropriately managed. On this basis, the EPA considers that the factors:

- Specially Protected Fauna;
- Light;
- Traffic impacts; and
- Aboriginal culture and heritage

and other issues raised in the submissions do not require further evaluation by the EPA because it has been demonstrated that they can be adequately managed. The identification process is summarised in Table 2.

The relevant environmental factors are discussed in Sections 3.2 to 3.7 of this report.

3.2 Vegetation Communities (including Rare and Priority Flora)

Description

The site is predominantly cleared, but remnant vegetation remains at the south of the site. The remnant area extends into the Road Reserve for the Great Eastern Highway Bypass and Roe Highway. The total area of the remnant is approximately 5ha, with approximately 3.5ha within the proposal site boundary. The remnant is not identified in Perth's Bushplan. Remnant bushland in Hazelmere occurs on the boundary between the Southern River Vegetation Complex and the Guildford Vegetation Complex (BSD Consulting, 1998a). Of the Southern River Vegetation Complex, 17% of the original area remains on the Swan Coastal Plain portion of the Perth Metropolitan Region, while 6% of the original area of the Guildford Vegetation Complex remains (Government of Western Australia, 1998).

Table 2: Identification of Relevant Environmental Factors

FACTOR	RELEVANT AREA	PROPOSAL CHARACTERISTICS	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT FACTORS
Vegetation Communities	Remnant vegetation communities in southern area of Lot 151 Bushmead Road.	Site is predominantly cleared, but remnant vegetation in the south includes two endangered ecological communities and a critically endangered ecological community. The remnant area extends into the Road Reserve for the Great Eastern Highway Bypass and Roe Highway. The site is not included in Perth's Bushplan.	**Government:** • DEP Conservation Branch concerned that site plan results in destruction of approximately 3 hectares of remnant vegetation; and that • noise bund will cause destruction of native vegetation. **Public:** • landscaping should use locally occurring species of type removed in remnant vegetation area; and • flora adjacent to the site (in road reserve) may be adversely affected by fluoride.	**Considered to be a relevant factor.**
Rare and Priority Flora	Remnant vegetation communities in southern area of Lot 151 Bushmead Road.	No gazetted rare flora found, but one Priority 3 species (*Lambertia multiflora* subsp. *darlingensis*) identified in the study area.	**Government:** • DEP Conservation Branch concerned that winter flora survey may not have identified certain species. **Public:** • Smoke Bush *Conospermum acerosum* exists on the site and is not commonly located in the Perth Metropolitan area.	Addressed in part under Vegetation communities factor. Spring survey was carried out to identify the presence of species not seen in Winter. **Factor does not require further EPA evaluation.**
Specially Protected Fauna	Remnant vegetation communities in southern area of Lot 151 Bushmead Road.	No rare or endangered fauna identified on site.	**Government:** • DEP Conservation Branch indicated that site is likely to be a habitat for reptile and invertebrate species as well as birds. **Public:** • bandicoots have been seen by local residents, and indicate that native fauna live on the site.	**Factor does not require further EPA evaluation.**

FACTOR	RELEVANT AREA	PROPOSAL CHARACTERISTICS	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT FACTORS
Hydrogen fluoride emissions	Area surrounding the plant site and the Swan Valley area.	Hydrogen fluoride is a byproduct of the clay firing process. Goals for protection of vegetation have been set by ANZECC, and adopted as objectives in the EPA's Fluoride in the Swan Valley Environmental Strategy (1993). The emissions from this proposal are expected to be very low, due to the inclusion of a cascading limestone absorption scrubber. Maximum concentration of HF from this proposal will be 5mg/m^3, with maximum total mass emission rate of 0.145g/s. Bypass of the scrubber, allowing direct emission of exhaust to the atmosphere will not be possible. In the event of a failure in the scrubbing system, kilns will be automatically shut down, and gases contained within the kilns until the problem has been rectified. A monitoring and action programme for gaseous emissions will be included in the Environmental Management Programme to be submitted by the proponent following approval.	**HYDROGEN FLUORIDE EMISSIONS** **Government:** • Health Dept mentioned that proponent should present case studies demonstrating that the technology to be used in the plant is capable of reducing fluoride emissions. **Public:** Existing brick manufacturers suggested that: • fluoride emissions have been understated in the CER; • claims made in the CER relating to fluoride retention in clay should be substantiated for local clays; and • emission levels of HF will vary depending on fluoride content of clay; **SCRUBBER EFFICIENCY** **Government** • DEP requested information to demonstrate that the proposed limestone cascade absorber is capable of the required efficiency of removal of hydrogen fluoride. **Public** • Existing brick manufacturers suggested demonstration needed on how proposed scrubbers will outperform similar systems in existing brick and tile plants; • Concern that less efficient local limestone will be used if more efficient German limestone becomes unavailable.	**Considered to be a relevant factor.**

FACTOR	RELEVANT AREA	PROPOSAL CHARACTERISTICS	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT FACTORS
Ambient fluoride levels	Area surrounding the plant site and the Swan Valley area.	The proposal is to be sited in the Swan Valley, where 4 other brick and tile manufacturing plants already operate. Reported ambient levels of hydrogen fluoride already exceed EPA Strategy objectives on some occasions in areas close to the existing brick plants.	**HYDROGEN FLUORIDE EMISSIONS** **Government:** • DEP Air Quality Management Branch stated that there is an existing problem with cumulative fluoride impacts in the Swan Valley, as seen in exceedences of ANZECC goals. This proposal will add further hydrogen fluoride to the airshed. This issue is dealt with outside the proponent's CER document. • Air Quality Management Branch indicated that it would be appropriate for the proponent to participate in a hydrogen fluoride and hydrogen chloride impact study and industry management plan for the region if one is deemed appropriate by the EPA/DEP. **Public:** Existing brick manufacturers suggested that: • discrepancy in modelling results shown in DEP's Review of ambient and cumulative studies of fluoride in the Swan Valley indicates that the model will not predict ground level concentrations accurately from the proposed plant. Other submissions raised concerns over health effects of fluoride in humans. **OTHER ISSUES** **Public** • Air dispersion modelling based on Caversham meteorological data is not applicable to the Hazelmere and Helena Valley area; and • Concern that fluoride in forage may affect cattle, and milk used for human consumption.	**Considered to be a relevant factor**

FACTOR	RELEVANT AREA	PROPOSAL CHARACTERISTICS	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT FACTORS
Other atmospheric emissions including dust and odour.	Swan Valley region.	Gaseous chlorine compounds, sulphur dioxide and sulphur trioxide result from clay firing. Of these, hydrogen chloride is generally considered the most significant. Limestone absorption scrubbers employed for the removal of hydrogen fluoride will also remove HCl. Other gaseous emissions include NOx, CO_2 and volatile organic compounds (VOCs). Clay will be stockpiled on site, and loaded into the plant using front-end loaders. Stockpiles, dried clay on vehicle tyres, and loading operations are potential fugitive sources of dust. Since the kilns are gas fired, exhausts are not expected to include significant particulate content.	**Government:** DEP suggested that: • proponent should demonstrate after commissioning, that no significant atmospheric wastes are released from drier stacks; • proponent should commit to remedial action in the event that the NH&MRC guideline for HCl of 0.4g/m^3 is not met; • low NOx burners should be required as part of best practice emissions control; and • anticipated VOC emission levels should be quantified. **Public:** • Airport concerned that proposal is in flight path for Perth Airport, and emissions must not impact on operations or flights; • brick kiln practices such as "flashing" to clean stacks, and operating in a reducing environment to produce certain colour effects result in higher emissions of some gases (eg CO); • existing brick manufacturers suggest CER overestimates removal efficiencies of scrubbers for HCl and SOx; • moisture content of stockpiles should be maintained, and dust managed to prevent offsite impacts; and • proponent should verify (and if necessary rectify) odour complaints if they arise.	**Considered to be a relevant factor.**

FACTOR	RELEVANT AREA	PROPOSAL CHARACTERISTICS	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT FACTORS
Surface and groundwater quality	Groundwater beneath site, surface water and groundwater hydrology of Helena River and Hazelmere Lakes.	Drainage is predominantly to the Helena River approximately 700m to the north of the site. Drainage basin in west of site will provide drainage for the proposal area as well as adjacent lots. Basin is designed to accommodate flood events and to allow for settlement of fine particulates. Potential impacts on groundwater include spills of petrochemicals (such as fuels) stored onsite. Stormwater and waste water are likely to contain fine suspended particulates, due to the use of clay on site. Wastewater could also potentially be contaminated by oils, as mobile equipment will be washed regularly as a dust management measure. A monitoring and action programme for surface and groundwater will be included in the Environmental Management Programme to be submitted by the proponent following approval.	**Government:** WRC provided the following comments: • no direct discharge of stormwater to the Helena River should be allowed; • suspended load with high clay content would require regular conditioning and basin should be designed to allow for infiltration; • waste water may require filtration to prevent fine suspended material entering the Helena River; • proponent should determine baseline groundwater quality and conditions prior to development; • proponent should undertake monitoring of discharge waters from retention basin; and • management of petrochemical products stored onsite. Western Power commented that drainage basin must not interfere with Western Power line easement to west of site. **Public:** • Cons Council suggested storage of sewage on site has potential for impact on groundwater; • site drains to System 6 areas; and • truck wash-down water will contain oil which could contaminate groundwater.	**Considered to be a relevant factor.**

FACTOR	RELEVANT AREA	PROPOSAL CHARACTERISTICS	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT FACTORS
Noise	Area surrounding site including closest residences.	Surrounding land use is industrial to north west of site, and rural to south and east, with 2 residences within 100m of the site. • The CER indicates that noise sources on site will include stack, scrubber and drier exhausts, mobile equipment including front end loaders and scrubber fans. • Potential for significant noise impacts also exists from heavy vehicles in the delivery of clay to the site, and in the dispatch of product. Assigned noise levels at closest residences range from 38dB(L_{Amax}) at residences to the south and east of the site, 44dB(L_{Amax}) at the residence to the west, to 48dB(L_{Amax}) at the closest residence to the north of the site. An implementation programme for noise reduction measures will be included in the Environmental Management Programme to be submitted by the proponent following approval.	**Government:** • DEP required that further noise modelling be undertaken in accordance with the EPA draft Guidance for Assessment of Environmental Factors No 8 - Environmental Noise. The proponent has supplied this study to the DEP. **Public:** • modelling undertaken for CER does not include clay crushers; and • concern that noise assessment did not include consideration of reversing alarms on mobile equipment and noise due to tip truck tailgates, and trucks turning into the site from a stationary start.	**Considered to be a relevant factor.**
Light	Area surrounding and above site in airport flightpath.	Proposal is for a 24 hour operation, and will require lighting at night. Management of light sources will be included in the Environmental Management Programme to be submitted by the proponent following approval.	**Public:** • maximum intensity of any light source on the site, measured at 3 degrees above horizontal must not exceed 150 candela to prevent interference with aircraft.	Controlled by statutory Regulations under the Commonwealth *Air Services Act 1995*. **Factor does not require further EPA evaluation.**

FACTOR	RELEVANT AREA	PROPOSAL CHARACTERISTICS	GOVERNMENT AGENCY AND PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT FACTORS
Traffic impacts	Regional road network.	Proponent anticipates that delivery of raw materials and dispatch of product will result in 130 heavy vehicles per day. These vehicles would be expected to use major roads such as Great Eastern Highway Bypass and Roe Highway, and therefore is not expected to have a significant impact on traffic volume or noise in the area.	**Government**: • Transport concerned with potential for product dispatch trucks to use routes through residential areas or roads not designed for heavy vehicles. **Public**: • Existing brick manufacturers suggest that CER underestimates traffic impacts - heavy vehicle movements will not be evenly distributed throughout the day. • Public concerned with road safety issues.	Proponent commits to implementing measures to ensure that contracted heavy vehicles will not travel through residential areas. **Factor does not require further EPA evaluation.**
Aboriginal culture and heritage	Subject site.	An archaeological survey was undertaken within the proposed site. Two archaeological sites were identified through the Interim Register of sites at the Aboriginal Affairs Department. A detailed archaeological survey did not find any evidence of these sites, but identified two new sites outside the subject area.	No comments received.	Proponent commits to protecting archaeological sites to the requirements of the *Aboriginal Heritage Act.* **Factor does not require further EPA evaluation.**

OTHER ISSUES				
Land use issues	Subject site.	Proposal falls within an area zoned for industrial use. Residential areas in the immediate region include Hazelmere, approximately 1500m to the north west, and Helena Valley, approximately 1200m to the east. Individual residences exist closer to the site. Area of proposed site is approximately 20 ha. The proposal includes three tunnel kilns (including scrubbers, driers and crushers), raw material stockpiles, product stockpiles and drainage basin. No clay extraction will occur on site.	**Public:** • Nearest residence is 100m from site which does not comply with EPA draft guidance on industrial - residential buffers. • Proposal would detract from ambience of Helena Valley area. • Proposal will not create as much employment as smaller transport-based industries would. • Plant will reduce property values in Hazelmere and Helena Valley.	Proponent commits to establishing community liaison and complaints management procedures. **Factor does not require further EPA evaluation.**

Table 3: Summary of Assessment of Relevant Environmental Factors

FACTOR	RELEVANT AREA	EPA OBJECTIVES	EPA's ASSESSMENT	EPA's ADVICE
Vegetation Communities	Remnant vegetation communities in southern area of Lot 151 Bushmead Road.	Given that the proposed site is located in an industrial zoned area, and the remnant vegetation at the site is not included in Perth's Bushplan, the EPA's objective for this proposal in regard to vegetation communities is to maintain as far as practicable, the abundance, species diversity, geographic distribution and productivity of vegetation communities.	The area includes threatened vegetation communities, and is subject to a number of pressures including: • invasive weeds; • small size of remnant; and • frequent fires. **Proponent Commitments:** • Southern boundary of the site will be modified as in Attachment 4 to protect all of vegetation community A1 (endangered) and a continuous (approx 40m) strip including communities A2 (low risk), C1(endangered) and B1 (critically endangered). • A portion of the eastern boundary of the site will be revegetated with local vegetation species. • Explore other practicable opportunities to minimise clearance of remnant vegetation. • Enter into a conservation covenant with Main Roads WA, the responsible agent for the adjacent road reserve. The EPA considers that without active measures to protect the vegetation, the environmental values would be lost. The EPA considers the portion to be removed is acceptable if the proponent seeks to enter a conservation covenant to satisfaction of DEP, if Main Roads commits to such a covenant.	Having particular regard to: • the zoning of the site, that the remnant is not included in Perth's Bushplan, and the potential threats to the viability of the remnant even if the proposal is not implemented; • the reduction in the area of remnant vegetation impacted; and • the proponent's commitments, it is the EPA's opinion that the proposal can be managed to meet the EPA's objective provided that the proponent's commitments are made legally enforceable.

FACTOR	RELEVANT AREA	EPA OBJECTIVES	EPA's ASSESSMENT	EPA's ADVICE
Hydrogen fluoride emissions	Area surrounding the plant site and the Swan Valley area	(i) to ensure that hydrogen fluoride emissions are such that emission objectives of the EPA Strategy are met; and (ii) Use "best practice management" measures to minimise the discharge of hydrogen fluoride emissions.	The EPA considers that the proponent has provided sufficient information to confirm that the proposed limit of 5mg/m^3 (0.145mg/s) can be achieved. The EPA notes that: • this limit will be enforced through licence requirements; and • the proponent has committed to implement necessary contingency measures in the event that emission targets are not achieved. The EPA also notes that if this brickworks proposal is implemented, modelling predicts that near existing brick manufacturers, there will be a 0.6% increase in hydrogen fluoride levels, averaged over 90 days, in the area. No increase is predicted for maximum ground level concentrations near existing brick plants for averaging periods less than 7 days. The EPA understands that the DEP will be taking steps to verify the data which has been collected in the Swan Valley area, including emission rates from existing brick manufacturers and ambient monitoring results, and taking appropriate actions. **Proponent Commitments:** • Undertake detailed chemical analysis of local clays. • design appropriately sized scrubbers on all kilns to achieve maximum emission concentrations of 5mg/m^3 for hydrogen fluoride. • monitor scrubber stack exhaust gases and undertake remedial action if scrubber performance is not achieved. • Proponent will verify that there are no gaseous emissions from drier stacks.	Having particular regard to: • the proposed efficiency of the hydrogen fluoride scrubber; • the proponent's commitments to meet emission targets through design of sufficiently sized scrubbers and operation of scrubbers to ensure maximum possible efficiency of fluoride removal; • the proponent's commitments to undertake monthly stack monitoring in conjunction with random monitoring; and • the ability for hydrogen fluoride emissions to be managed under Part V of the Environmental Protection Act 1986 through appropriate placing of licence conditions, it is the EPA's opinion that the proposal can be managed to meet the EPA's objectives in regard to hydrogen fluoride emissions.
Ambient fluoride levels	Area surrounding the plant site and the Swan Valley area	Ensure that hydrogen fluoride emissions, both individually and cumulatively, meet the EPA Strategy objectives.	The EPA also notes that if this brickworks proposal is implemented, modelling predicts that near existing brick manufacturers, there will be a 0.6% increase in hydrogen fluoride levels, averaged over 90 days, in the area. No increase is predicted for maximum ground level concentrations near existing brick plants for averaging periods less than 7 days. The EPA understands that the DEP will be taking steps to verify the data which has been collected in the Swan Valley area, including emission rates from existing brick manufacturers and ambient monitoring results, and taking appropriate actions. **Proponent Commitments:** • To participate in studies of hydrogen fluoride and hydrogen chloride generated by brick manufacturers if required by the DEP/EPA.	Having particular regard to: • the small contribution of the proposed brick and tile plant to total hydrogen fluoride emissions in the Swan Valley; and • the actions to be undertaken by the DEP, independent of this proposal, in regard to emissions from existing brick and tile plants, it is the EPA's opinion that the proposal can be managed to meet the EPA's objectives in regard to ambient hydrogen fluoride levels.

FACTOR	RELEVANT AREA	EPA OBJECTIVES	EPA's ASSESSMENT	EPA's ADVICE
Other atmospheric emissions including dust and odour	Swan Valley Region	Ensure that gaseous emissions, odour and dust levels do not adversely affect the environment or health, welfare and amenity of nearby land users by meeting the statutory requirements (including Section 51 of the EP Act) and acceptable standards.	The EPA considers that the proponent has provided sufficient information to confirm that other gaseous emissions can be managed to meet appropriate criteria. The EPA notes that: • limits may be enforced through licence requirements; and • the proponent has committed to appropriate monitoring of VOCs, odour and other gaseous emissions. **Proponent's commitments;** • design appropriately sized scrubbers on all kilns to achieve maximum emission concentrations of 200mg/ m^3 for hydrogen chloride. • hydrogen chloride emissions will be limited to NH&MRC guidelines. • Undertake testing to characterise VOCs. • Proponent will perform verification and rectification of odour if complaints arise. • Proponent will participate in a hydrogen fluoride and hydrogen chloride impact study and industry management plan for the region if one is deemed appropriate by the EPA/DEP in the future. • Establish and implement dust control procedures on site, including wheel-washing facilities for heavy vehicles leaving the site. • Consider entering the Commonwealth Government's Voluntary Greenhouse Challenge following plant startup.	Having particular regard to: • the proponent's commitments to meet emission targets; • factor can be managed under Part V; and • the proponent's commitments to develop and implement dust control procedures, it is the EPA's opinion that the proposal can be managed to meet the EPA's objectives in regard to other gaseous emissions and dust.
Noise	Area surrounding site including closest residences.	To protect the amenity of nearby residences from noise impacts by ensuring noise meets reasonable criteria.	**Proponent Commitments:** • final plant design will incorporate appropriate noise control measures to ensure compliance with the assigned noise emission levels. • The proponent will implement, as part of the Environmental Management Programme, a community liaison and complaints management procedure to facilitate dialogue between local residents and appropriate plant management to address any issues arising in regard to noise generation.	Having particular regard to: • the proponents commitments to comply with assigned noise levels, it is the EPA's opinion that the proposal can be managed to meet the EPA's objective for noise.

FACTOR	RELEVANT AREA	EPA OBJECTIVES	EPA's ASSESSMENT	EPA's ADVICE
Surface and groundwater quality	Groundwater beneath site, surface water and groundwater hydrology of Helena River and Hazelmere Lakes.	• Maintain the quality of surface water so that existing and potential uses, including ecosystem maintenance, are protected • Ensure that the beneficial uses of groundwater can be maintained, consistent with the draft WA Guidelines for Fresh and Marine Waters (EPA, 1993)	Drainage basin is sized sufficiently to cope with 1 in 10 year storm events as required by Shire, and also has sufficient capacity to allow settling of fine suspended particulates. In addition, proponent will install oil separators where waste stream may be contaminated. **Proponent's Commitments**: • proponent will undertake water quality monitoring of the detention basin, and any outflow, to compare with existing water quality data. If this identifies a need for additional treatment other than sedimentation, this will be incorporated following Water and Rivers Commission advice. Outflow will be designed such that these measures can be incorporated at a later date if required. • proponent will measure existing groundwater conditions on site and undertake ongoing monitoring following development as appropriate. • proponent will report any significant petrochemical spill to the appropriate authorities and remediate subsurface and surface conditions in the event of a spill.	Having particular regard to: • the proponents commitments with regard to water quality protection and monitoring; and • large capacity of drainage basin, it is the EPA's opinion that the proposal can be managed to meet the EPA's objective for surface and groundwater quality.

Five vegetation communities were identified, A1 (Gibson et al Floristic Community Type 20a), A2 (Community Type 23a), B1 (Community Type 3a), B2 (Community Type 9) and C1 (Community Type 10a) (BSD Consulting, 1998). A1 and C1 are classified as endangered ecological communities and B1 as a critically endangered ecological community (English & Blyth, 1997). In addition one Priority 3 species, *Lambertia multiflora* subsp. *darlingensis* was identified in communities B1 and C1. *Conospermum acerosum* subsp. *acerosum*, an uncommon species in Metropolitan Perth, was recorded from plant community A1 (see Figure 4).

Submissions

Concerns were raised in submissions that the site plan would result in the destruction of a large proportion of the area of remnant vegetation including Threatened Ecological Communities, and that construction of the noise barrier would cause destruction of native vegetation. Submissions expressed concern that spring flowering species may have been overlooked in the original survey carried out by the proponent in the winter. Additionally, concern was raised that flora adjacent to the site (in the road reserve) may be adversely affected by fluoride. It was requested that any landscaping on the site should use locally occurring species of the types removed in the clearing of remnant vegetation.

Assessment

The area considered for assessment of this factor is that covered by the remnant vegetation communities in the southern area of Lot 151 Bushmead Road.

Given that the proposed site is located in an industrial zoned area, and the remnant vegetation at the site is not identified in Perth's Bushplan, the EPA's objective for this proposal in regard to vegetation communities is to maintain, as far as practicable, the abundance, species diversity, geographic distribution and productivity of vegetation communities.

The proponent carried out a spring survey of the vegetation remnant, and included the report in their response to submissions documentation. This survey confirmed the presence of live specimens of the Priority 3 species *Lambertia multiflora* subsp. *darlingensis* in Vegetation Communities B1 and C1.

In assessing this environmental factor, the EPA recognises that the significance of the remnant vegetation communities was identified during the flora surveys undertaken both during preparation of the proponent's CER document and during a following spring survey (provided as an appendix to the proponent's response to submissions). Upon recognising the significance of the remnant, the proponent altered the site design to allow for protection of 0.86ha of the 3.5ha area of vegetation within the site boundary, and contiguous with the remnant remaining in the adjacent road reserve. Further alterations were then made following discussion with the DEP which also allow for revegetation of a 0.28ha area to the north of the existing A1 area (refer to Figure 2). Constraints to further alteration of site design include:

- need for sufficient product storage area;
- size of kilns;
- need for sufficient area to allow for efficient movement of vehicles on site; and
- requirement for the drainage basin to be included on the site, and for this basin to be sized to allow for drainage of all lots bounded by Bushmead Road, Stirling Crescent, Great Eastern Highway Bypass and Roe Highway, in addition to the proposal area, and for the basin to be sized to allow for sedimentation of fine particulate clay material.

The EPA recognises the consideration the proponent has already given to altering site layout to minimise the area of remnant vegetation to be cleared, and the constraints already existing on the area available for the proposal.

The EPA further notes the proponent's commitment to preserve as far as practicable, the remnant vegetation through design and layout of the plant in addition to that already identified during design and layout of the plant and indicated in Figure 2.

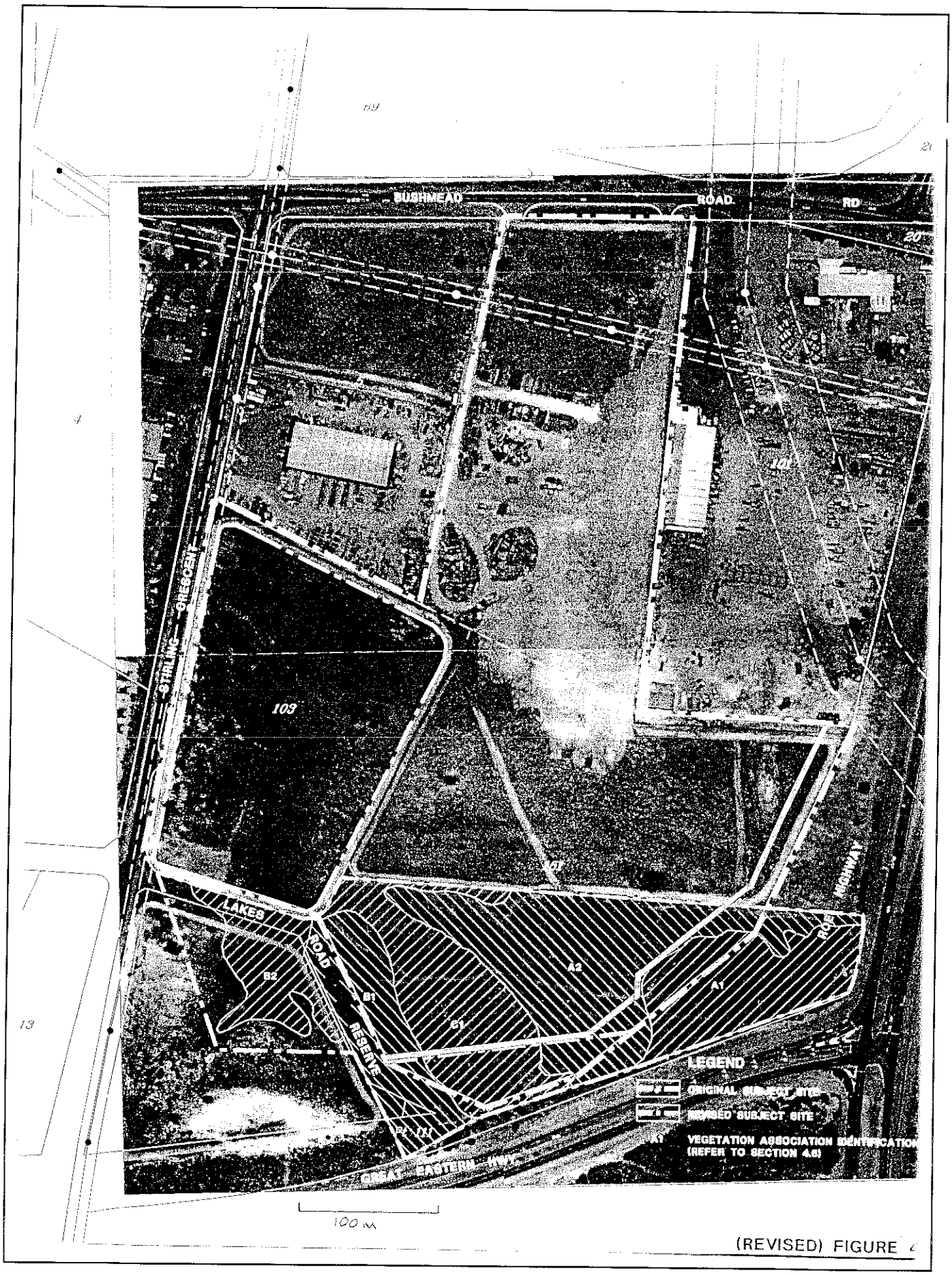


Figure 4. Vegetation communities.

The noise bund will be constructed around the clay stockpile area to the south of the site, within the site boundary. The ground area required for the barrier will be minimised by constructing a combination wall/earthen bund.

Local flora species will be used in landscaping around the perimeter of the site.

The EPA recognises that criteria for ambient concentrations of hydrogen fluoride are set to protect vegetation from fluoride damage. As the proposal will be required to meet ambient objectives for hydrogen fluoride, no damage to surrounding vegetation is expected.

Having particular regard to:

(a) the zoning of the site, that the remnant is not identified in Perth's Bushplan, and the potential threats to the viability of the remnant even if the proposal is not implemented;

(b) the proponent's reconfiguration of the site layout and consequent reduction in the area of remnant vegetation impacted; and

(c) the proponent's commitment to preserve as much as practicable the remnant vegetation in addition to that already identified during design and layout of the plant,

it is the EPA's opinion that the proposal can be managed to meet the EPA's objective for vegetation communities including rare and priority flora, given that the proponent's commitments are legally enforceable.

3.3 Hydrogen fluoride emissions

Description

Hydrogen fluoride (HF) is a byproduct of brick making. Some of the fluoride naturally occurring in the clay is released as hydrogen fluoride during the clay firing process. The hydrogen fluoride generated in the kilns is passed through a limestone cascade scrubber, where fluoride is absorbed as calcium fluoride. Limestone is continually fed to the scrubber from a silo at the top and removed from the scrubber at the bottom. The removed limestone enters a peeling drum where the thin layer of softer calcium fluoride material on the surface is knocked or peeled off. The smaller limestone material (less than 2mm in diameter) then passes through a sieve, being rejected to a waste bin. The remaining limestone granules are returned to the top of the silo by pneumatic conveyor. The waste calcium fluoride will be disposed of to a licensed landfill site. Any hydrogen fluoride not absorbed in the scrubber is vented to atmosphere with other waste gases through the stacks.

Standards for hydrogen fluoride

Hydrogen fluoride can have a damaging effect on vegetation and may affect susceptible plant species at concentrations in air of about 0.5 µg HF/m^3 after continuous periods of exposure of several weeks (Doley, 1986). Hydrogen fluoride can have an adverse effect on human health at higher concentrations. On the basis of occupational health standards for fluoride, a value of 89 µg HF/m^3 over 24 hours using the Victorian EPA method of calculating can be adopted for the protection of sensitive individuals (DEP, 1998).

Goals for protection of vegetation have been set by ANZECC (ANZEC, 1990), and adopted as objectives in the EPA's *Fluoride in the Swan Valley Environmental Strategy* (1993). The concentrations are adopted as objectives to protect vegetation from damage and are much more stringent than those recommended to protect human health. General Land Use (including residential) goals are designed to protect most of the sensitive plant species in the natural environment, while Specialised Land Use goals are used in the consideration of commercially valuable plant species, which have been demonstrated to be very sensitive to fluoride (ANZEC, 1990).

Orchard and vineyard areas marked on Figure 1, and areas corresponding to the Shire of Swan zoning "Swan Valley Rural" are subject to Specialised Land Use goals (DEP, 1998).

The objectives are as follows:

Table 4: Ambient air goals for fluoride

Averaging Time	Maximum acceptable average ambient fluoride concentrations (µg HF/m^3) *	
	General Land Use	Specialised Land Use
12 Hours	3.7	1.8
1 day	2.9	1.5
7 days	1.7	0.8
30 days	0.84	0.4
90 days	0.5	0.25

* concentrations are expressed at 0°C and 101.3 kPa

Fluoride absorbers

The emissions from this proposal are expected to be very low, due to the inclusion of the cascading limestone absorption scrubbers. It is predicted that the maximum concentration of hydrogen fluoride from this proposal will be 5 mg/m^3, with maximum total mass emission rate of 0.145 g HF/s. In contrast, the EPA's Strategy objectives for fluoride in the Swan Valley include that industry should strive to achieve a fluoride total mass emission rate of 0.7 g HF/s. Total mass emission rates from existing brick manufacturers in the Swan Valley range from 0.1 to 1 g HF/s depending on throughput and emission control equipment (DEP, 1998). This proposal presents a significant improvement on the EPA's objective.

Current licensed throughput and licensed maximum emission rates are compared with this proposal in the table below:

Table 5: Comparison of existing licences and proposed levels of hydrogen fluoride emission

Brick plant	Licensed * throughput tpa	Licensed * maximum mass emission rate g/s	grams HF per tonne fired product (Licensed figures)	Licensed * maximum HF concentration mg/m^3
Midland Brick	1 040 000	1 (0.8 g/s 80% of time)	30	30
Whitemans	350 000	0.6	54	5
Metro Brick	166 000	1	190	20
Bristile Clay Tiles	85 000	0.6	223	not licensed
Tower Brick	584 000 (1)	0.145 (2)	8 (2)	5 (2)

* Data based on published, licence limits.
Actual throughputs and emissions are expected to be below these values
(1) 1600 tpd (BSD Consulting, 1998a)
(2) Proposed

This table, based on licence allowances only, indicates that in terms of grams of hydrogen fluoride produced each year per tonne of fired product, the proposed brick and tile plant has demonstrated best environmental practice.

Bypass of the scrubber allowing direct emission of exhaust to the atmosphere will not be possible.

Submissions

Submissions raised concerns that fluoride emissions have been understated in the CER, due to various factors such as local clays containing high fluoride levels and fluoride retention rates in the product not being accurately known. Another matter of concern was that the scrubber may not attain the predicted efficiency or that less efficient limestone than proposed in the CER may be used. It was suggested that the proponent should present further information on the scrubber, scrubber maintenance and case studies demonstrating that the technology to be used in the plant is capable of reducing fluoride emissions to the levels predicted.

Assessment

The area considered for assessment of this factor is the area surrounding the plant site and the Swan Valley area.

The EPA's objective in regard to this environmental factor is:

i) to ensure that hydrogen fluoride emissions are such that emission objectives of the EPA Strategy are met; and

ii) to use "best practice management" measures to minimise the discharge of hydrogen fluoride emissions.

The proponent provided results of tests of scrubber efficiency for an operating plant in Europe as a confidential appendix to their response to submissions. This information, and mass balance calculations undertaken by the DEP, based on information in the CER, indicates that the EPA's objectives are able to be met. Furthermore, the proponent has committed to a number of remedial actions in the event that removal rates of hydrogen fluoride are not achieved. Based on this information, and on the DEP's calculations using figures provided in the CER, the EPA is satisfied that the proponent will be able to meet the emission rates and total mass emission limits outlined in the CER provided that the scrubber properly maintained, an appropriate scrubbing medium is used, and the scrubbers are sized appropriately for Western Australian clays. The scrubbers proposed for this plant use a process consistent with current technology installed at existing plants in the area, but the capacity of the proposed scrubber will be greater.

The proponent has committed to various contingency measures in the event that emission limits are exceeded. These include:

- modification of operational processes such as firing temperature, air flow, kiln setting pattern;
- injection of calcium hydroxide powder to the flue gas stream;
- use of calcium hydroxide pellets; and
- installation of more scrubber modules.

A monitoring and action programme for gaseous emissions will be included in the Environmental Management Programme to be submitted by the proponent following approval.

On the basis of cumulative air dispersion modelling, the EPA considers that the contribution of 0.6% from this proposal (DEP, 1998) to the total hydrogen fluoride in the airshed will be minimal. Ambient fluoride levels are discussed in Section 3.4, and actions relating to existing ambient air quality are discussed further in Section 5.

Having particular regard to:

(a) the effectiveness of the proposed hydrogen fluoride scrubber and available contingencies;

(b) the proponent's commitments to meet targets for emission rates and hydrogen fluoride concentrations through design of sufficiently sized scrubbers and operation of scrubbers to ensure maximum possible efficiency of fluoride removal;

(c) The proponent's commitments to undertake monthly stack monitoring in conjunction with random monitoring; and

(d) the ability for hydrogen fluoride emissions to be managed under Part V of the *Environmental Protection Act 1986* through appropriate placing of licence conditions

it is the EPA's opinion that the proposal can be managed to meet the EPA's objectives in regard to hydrogen fluoride emissions.

3.4 Ambient fluoride levels

Description

DEP Report on ambient and cumulative studies for hydrogen fluoride

The DEP undertook a review of ambient air quality and predicted cumulative hydrogen fluoride levels from brick manufacturers, as there are currently four other brick and tile manufacturing plants operating in the Swan Valley, the DEP prepared a report, *Review of ambient and cumulative studies of fluoride in the Swan Valley* (DEP, 1998), presenting results of ambient monitoring of hydrogen fluoride for existing brick manufacturers in the Swan Valley.

The report showed that reported ambient levels of hydrogen fluoride exceed EPA Strategy objectives on some occasions in areas close to the existing brick plants. Figures showing occasions of exceedence for the various averaging periods are included in the DEP's review (DEP, 1998).

The report also presented air dispersion modelling predictions of cumulative levels of hydrogen fluoride both from existing and approved brick manufacturers, and with the inclusion of this proposal. The dispersion model used was Ausplume. The findings of this study indicated that the proposed brick plant would add only a 0.6% increase in predicted maximum ground level concentrations of hydrogen fluoride for the 90 day averaging period currently contributed by the of existing brick plants. The increase is negligible for averaging periods less than seven days. Figure 5 shows the predicted maximum 90 day concentration of hydrogen fluoride both with and without the inclusion of this proposed plant.

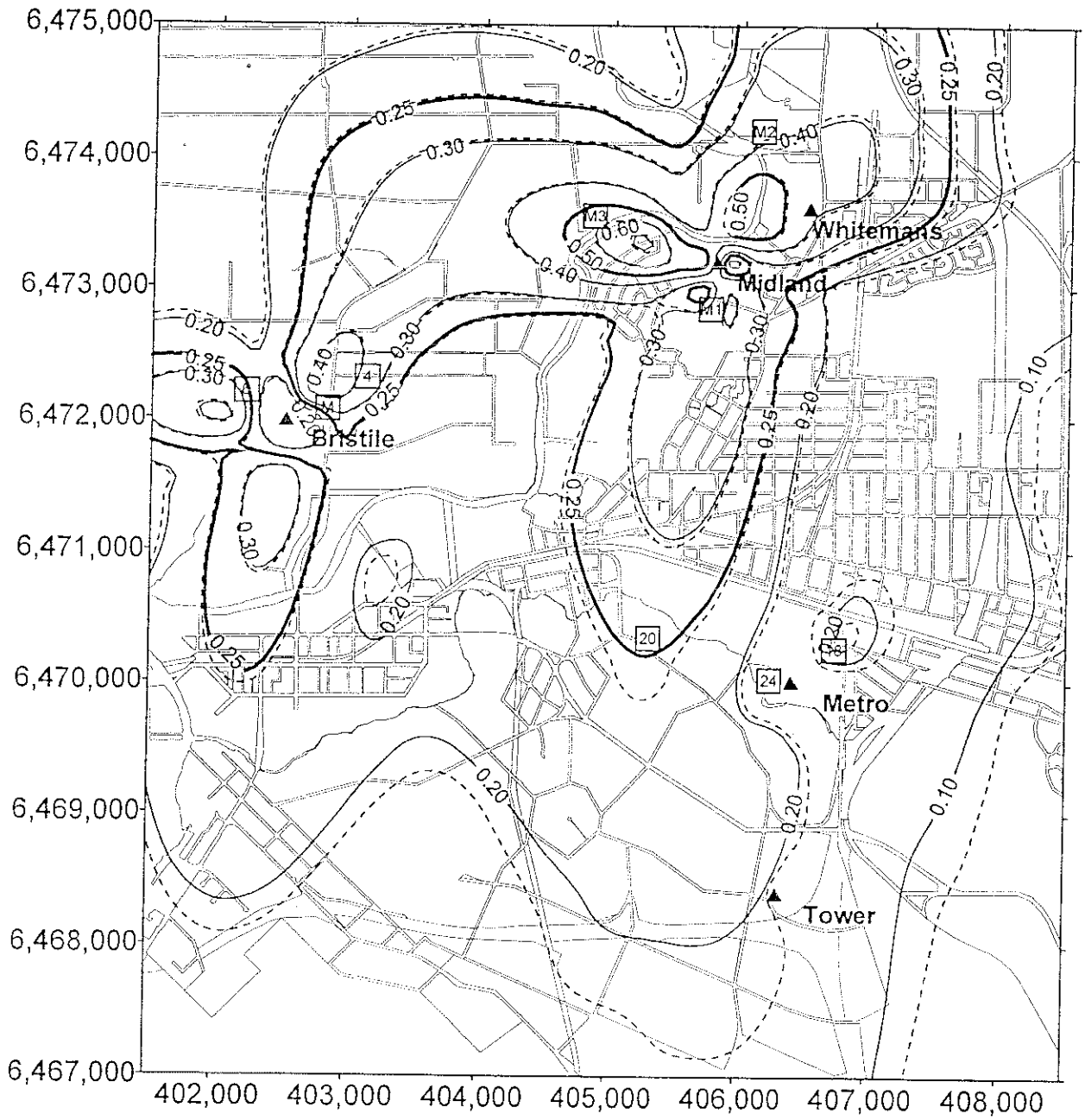
The report also showed a discrepancy between ambient hydrogen fluoride levels predicted by modelling and ambient levels actually monitored. Details are included in the DEP's review (DEP, 1998).

Submissions

Submissions expressed concern that there is an existing problem with cumulative fluoride impacts in the Swan Valley, as seen in exceedences of ANZECC goals. This proposal will add further hydrogen fluoride to the airshed. It was considered that it would be appropriate for the proponent to participate in a hydrogen fluoride and hydrogen chloride impact study and industry management plan for the region if one is deemed appropriate by the EPA/DEP.

Submissions also suggested that the discrepancy in modelling results shown in DEP's *Review of ambient and cumulative studies of fluoride in the Swan Valley* (DEP, 1998) indicates that the model will not predict ground level concentrations accurately from the proposed plant. Another concern was that air dispersion modelling based on Caversham meteorological data is not applicable to the Hazelmere and Helena Valley area.

Other submissions raised concerns over health effects of fluoride in humans and that fluoride in forage may affect cattle, and milk used for human consumption.



Predicted maximum 90 day concentration of hydrogen fluoride (µg/m^3). Concentrations from existing brickworks are denoted by solid lines with the dashed line indicating concentrations with the inclusion of Tower Brick.

Figure 5. Predicted cumulative concentrations of hydrogen fluoride.

Assessment

The area considered for assessment of this factor is the Swan Valley Region.

The EPA's objective in regard to this environmental factor is to ensure that hydrogen fluoride emissions, both individually and cumulatively, meet the EPA Strategy objectives.

In addition to ambient objectives for hydrogen fluoride, as outlined in Table 4, the EPA's Strategy (EPA, 1993) includes objectives for fluoride stack emissions and seeks to protect vegetation from hydrogen fluoride damage.

The EPA considers that the air dispersion model, Ausplume, is an appropriate tool for gaining an understanding of the likely buoyant plume dispersion from a stack, and that the model has certain well documented limitations. Discrepancies between data from ambient monitoring sites, and ground level concentrations predicted by Ausplume are being investigated by the DEP, including a review of existing emissions data, as well as ambient monitoring and modelling methodologies. Details of the DEP's investigations are given in Appendix 4.

Exceedence of the EPA's Strategy on a number of occasions at certain monitoring sites is also being investigated by the DEP, with action to be taken to reduce ambient hydrogen fluoride levels should this prove to be necessary.

The proponent has committed to participating in studies of hydrogen fluoride generated by brick manufacturers if required to by the DEP/EPA.

At high concentrations, hydrogen fluoride gas can cause health problems, with toxicity dependent on the mode of entry into the body. Acute effects due to gaseous fluoride exposure include skin irritation and irritation of the respiratory tract (AWN Consultants, 1997). Based on advice from the DEP, the EPA is satisfied that existing concentrations of hydrogen fluoride in the Swan Valley are well below levels which may be of concern for human health. Similarly, due to the low levels of particulate hydrogen fluoride emissions emitted by modern brick kilns, levels of fluoride in forage in the Hazelmere area are also likely to be low. Accordingly fluoride levels in meat and milk from grazing cattle are likely to be low.

It is the EPA's view that this proposal is expected to contribute only low levels of hydrogen fluoride to the atmosphere.

Having particular regard to:

(a) the use of best practice technology and hence the small contribution of the proposed brick and tile plant to total hydrogen fluoride emissions in the Swan Valley;

(b) surveys of vegetation surrounding existing brick manufacturers indicating that brickworks do not pose an adverse effect on the environment; and

(c) the actions to be undertaken by the DEP, independent of this proposal, in regard to emissions from existing brick and tile plants

it is the EPA's opinion that the proposal can be managed to meet the EPA's objectives in regard to ambient fluoride levels.

3.5 Other atmospheric emissions including dust and odour

Description

In addition to hydrogen fluoride, hydrogen chloride (HCl), nitrogen oxides (NO_X), sulphur dioxide (SO_2), sulphur trioxide (SO_3), carbon monoxide (CO), carbon dioxide (CO_2), volatile organic compounds (VOC) and particulate matter would be emitted from the stacks. The majority of these emissions originate from elements within the clay being oxidised and released to atmosphere. NO_X is generated from the oxidisation of atmospheric nitrogen in the high temperature region of the gas burners during combustion of natural gas. Particulate matter is generated both as a by-product of combustion and from material being entrained in the airflow within the scrubbers.

Hydrogen chloride

It is predicted that approximately 50% of hydrogen chloride emissions, 20% of sulphur dioxide and 80% of sulphur trioxide emissions will by removed from the kiln gas by the limestone scrubber.

Hydrogen chloride (HCl) is a colourless gas with an irritating pungent odour and odour threshold of about 7000 $\mu g/m^3$ (USEPA, 1998). The National Health and Medical Research Council (NH&MRC) has set an emission guideline for hydrogen chloride of 0.4 g/m^3. There is no recommended ambient standard for hydrogen chloride but 200 μg HCl/m^3 averaged over 3 minutes, as used by the Victorian Environment Protection Authority (VicEPA, 1981) may be adopted as a guidance value. Modelling carried out for the proposal predicts a maximum ground level concentration of 73 $\mu g/m^3$ of hydrogen chloride for a 3 minute average.

Other atmospheric emissions

Nitrogen oxides, sulphur dioxide and sulphur trioxide can irritate mucous membranes. Carbon monoxide is poisonous to humans at high concentrations. Particulates can cause health problems, especially when the particle size is less than 10µm in diameter. Particulate matter would be emitted from the kiln stacks. As clay will be stockpiled onsite, and loaded into the plant using front-end loaders, potential fugitive sources of dust include stockpiles, dried clay on vehicle tyres, and loading operations.

A summary of ambient air standards adopted is provided in Table 6 below.

The NH&MRC has set a stack emission guideline for NOx of 0.5 g/m^3. The NH&MRC guideline for sulphur trioxide is 0.1 g/m^3.

Hydrogen fluoride, hydrogen chloride and oxides of sulphur may have an additive effect due to their acid nature.

Although individually HF and HCl are predicted to be below their recognised odour thresholds, the effects of mixtures of odour sources cannot be determined from this information.

Table 6: Adopted Ambient Air Quality Criteria for Pollutants other than Hydrogen Fluoride

Pollutant	Averaging time	Ambient Criteria	Predicted ground level concentration from Tower Brick Proposal
Sulphur dioxide	1 hour	0.2 ppm	0.0016 ppm
	1 day	0.08 ppm	
	1 year	0.02 ppm	0.00013 ppm
Nitrogen dioxide	1 hour	0.125ppm	0.0038 ppm
	1 year	0.03ppm	0.00031ppm
Particulate PM50	1 hour	90 $\mu g/m^3$	
Particulate PM10	1 hour	50 $\mu g/m^3$	1.45 $\mu g/m^3$
Carbon monoxide	8 hour	9 ppm	0.036 ppm

Notes:
SO_2, NO_2 and CO from NEPM (NEPC, 1998)
Particulate (PM_{10}) from NEPM (NEPC, 1997)
Particulate (PM_{50}) from WA EPA (1992)

Submissions

Submissions suggested that the proponent should commit to remedial action in the event that the NH&MRC guideline for emission of hydrogen chloride of 0.4 g/m^3 is not met, that after commissioning it should be demonstrated that no significant atmospheric wastes are released from drier stacks, that low NOx burners should be required as part of best practice emissions control and that the anticipated VOC emission levels should be quantified. Other concerns were the impact of emissions on aeroplanes using Perth Airport, the potential for acidic gases to accelerate corrosion of Western Power lines and the impact of "flashing" in kilns in increasing emissions. Submissions suggested that the removal efficiencies of scrubbers for HCl and SOx had been overestimated, that the moisture content of stockpiles should be maintained, and dust managed to prevent offsite impacts and that the proponent should verify (and if necessary rectify) odour complaints if they arise. Further submissions urged the proponent to participate in the Commonwealth Government's voluntary Greenhouse Challenge.

Assessment

The area considered for assessment of this factor is the Swan Valley Region.

The EPA's objective in regard to this environmental factor is to ensure that gaseous emissions, odour and dust levels do not adversely affect the environment or health, welfare and amenity of nearby land users by meeting acceptable standards.

Hydrogen chloride

The proponent provided details to the DEP relating to hydrogen chloride absorption by scrubbers. The proponent has committed to installing an additional scrubber module for the removal of hydrogen chloride if calculations at the final design phase show that this will be necessary, or if monitoring during operation indicate that emission criteria are not met. Based on this information and advice from the DEP, the EPA is satisfied that the proposal will be able to meet the emission rates and total mass emission limits outlined in the CER provided that the scrubber is sized appropriately for Western Australian clays.

The proponent has committed to participating in studies of hydrogen chloride generated by brick manufacturers if required to by the DEP/EPA.

Other atmospheric emissions

Emissions of sulphur dioxide (SO_2), sulphur trioxide (SO_3), carbon monoxide (CO), carbon dioxide (CO_2) and particulates from brick kilns are generally low (for natural gas fired kilns) (Vic EPA, 1998).

With regard to "flashing", the proponent has advised that this only occurs within the clay firing zone, and is not used to clean kiln chimneys. Monitoring of fuel and oxygen levels within the kiln ensures that no unburnt fuel is present in kiln exhaust.

The proponent has made a number of commitments in relation to gaseous emissions, as outlined in Appendix 3, including monitoring for VOCs and drier stack emissions. The proponent will liaise with the Perth International Airport to ensure that requirements for stack heights, and warm air currents are managed. The proponent will also liaise with Western Power on a number of issues, including reporting of emission results.

To manage potential dust problems from stockpile areas and from machinery movements around the site, the proponent will implement the following dust control measures:

- sprinklers will be installed on clay stockpiles;
- disturbance of the clay stockpile will be restricted to a single face;
- minimum clay stockpiles will be held on site; and
- a wheel washing facility will be installed.

The proponent will establish a complaints register, will investigate complaints and will undertake testing to characterise odours should verifiable odour complaints arise.

The EPA notes that in regard to greenhouse gases, this proposal will add approximately 0.2% to the total greenhouse gas emissions in Western Australia (based on inventory compiled by the National Greenhouse Gas Inventory Committee for 1990) (EPA, 1998). The EPA notes that the proponent will consider entering the Commonwealth Government's Voluntary Greenhouse Challenge within six months of plant commissioning.

Having particular regard to:

(a) the proponent's commitments to meet emission standards;

(b) the proponent's commitments to monitor emissions;

(c) the ability for gaseous and particulate emissions to be managed under Part V of the *Environmental Protection Act 1986* through appropriate setting of licence conditions; and

(d) the proponent's commitments to develop and implement dust control procedures

it is the EPA's opinion that the proposal can be managed to meet the EPA's objectives in regard to other gaseous emissions and dust.

3.6 Surface and Groundwater quality

Description

Drainage is predominantly to the Helena River approximately 700m to the north of the site. Currently there is not a direct surface discharge from the site to the river. Drainage is directly to groundwater.

The proposal would increase stormwater run-off due to the increase in sealed surfaces within the development area. Potential pollutant sources on site include waste water from the truck wheel washing facility, sewage treatment facilities and the fuel storage area.

Stormwater and waste water are likely to contain fine suspended particulates, due to the use of clay on site. This could lead to increases in particulate transport from the site. In order to manage surface water a drainage basin in the west of the site will capture water from the proposal area as well as adjacent lots. The basin will be designed to accommodate flood events and to allow for settlement of fine particulates and will be built in accordance with Water and Rivers Commission and Shire requirements. A drain running north along Stirling Crescent and then east to the river will discharge water from the basin to the Helena River.

Wastewater could also potentially be contaminated by oils, as mobile equipment will be washed regularly as a dust management measure. Waste water from the wheel wash will be passed through an oil/sediment separator, from which clay and water will be recycled.

Currently the site is not connected to mains sewerage and sewage would need to be treated on-site until the sewerage line is extended to the site.

Potential impacts on groundwater include spills of petrochemicals (such as fuels) stored on site. These chemicals would be stored "off-ground" above sealed and bunded areas for safety reasons or below ground in approved double-skinned tanks in accordance with the *Explosives and Dangerous Goods Act 1961*. Bunded areas would include interceptor pits with oil/water separators to collect and separate oil for recycling. Liquid petroleum gas (LPG) would also be stored for use by forklifts. Liquid fructose would be stored on site in 20,000 litre storage units in "off-ground" bunded areas.

Hazelmere Lakes, a gazetted conservation reserve (System 6, EPA, 1983), are located 2km west of the proposed site (Figure 1). However, there are no designated System 6 areas immediately adjacent to or within the development area. The site lies in an area where groundwater can often be found in good supply, but of variable quality.

A monitoring and action programme for surface and groundwater will be included in the Environmental Management Programme to be submitted by the proponent following approval.

Submissions

The Water and Rivers Commission provided the following comments:

- no direct discharge of stormwater to the Helena River should be allowed;
- suspended load with high clay content would require regular conditioning and basin should be designed to allow for infiltration;
- waste water may require filtration to prevent fine suspended material entering the Helena River;
- proponent should determine baseline groundwater quality and conditions prior to development;
- proponent should undertake monitoring of discharge waters from retention basin; and
- petrochemical products stored onsite should be managed to protect groundwater quality.

Western Power commented that the drainage basin must not interfere with the Western Power line easement to the west of the site.

Public submissions suggested that the storage of sewage on site has the potential to impact on groundwater and that as the site drains to System 6 areas, groundwater should be protected. Concern was expressed that truck wash-down water will contain oil which could contaminate groundwater.

Assessment

The area considered for assessment of this factor is groundwater beneath the site, surface water and groundwater hydrology of the Helena River and Hazelmere Lakes.

The EPA's objective in regard to this environmental factor is to maintain the quality of surface water so that existing and potential uses, including ecosystem maintenance, are protected.

Based on information from the CER, the proponent's response, the Water and Rivers Commission (WRC), and advice from the DEP, the EPA is satisfied that the drainage basin is sized sufficiently to cope with 1 in 10 year storm events with a 7 day residence time, as required by the Shire of Swan, and has sufficient capacity to allow settling of fine suspended particulates. With the drainage basin in place, drainage would be to groundwater except in extreme storm events.

The proponent has committed to:

- installing oil separators for inputs to the drainage basin where the waste stream is able to pick up contaminants (such as oil from on site roads etc);
- measuring existing groundwater conditions on site and undertake ongoing monitoring following development as required, on the advice of the DEP and Water and Rivers Commission;
- undertaking water quality monitoring of the detention basin, and any outflow, to compare with existing water quality data. If this identifies a need for additional treatment other than sedimentation, this will be incorporated following Water and Rivers Commission advice. Outflow will be designed such that these measures can be incorporated at a later date if required;
- bunding and sealing of fuel storage areas;
- designing the drainage basin so as not to interfere with the Western Power line easement; and
- reporting any significant petrochemical spill to the appropriate authorities and remediate subsurface and surface conditions in the event of a spill.

The proponent has advised that Shire of Swan advice indicates support for the temporary use of Aerated Treatment Units (ATUs) for sewage treatment prior to connection to the main sewer network.

Details of monitoring and contingency plans will be included in the proponent's Environmental Management System (EMS).

Having particular regard to the:

(a) the proponent's commitments with regard to water quality protection measures and monitoring; and

(b) the large capacity of the drainage basin,

it is the EPA's opinion that the proposal can be managed to meet the EPA's objective for surface and groundwater quality.

3.7 Noise

Description

Land use surrounding the proposal site is industrial to the north west, and rural to the south and east, with two residences within 100m of the site.

The CER indicates that noise sources on site will include the stack, scrubber and drier exhausts, mobile equipment including front end loaders and scrubber fans.

Potential for significant noise impacts also exists from heavy vehicles in the delivery of clay to the site, and in the dispatch of product.

Assigned noise levels at closest residences range from 38 dB (L_{Amax}) at residences to the south and east of the site, 44 dB (L_{Amax}) at the residence to the west, to 48 dB (L_{Amax}) at the closest residence to the north of the site. Assigned noise levels are calculated based on the zoning of the land surrounding the noise sensitive premises. Noise sensitive premises with a large percentage of surrounding area zoned industrial, or premises close to major roads tend to have higher assigned noise levels.

The proponent has undertaken to incorporate recommended noise reduction measures, and combined with existing plant design features, it is predicted that this would ensure that all noise emissions would comply with DEP regulatory standards.

To comply with the regulations, the following noise controls were recommended after the initial noise study:

- limit the noise emission from stack, drier and scrubber discharges to 80 dB(A) at 1 metre, either by the selection of fans and/or installation of acoustic silencers;
- limit the noise emissions of the front end loader to 80 dB(A) at 7 metres either by the selection of the machine and/or by incorporating noise control;
- line the underside of the plant's roof with 50 mm thick insulation;
- locate the main door on the northern or western side of the plant;
- ensure that all external fans and equipment have a maximum sound level of 80 dB(A) at 1 metre; and
- construct a 4 metre high earthen bund along the southern boundary of the site.

An implementation programme for noise reduction measures will be included in the Environmental Management Programme to be submitted by the proponent following approval.

Submissions

A submission from the DEP required that further noise modelling be undertaken in accordance with the EPA draft Guidance for Assessment of Environmental Factors No 8 - Environmental Noise. Other submissions raised concerns that the modelling undertaken for the CER did not include clay crushers and that the noise assessment did not include consideration of reversing alarms on mobile equipment and noise due to tip truck tailgates, and trucks turning into the site from a stationary start.

Assessment

The area considered for assessment of this factor is the area surrounding the proposal site including nearby residences.

The EPA's objective in regard to this environmental factor is to protect the amenity of nearby residences from noise impacts by ensuring noise meets assigned noise levels in the *Environmental Protection (Noise) Regulations 1997.*

A further study undertaken in response to a request from the DEP recommended upgrade of 50mm thick insulation to perforated 350 Fibretex or equivalent, that forklifts be noise limited to 85 dB(A) at 1m, and that barriers be constructed for scrubber fans on the western side of the building (BSD, 1998b).

Following further noise modelling, the proponent has committed to incorporating appropriate noise control measures into the plant design to ensure compliance with the assigned noise levels at the site boundary and at nearby residences. The proponent has committed to the following measures:

- lining the underside of the plant's roof with 50 mm thick insulation;
- locating the main door on the northern or western side of the plant;
- installing an enhanced safety system on front end loaders and heavy vehicles to enable reversing alarms on mobile equipment to be reduced after dark, and supplemented with flashing lights;
- limiting the noise emission from stack, drier and scrubber discharges to 80 dB(A) at 1 metre;
- ensuring that all external fans and equipment have a maximum sound level of 80 dB(A) at 1 metre; and
- constructing a sound barrier on site where required.

The proponent has advised that clay crushers will not contribute significantly to noise levels from the plant. The proponent has also advised, in their response to submissions, that the proposed sound barrier at the south of the site will be constructed of suitable materials to minimise the area of the base to ensure that vegetation clearance is minimised. The proposed site layout and intersection design is such that trucks will not generally need to stop before entering the site.

The proponent will implement, as part of the Environmental Management Programme, a community liaison and complaints management procedure to facilitate dialogue between local residents and appropriate plant management to address any issues arising in regard to noise generation.

Having particular regard to the:

(a) proponent's commitments to comply with assigned noise levels; and

(b) the ability for noise emissions to be managed under Part V of the *Environmental Protection Act 1986* through appropriate licence conditions

it is the EPA's opinion that the proposal can meet the EPA's objective for noise.

4. Conditions and Commitments

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

In developing recommended conditions for each project, the EPA's preferred course of action is to have the proponent provide an array of commitments to ameliorate the impacts of the proposal on the environment. The commitments are considered by the EPA as part of its assessment of the proposal, and following discussion with the proponent the EPA may seek additional commitments.

The EPA recognises that not all of the commitments are written in a form which makes them readily enforceable, but they do provide a clear statement of the action to be taken as part of the proponent's responsibility for and commitment to continuous improvement in environmental performance. The commitments, modified if necessary to ensure enforceability, then form part of the conditions to which the proposal should be subject if it is to be implemented.

The EPA may, of course, also recommend conditions additional to that relating to the proponent's commitments.

Having considered the proponent's commitments and the information provided in this report, the EPA has developed a set of conditions which the EPA recommends be imposed if the proposal by Saracen Properties to construct a brick and tile manufacturing facility, is approved for implementation. These conditions are presented in Appendix 3. Matters addressed in the conditions include:

(a) the proponent shall fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 3;

(b) In order to manage the environmental impacts of the project, and to fulfil the requirements of the conditions and procedures in this statement, prior to construction, the proponent shall demonstrate to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection that there is in place an environmental management system which includes the following elements:

- environmental policy and commitment;
- planning of environmental requirements;
- implementation and operation of environmental requirements;
- measurement and evaluation of environmental performance; and
- review and improvement of environmental outcomes.

5. Other Advice

Cumulative impacts and issues relating to ambient air quality in the Swan Valley have been dealt with outside the proponent's CER in a DEP document entitled *Review of ambient and cumulative studies of fluoride in the Swan Valley* (DEP, 1998). This document was released for public review concurrently with the proponent's CER.

The review found that existing reported ambient concentrations of hydrogen fluoride, averaged over 90 days, already exceed ANZECC goals for protection of vegetation at times and in certain areas near existing brick manufacturers.

Surveys of vegetation are carried out annually on behalf of one existing brick manufacturer to determine whether any damage to plant species is occurring. Results indicate that brickworks do not impose an adverse effect on the environment at present (Doley, 1998). These surveys include an assessment of nearby vineyard grapevines.

The DEP's review also indicated that this proposal by Saracen Properties would add only 0.6% to the 90 day averaged maximum ground level concentrations for hydrogen fluoride in the Midland area, currently contributed by existing brick manufacturing plants. The increase due to this proposal is negligible in the Midland area for averaging periods of 7 days or less (DEP, 1998).

A concern with the DEP's review was that plume dispersion modelling showed discrepancies between modelled ground level concentrations and data obtained from ambient monitors.

The exceedence and the discrepancy will be addressed through the review by the DEP, which includes a review of existing emissions data, as well as ambient monitoring and modelling methodologies (Appendix 4).

In summary, the review will include:

- more detailed investigations of how local meteorology and topography affect the dispersion of brick and tile plant emissions;
- refinement of modelling techniques to take account of building wake effects and achieve an improved understanding of high levels observed at monitoring stations close to existing brick and tile plants;
- review of methods for measuring ambient hydrogen fluoride concentrations;
- review of the variability of stack emission rates; and
- review of licence conditions to achieve Strategy objectives.

A programme of monitoring hydrogen chloride emissions will also be undertaken.

The EPA recognises that the DEP will carry out investigations into the Swan Valley airshed with a view to ensuring that goals for the protection of human health and vegetation are met with respect to the operation of both existing and this proposed brick and tile plant. The conclusions of this work will be reported back to the EPA.

6. Conclusions

The EPA has considered the proposal by Saracen Properties to construct a brick and tile manufacturing facility in Hazelmere.

The EPA has concluded that the proposal can be managed to meet the EPA's objectives, and thus not impose an unacceptable impact on the environment, provided there is a satisfactory implementation by the proponent of the proponent's commitments and the recommended conditions set out in Section 4 and Appendix 3.

In reaching this conclusion, the EPA has taken into consideration the fact that the environmental impacts of this proposal are manageable, and the proposed management is consistent with levels in "best practice" environmental management.

The EPA recognises that reported ambient concentrations of hydrogen fluoride in the Swan Valley have at times exceeded the EPA's *Fluoride in the Swan Valley Environmental Strategy* (EPA, 1993). However the EPA is satisfied that while this proposal will contribute to the cumulative concentrations of hydrogen fluoride in the region, the predicted contribution is likely to be very small.

The EPA recognises that the DEP will carry out investigations into the Swan Valley airshed with a view to ensuring that goals for the protection of human health and vegetation are met with respect to the operation of both existing and this proposed brick and tile plant. The conclusions of this work will be reported back to the EPA.

7. Recommendations

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister considers the report on the relevant environmental factors of vegetation communities (including rare and priority flora), hydrogen fluoride, other atmospheric emissions including dust and odour, surface and groundwater quality and noise, as set out in Section 3.

2. The Minister notes that the EPA has concluded that the proposal can be managed in an environmentally acceptable manner, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Section 4.

3. The Minister imposes the conditions and procedures recommended in Appendix 3 of this report.

4. That the Minister notes that the DEP is carrying out investigations into the Swan Valley airshed with a view to ensuring that goals for the protection of human health and vegetation are met with respect to the operation of both existing and this proposed brick and tile plant. The DEP will report its findings to the EPA.

Appendix 1

List of submitters

Government Agencies:

Department of Conservation and Land Management
Department of Environmental Protection
Department of Resources Development
Health Department of WA
Shire of Swan
Transport WA
Water and Rivers Commission
Western Power Corporation

Organisations:

Bristile Ltd
Conservation Council of Western Australia
Metro Brick
Midland Brick Company Pty Ltd
Perth International Airport

Clean Air Committee
Hazelmere Progress Association
Helena Valley P & C Association
Helena Valley Residents Association Inc
The Guildford Association

Individuals:

Mr P Alsept
Ms R Bezu
Ms J Catalano
Ms J Creighton
Mr B Cutjar
Ms J Davis
Mr S Delic
L & S Di Tommaso
D J Emmott
Mr P Gajewski
Mr J Ghizzo
Mr A Gliddon
Mrs N Gliddon
Ms J Harridine
Ms L Harris
Ms E Hayes
J & D Heap
P & L Huisman
R & S King
JA & GP Lamers
Ms A Lamers
Mr & Mrs G K Lamp
Mr B Leggo
R & C Lewis
Mr J Lodge
Mr & Mrs D Ogilvie
Ms LC Poulsen
Mr J Roberts
Mr & Mrs Russell
Mr M Sleath
Mrs ML Spanghero
Mr N Srsen
Mr W Swerlowycz
Mr J Toneman
Mr R Ventouras
Mr G Wheeler
R J & E J White
S & M White
1 anonymous
3 names illegible

Appendix 2

References

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Appendix 3

Recommended Environmental Conditions and proponent's consolidated commitments

Statement No.

RECOMMENDED CONDITIONS

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

BRICKWORKS, LOT 6 BUSHMEAD ROAD &
LOTS 6, 103 & 151 LAKES ROAD, HAZELMERE, SHIRE OF SWAN (1207)

Proposal: Construction and operation of a brick and tile manufacturing plant in Hazelmere, producing 140 to 180 million bricks and tiles per annum. Three tunnel kilns are intended for the site, with kiln exhaust gases to pass through limestone cascade absorbers to remove acid gases. Raw materials for manufacture of bricks and tiles will be obtained off site, as documented in Schedule 1 of this statement.

Proponent: Saracen Properties Pty Ltd for and on behalf of Latanzi Nominees Pty Ltd trading as Tower Brick.

Proponent Address: c/o BSD Consultants
BSD Centre, 2 Bagot Road
Subiaco WA 6008

Assessment Number: 1207

Report of the Environmental Protection Authority: Bulletin 916

The proposal to which the above report of the Environmental Protection Authority relates may be implemented subject to the following conditions and procedures:

1 Implementation

1-1 Subject to these conditions and procedures, the proponent shall implement the proposal as documented in schedule 1 of this statement.

1-2 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment determines, on advice of the Environmental Protection Authority, is substantial, the proponent shall refer the matter to the Environmental Protection Authority.

1-3 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment determines, on advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

2 Proponent Commitments

2-1 The proponent shall implement the consolidated environmental management commitments documented in schedule 2 of this statement.

2-2 The proponent shall implement subsequent environmental management commitments which the proponent makes as part of the fulfilment of conditions and procedures in this statement.

3 Environmental Management System

3-1 In order to manage the environmental impacts of the project, and to fulfil the requirements of the conditions and procedures in this statement, prior to construction, the proponent shall demonstrate to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection that there is in place an environmental management system which includes the following elements:

1 An environmental policy and corporate commitment to it;

2 Mechanisms and processes to ensure:

2.1 planning to meet environmental requirements;

2.2 implementation and operation of actions to meet environmental requirements;

2.3 measurement and evaluation of environmental performance; and

3 Review and improvement of environmental outcomes.

3-2 The proponent shall implement the environmental management system referred to in condition 3-1.

4 Decommissioning and Rehabilitation Management Plan

4-1 At least six months prior to decommissioning, the proponent shall prepare a Decommissioning and Rehabilitation Management Plan to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection.

This Plan shall address:

1 removal or, if appropriate, retention of plant and infrastructure;

2 rehabilitation of all disturbed areas to a standard suitable for agreed new land use/s; and

3 identification of contaminated areas, including provision of evidence of notification to relevant statutory authorities.

4-2 The proponent shall implement the Decommissioning and Rehabilitation Management Plan required by condition 4-1 until such time as the Minister for the Environment determines that decommissioning and / or rehabilitation is / are complete.

4-3 The proponent shall make the Decommissioning and Rehabilitation Management Plan required by condition 4-1 publicly available, to the requirements of the Environmental Protection Authority.

5 Performance Review

5-1 Each six years following the commencement of construction, the proponent shall submit a Performance Review to the Department of Environmental Protection:

- to document the outcomes, beneficial or otherwise;
- to review the success of goals, objectives and targets; and
- to evaluate the environmental performance over the six years;

relevant to the following:

1 environmental objectives reported on in Environmental Protection Authority Bulletin 916;

2 proponent's consolidated environmental management commitments documented in schedule 2 of this statement and those arising from the fulfilment of conditions and procedures in this statement;

3 environmental management system environmental management targets;

4 environmental management programs and plans; and/or

5 environmental performance indicators;

to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection.

Note: The Environmental Protection Authority may recommend changes and actions to the Minister for the Environment following consideration of the Performance Review.

6 Proponent

6-1 The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the Environmental Protection Act 1986 is responsible for the implementation of the proposal until such time as the Minister for the Environment has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person in respect of the proposal.

6-2 Any request for the exercise of that power of the Minister referred to in condition 6-1 shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the proposal in accordance with the conditions and procedures set out in the statement.

6-3 The proponent shall notify the Department of Environmental Protection of any change of proponent contact name and address within 30 days of such change.

7 Commencement

7-1 The proponent shall provide evidence to the Minister for the Environment within five years of the date of this statement that the proposal has been substantially commenced.

7-2 Where the proposal has not been substantially commenced within five years of the date of this statement, the approval to implement the proposal as granted in this statement shall

lapse and be void. The Minister for the Environment will determine any question as to whether the proposal has been substantially commenced.

7-3 The proponent shall make application to the Minister for the Environment for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this statement at least six months prior to the expiration of the five year period referred to in conditions 7-1 and 7-2.

7-4 Where the proponent demonstrates to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority that the environmental parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding five years for the substantial commencement of the proposal.

8 Compliance Auditing

8-1 The proponent shall submit periodic Performance and Compliance Reports, in accordance with an audit program prepared in consultation between the proponent and the Department of Environmental Protection.

8-2 Unless otherwise specified, the Chief Executive Officer of the Department of Environmental Protection is responsible for assessing compliance with the conditions, procedures and commitments contained in this statement and for issuing formal clearances.

8-3 Where compliance with any condition, procedure or commitment is in dispute, the matter will be determined by the Minister for the Environment.

Note

1 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.

The Proposal

The proposed site comprises Lot 6 Bushmead Road and Lots 103 and 151 Lakes Road, Hazelmere, Shire of Swan.

The proposal consists of a raw materials stockpile, a building for clay mixing, a building for clay crushing and grinding, a building for storage of ground clay material, a brick and tile production building, a drainage basin, a fuel storage area, an area for product storage, carparks, weigh bridge and wheel wash facility and office buildings.

Plant includes up to eight crushers, three tunnel kilns and drier units, six drier stacks and three scrubber stacks equipped with dry fluoride cascade scrubbers.

The proposed plant would operate seven days a week, with kilns operating 24 hours per day. Full production would occur for only 20 hours per day, and production would cease between 2 am and 6 am each day to allow for servicing of equipment.

Total area of the site is approximately 17.5ha. The proponent has not included Lot 6 Lakes Road in the subject site.

In order to accommodate the proposal on the site, approximately 2.7 hectares of remnant vegetation to the south of the site would require clearing. An area of 0.86 hectares of the remnant will remain on the site, with a further contiguous area of approximately 1.4 hectares of remnant outside the site boundary, in the control of Main Roads WA.

The proposed development is modelled on German plants incorporating the latest technology and designs. The process involves the stockpiling of wet clay (10-15% water content), crushing, grinding and mixing of the clay, the formation of the product, initial drying of the product in two-chamber driers, which utilise heat recycled from the kilns, and gradual heating of the product to a maximum temperature of approximately 1200°C in the natural gas powered kilns.

During the firing of the clay, hydrogen fluoride, hydrogen chloride and oxides of sulphur are released. Gases from the furnaces will be passed through a Hellmich limestone cascade scrubber (or equivalent) to reduce the concentration of hydrogen fluoride, hydrogen chloride and oxides of sulphur before being exhausted to atmosphere. Solid waste from the limestone scrubbers will be removed by a contractor to an approved landfill site. Water vapour will be exhausted to atmosphere from the drier stacks. Other minor gaseous emissions will be carbon monoxide, carbon dioxide, nitrogen oxides and volatile organic compounds.

Dust from the clay stock pile will be controlled by the use of sprinklers.

Surface water runoff from the site will be diverted to a drainage basin to precipitate sediment before discharge to the Helena River. Waste water from the wheel wash will be passed through an oil/sediment separator, from which clay and water will be recycled. Sewage will be treated on-site using aerated treatment units (ATU's) until connection with the sewer network becomes possible. All chemicals will be stored in bunded areas in case of spillage.

Noise from the site will be controlled by noise suppression measures and a sound barrier at the southern boundary of the site to reduce impacts of noise generated by mobile equipment in the clay stockpile area.

The site has been designed to allow ease of access for trucks, and major highways are adjacent to the site.

Electricity, gas and water supply services are available to the site.

The proposed development would produce 140-180 million bricks, tiles and pavers per annum which equates to an approximate daily production of 1600 tonnes of bricks, tiles and pavers.

The main characteristics of the proposal are summarised in Table 1 below.

Summary of key proposal characteristics

Proposal Aspect	Description	
Site Location and area	Lot 6 Bushmead Road and Lots 103 and 151 Lakes Road, Hazelmere, Shire of Swan. Approximate area 17.5 ha.	
Timing	Construction will take approximately 15 months. Production expected to begin in June 2000.	
Plant	• 3 Tunnel Kiln and Drier units	Natural gas fired kilns fitted with waste heat recovery heated driers
	• 3 Scrubber Stack units	"Product of Combustion" exhaust stacks
	• 6 Drier Stack units	Water vapour exhaust stacks
	• 6 Drier Fan units	Low speed, centrifugal, axial controlled fans
	• 3 Fluoride Cascade Absorber units •	Calcium carbonate cascade absorbers
	• Conveying Crushing Equipment	Plant process controlled
Inputs		
Raw Materials:	• Clay soils	1800 tonnes per day
- maximum quantities	• Manganese dioxide	100 tonnes per annum
	• Liquid fructose	300 tonnes per annum
	• Limestone	730 tonnes per annum
Utilities: - maximum quantities	• Natural Gas	150 GJ/h
	• Electricity (operating 20 hrs/day)	8 MW
	• Electricity (operating 4 hrs/day)	4 MW
	• Scheme Water	10,000 litres per hour
	• Sewage treatment	Aerated Treatment Units (ATUs)
	• Drainage basin	25,650 cubic metres volume
	• Fuel storage in double skinned, bunded tanks	15,000 litres diesel 1500 litres various lubricants
	• Wheel wash and oil separation facility	
Outputs		
Product	Bricks, tiles and pavers	1600 tonnes per day
Solid waste	Calcium fluoride	0.5 tonnes per day
Gaseous Waste	HF	< 0.005 tonnes per day
	HCl	0.389 tonnes per day
	NO_X	0.123 tonnes per day
	SO_2	0.037 tonnes per day
	SO_3	0.003 tonnes per day
	CO	2.944 tonnes per day
	VOC	0.084 tonnes per day
	CO_2	99,000 tonnes per annum
	100% scheme water input lost through process evaporation	

Environmental Management		
Vegetation Communities	• Retain area of 0.86 hectares of the remnant vegetation	Landscape with native vegetation
Hydrogen Fluoride	• Calcium carbonate cascade absorbers	35m stacks
Hydrogen Chloride	• Calcium carbonate cascade absorbers	Pre-treatment facility if required
Dust	• Dust control at clay stock pile by sprinklers.	Wheel wash facility
Noise	• Noise suppression measures at plant	A sound barrier at the southern boundary of the site
Waste water	• Drainage basin • Oil separators installed where waste stream is potentially contaminated	Sewage treatment
Chemical and fuel storage	• Bunded areas	
Traffic	• entries and exits designed to minimise impact on local community	

Plans, Specifications, Charts

Figure 1: location map (showing land use and environmental features)

Figure 2: plant layout (showing buildings, stockpile areas, waste product disposal and treatment areas, all dams and water storage areas, storage areas including fuel storage, landscaped areas etc.)

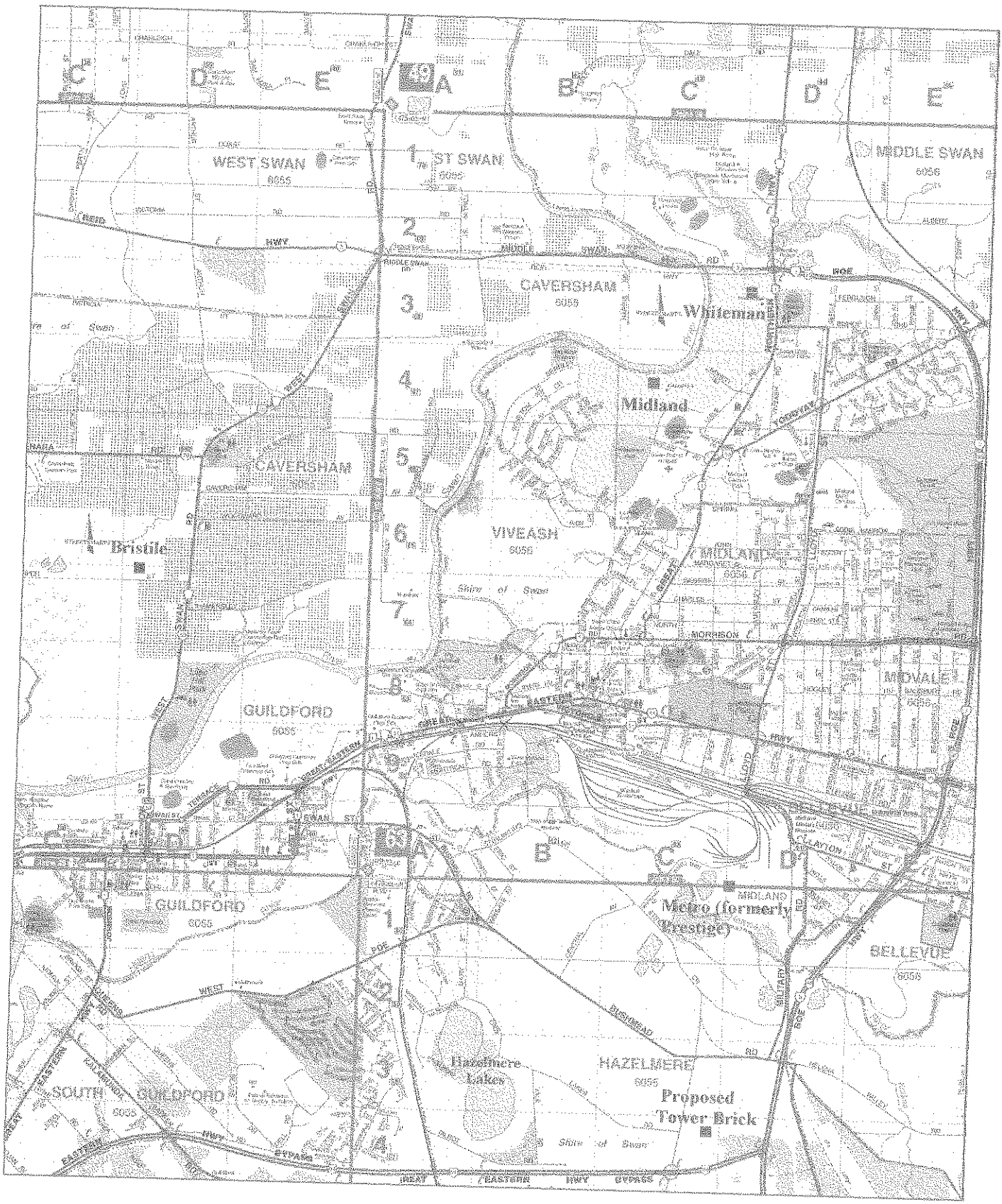


Figure 1. Proposal Location

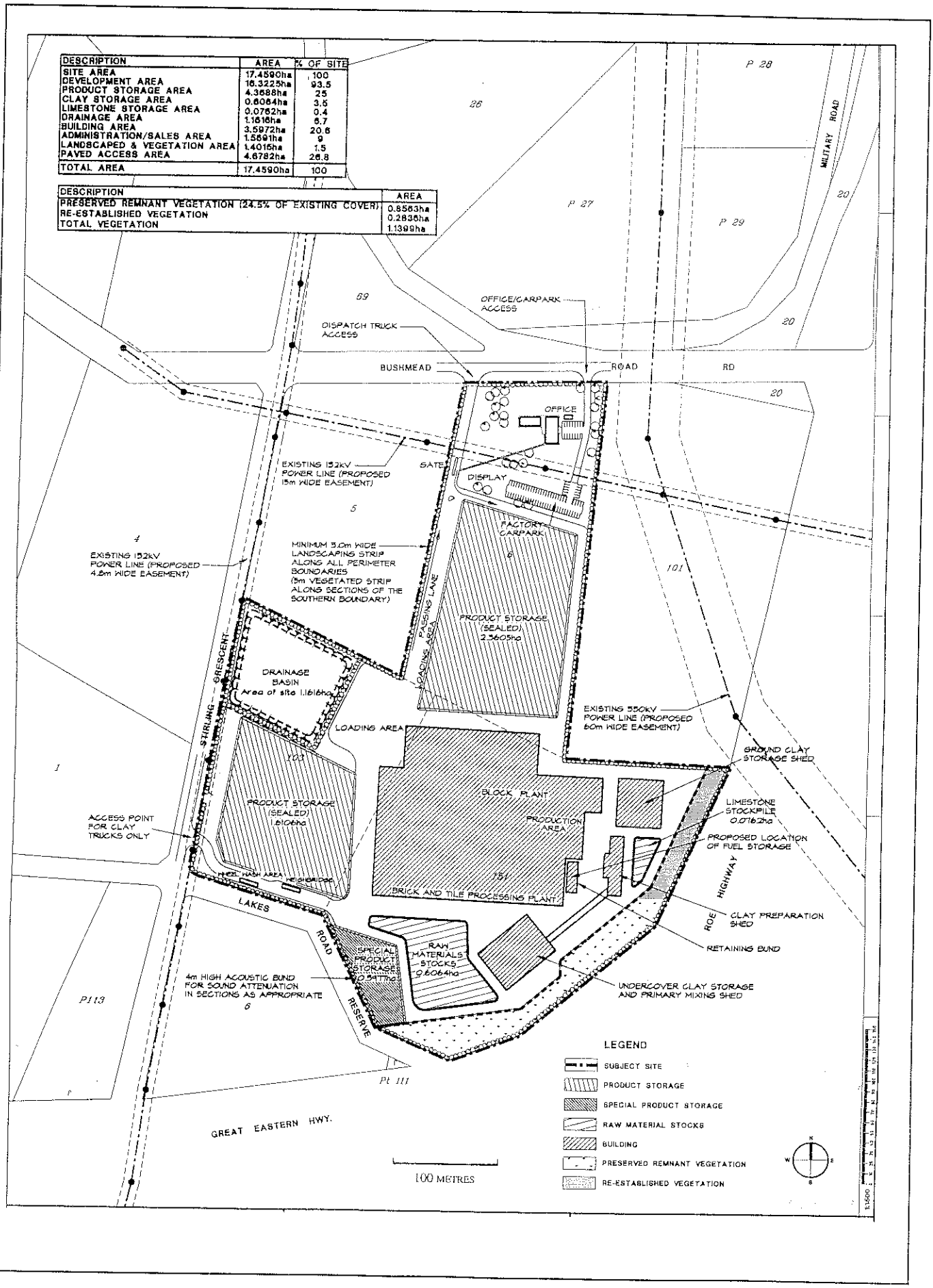


Figure 2. Plant layout.

Schedule 2

Proponent's Consolidated Environmental Management Commitments

December 1998

Brickworks Lot 6 Bushmead Road & Lots 6, 103 &151 Lakes Road, Hazelmere

(Assessment number 1207)

Saracen Properties Pty Ltd

Summary of Tower Brick's Management Commitments

Topic	Commitment	Objective	Action	Timing	Advising Agency	Measurement/ Compliance Criteria
1 Environmental Management	Develop and implement an Environmental Management System (EMS).	To manage environmental issues identified in the Consultative Environmental Review, during the public review period and by the DEP/EPA.	Document management policy including an environmental management program (EMP) and detailing issues of responsibility, training schedules, monitoring and maintenance programs, incident reporting, corrective and preventative action, audit control and management review. Integrate the Environmental Management System with the plant-wide maintenance computer system to generate work orders on a pre-programmed basis.	EMP to be available prior to commissioning. EMS to be implemented within six months of Commissioning.	Department of Environmental Protection.	Submission of EMP and EMS documentation to Department of Environmental Protection.
2 Social Amenity	Establish community liaison and complaints management procedures.	To deal with issues arising as a result of plant operations and associated activities.	Implement the following actions: • maintain register of complaints; • detail action to be undertaken in the event of a complaint; and • liaise with representatives of community groups.	During construction and operations.	Department of Environmental Protection.	Successful development of good community relationships.
3 Air quality	Undertake detailed chemical analyses of local clays.	To determine fluoride content in local clays, to establish firing curves for operating processes and to ensure correct sizing of scrubber modules.	Provide local clay samples to qualified local and government laboratories for determining chemical content and firing characteristics. Size scrubber modules to achieve design scrubber efficiencies based on specific characteristics of raw materials and imported German limestone (or equivalent).	During detailed design.	Department of Environmental Protection.	Submission of detailed design documentation.
4 Air Quality	Design appropriately sized scrubbers on all kilns to achieve maximum emission concentrations of 5mg/m3 for hydrogen fluoride and 200mg/m3 for HCl. Total hydrogen fluoride emissions from the site will not exceed 0.145g/s.	To remove hydrogen fluoride and HCl from kiln exhaust gases.	Implement the following systems and procedures: • Hellmich scrubbers (or environmental performance equivalent) for each kiln; • use of imported German limestone (or equivalent); • kilns will be designed to automatically shut down in the event of power failure, fan failure or scrubber failure; and • scrubbing system will be installed with no bypass vent.	During detailed design.	Department of Environmental Protection.	Submission of design documentation.

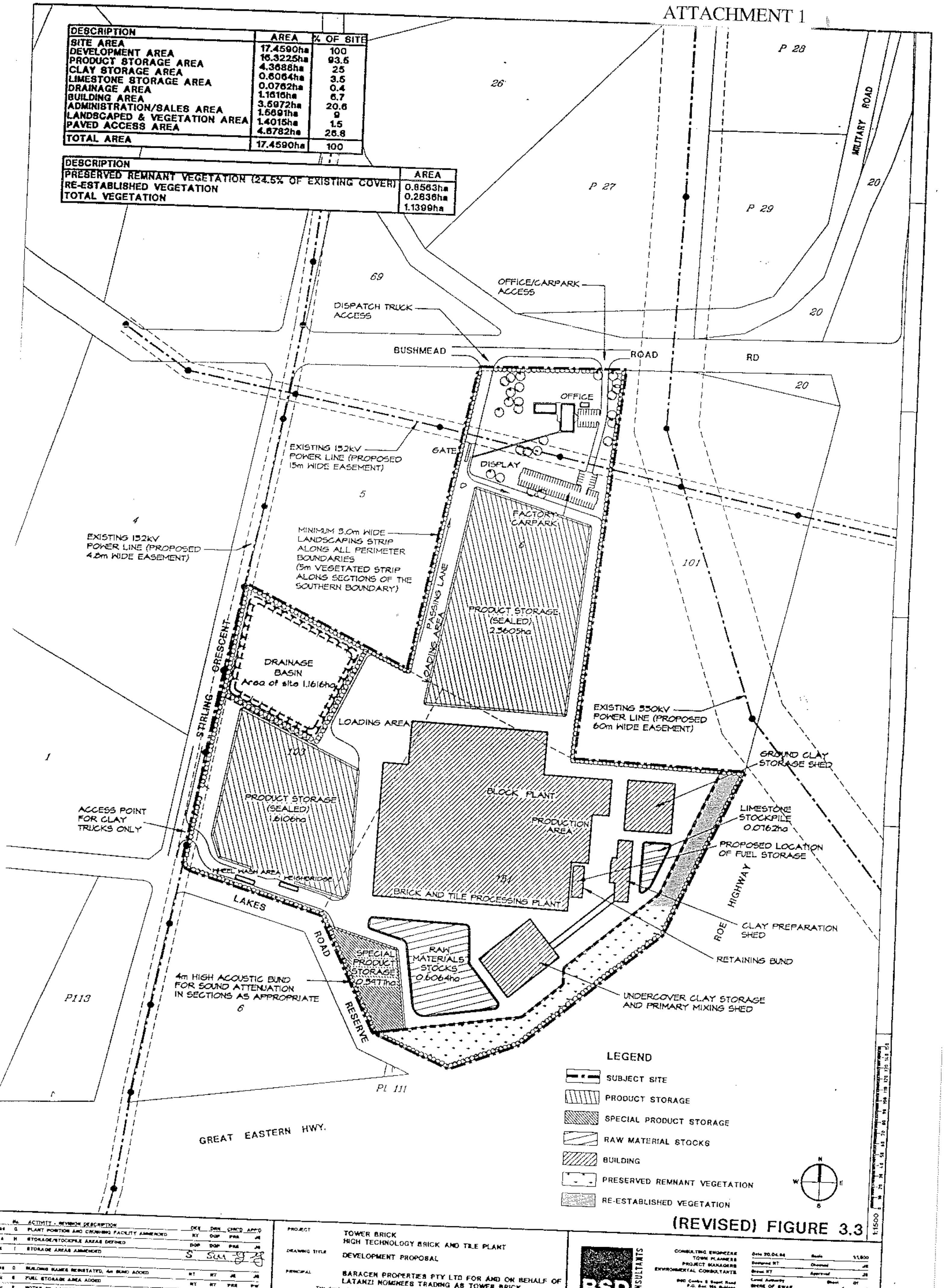
Topic	Commitment	Objective	Action	Timing	Advising Agency	Measurement/ Compliance Criteria
5 Air Quality	Monitor scrubber stack exhaust gases and undertake remedial action if scrubber performance as stated in Commitment 4 is not achieved.	To ensure that scrubber exhaust emission concentrations do not exceed 5mg/m3 for hydrogen fluoride and 200mg/m3 for hydrogen chloride, and to ensure that total hydrogen fluoride emissions from the site do not exceed 0.145g/s.	Test scrubber stack emissions during commissioning Sample scrubber stacks on a regular basis. Participate and co-operate fully with random stack sampling as required by the Department of Environmental Protection. Pursue the following remedial actions as appropriate if scrubber efficiencies for HF are not achieved: • modify operational processes (firing temperature, air flow, kiln setting pattern); • inject calcium hydroxide powder into the flue gas stream; • change from calcium carbonate granules (limestone) to calcium hydroxide pellets; and • change scrubber configuration (ie, install more scrubber modules). In the event that HCl efficiencies cannot be achieved, then the Proponent will install a pretreatment system that will increase the scrubber efficiency for HCl.	During commissioning During operations. Monthly for the first 12 months and thereafter on a quarterly basis. On a random basis as initiated by DEP.	Department of Environmental Protection.	Submission of scrubber stack monitoring results.
6 Air Quality	Monitor drier stack exhaust gases and undertake remedial action if atmospheric wastes are detected.	To confirm that no atmospheric wastes are emitted from drier stacks.	Monitor drier stack exhaust to confirm that no atmospheric wastes are emitted from drier stacks. If testing finds that atmospheric wastes are present in the drier stacks then the Proponent will take appropriate remedial action.	Once during commissioning and at random intervals during operation.	Department of Environmental Protection.	Submission of drier stack monitoring results.
7 Air Quality	Undertake testing to characterise Volatile Organic Compounds emissions from all stacks.	To ensure that Volatile Organic Compounds are within appropriate design ground level concentrations.	Undertake testing of all stack to characterise Volatile Organic Compounds. If testing finds that Volatile Organic Compounds exceed design ground level concentrations then the Proponent will install control mechanisms such as afterburners.	During plant commissioning and at random intervals during operation.	Department of Environmental Protection.	Submission of stack testing results.
8 Air Quality	Undertake testing to characterise odours should verifiable odour complaints arise.	To identify the source of verifiable odour complaints.	Maintain a register of odour complaints. Undertake source testing to characterise odours should verifiable complaints arise.	Following odour complaints which are verifiable by the DEP.	Department of Environmental Protection.	Summary of complaint register with documentation of complaint resolution.

Topic	Commitment	Objective	Action	Timing	Advising Agency	Measurement/ Compliance Criteria
9 Air Quality	Implement dust control measures.	To minimise the impact of dust on the local community.	Implement the following dust control measures: • install and operate sprinklers on clay stockpiles; • restrict disturbance of the clay stockpile to a single face; • minimise inventory of clay stockpiles on site; • install a wheel wash facility; and • undertake appropriate dust monitoring.	During detailed design and during operations.	Department of Environmental Protection.	Submission of detailed drawings and dust management procedures.
10 Air Quality	Participate in a hydrogen fluoride and hydrogen chloride impact study and industry management plan if required by the Department of Environmental Protection and in association with other local ceramic industries.	To improve local air quality.	Cooperate with DEP and other local ceramic industries to determine reasonable study parameters.	Upon request of the DEP.	Department of Environmental Protection.	To be specified by the Department of Environmental Protection in consultation with local ceramic industries.
11 Air Quality	Consider entering the Commonwealth Government's Voluntary Greenhouse Challenge.	To minimise Greenhouse Gas emissions.	Incorporate best practice kiln firing technology including continuous monitoring of oxygen in the flue gas. After consultation with the Greenhouse Challenge Office, a decision will be made whether to proceed with a formal acceptance of the Greenhouse Challenge.	During detailed design. Within six months of commissioning.	Department of Environmental Protection. Commonwealth Government of Australia.	Submission of design documentation. Submission of Annual Monitoring Reports (detailing greenhouse gas emissions) to the Commonwealth Government and Department of Environmental Protection
12 Water Quality	Monitor surface water quality of the detention basin and any outflow.	To ensure acceptable quality of discharge to the Helena River.	Design the outflow so that additional treatment other than sedimentation can be incorporated at a later date if required. Incorporate oil separators to input to drainage basin, where necessary. Prepare contingency plan to handle upset conditions which could potentially contaminate the stormwater detention basin. Undertake initial survey of detention basin and outflow. Monitor water quality of the detention basin and any outflow and compare results with initial water quality data.	During detailed design. Prior to commissioning Quarterly, during operation.	Department of Environmental Protection. Waters and Rivers Commission.	Submission of design documentation. Submission of contingency plan. Submission of surface water quality monitoring results.

Topic	Commitment	Objective	Action	Timing	Advising Agency	Measurement/ Compliance Criteria
13 Water Quality	Monitor groundwater quality.	To establish background levels prior to development and monitor changes over time.	Establish baseline groundwater quality and conditions prior to development. Monitor groundwater quality regularly during operations and compare against existing groundwater conditions on site.	Seasonally, prior to operation. Quarterly, during operation.	Department of Environmental Protection. Waters and Rivers Commission	Submission of groundwater monitoring results.
14 Water Quality	Report any significant petrochemical spill and remediate subsurface and surface conditions in the event of a spill.	To minimise the potential for surface and groundwater contamination.	Develop procedures to ensure that subsurface and surface conditions are remediated in the event of a spill. Report significant spills according to incident reporting system within the Environmental Management System	Within six months of commissioning. During operations.	Department of Environmental Protection. Waters and Rivers Commission.	Submission of documented procedures. Submission of incident reports, as required.
15 Water Quality	Construction of safety bunding on concrete around all fuel and chemical storage areas, including interceptor pits with oil/water separators	To minimise the potential for surface and groundwater contamination.	Design and build bunding and interceptor pits	During detailed design stage and construction	Department of Environmental Protection	Submission of design documentation.
16 Vegetation	Undertake plant boundary modifications to preserve remnant vegetation.	To minimise impact on remnant vegetation stands identified as having significant conservation value.	Redesign the layout of the facilities as illustrated in Attachment 1 to include: • preservation of 0.86ha of remnant vegetation; • setting aside an additional 0.28ha for transplanting with native species; and • including a 4m buffer zone planted with native species around the perimeter.	During detail design and prior to construction.	Department of Environmental Protection.	Submission of final plant layout design and site boundary inspection.
17 Vegetation	Explore other reasonable opportunities to minimise clearance of vegetation.	To minimise impact on remnant vegetation stands identified as having significant conservation value.	Review plant design and layout as proposed in Attachment 1 for other reasonable opportunities to preserve additional remnant vegetation in addition to the 0.86ha identified in Commitment 15.	During detail design and prior to construction.	Department of Environmental Protection	Submission of documentation describing the review of options and rationale for final recommended layout.

Topic	Commitment	Objective	Action	Timing	Advising Agency	Measurement/ Compliance Criteria
18 Vegetation	Enter into a conservation covenant with Main Roads WA, the responsible agent for the adjacent road reserve.	To protect and manage remnant vegetation.	Consult with Main Roads WA to encourage their support of the covenant and develop vegetation management procedures as part of the Environmental Management System.	Within six months of commissioning .	Department of Environmental Protection.	Submission of covenant documentation and vegetation management procedures.
19 Traffic	Ensure that company trucks or subcontractor's trucks do not travel through Hazelmere Townsite.	To minimise traffic impacts on local residents.	Issue written instructions to drivers and subcontractors.	At startup and regularly during operation.	Local Authority.	Copies of written instructions.
20 Noise	Install an enhanced safety system on front end loaders and heavy vehicles.	To minimise noise from the raw material stockpile areas.	Implement an enhanced safety system to enable the beeper volume to be reduced after dark and supplemented with downward and outward facing flashing lights. Maintain register of noise complaints.	During detailed design. During operations.	Department of Environmental Protection.	Summary of complaint register with documentation of complaint resolution.
21 Noise	Limit noise emissions at source	To minimise noise impacts outside of the site	Implementation to include: • Lining of underside of plant's roof with 50 millimetre thick insulation; • Location of main door on the northern or western side of the plant; • Limit noise emission from stack, drier and scrubber discharges to 80 dB (A) at 1 metre; • Limit noise emission from all external fans and equipment to 80 dB (A) at 1 metre • Limit noise emissions from front end loaders to 80 dB(A) at 7m. • Limit noise emission from forklifts to 85 dB(A) at 1m.	During detailed design and construction During operation	Department of Environmental Protection	Submission of design documentation. Confirmation of noise levels when plant operational.
22 Noise	Limit noise emissions from the site	To conform with Environmental Protection (Noise) Regulations 1997	Construct a sound attenuation barrier on site, where required	During detailed design and construction	Department of Environmental Protection	Submission of design documentation. Confirmation of noise levels when plant operational.
23 Water Supply	Investigate alternatives to scheme water supply.	To minimise use of scheme water.	Investigate the feasibility of supplementing scheme water with low grade groundwater, artesian source or recycled wastewater.	During detailed design.	Waters and Rivers Commission.	Submission of results of feasibility study.

ATTACHMENT 1



DESCRIPTION	AREA	% OF SITE
SITE AREA	17.4590ha	100
DEVELOPMENT AREA	16.3225ha	93.5
PRODUCT STORAGE AREA	4.3686ha	25
CLAY STORAGE AREA	0.6064ha	3.5
LIMESTONE STORAGE AREA	0.0762ha	0.4
DRAINAGE AREA	1.1616ha	6.7
BUILDING AREA	3.5972ha	20.6
ADMINISTRATION/SALES AREA	1.5691ha	9
LANDSCAPED & VEGETATION AREA	1.4015ha	1.5
PAVED ACCESS AREA	4.6782ha	26.8
TOTAL AREA	17.4590ha	100

DESCRIPTION	AREA
PRESERVED REMNANT VEGETATION (24.5% OF EXISTING COVER)	0.8563ha
RE-ESTABLISHED VEGETATION	0.2836ha
TOTAL VEGETATION	1.1399ha

(REVISED) FIGURE 3.3

No.	ACTIVITY - REVISION DESCRIPTION	DES	DRN	CHKD	APPD
G	PLANT POSITION AND CRUSHING FACILITY AMENDED	KT	DGP	PRS	JS
H	STORAGE/STOCKPILE AREAS DEFINED	DGP	DGP	PRS	JS
I	STORAGE AREAS AMENDED				
D	BUILDING NAMES REINSTATED, 4m BUND ADDED	KT	KT	JS	JS
E	FUEL STORAGE AREA ADDED	KT	KT	PRS	PW
F	NOTES RE. LANDSCAPED BUNDS AMENDED	PRS	KT	PRS	JS

PROJECT: TOWER BRICK
HIGH TECHNOLOGY BRICK AND TILE PLANT

DRAWING TITLE: DEVELOPMENT PROPOSAL

PRINCIPAL: BARACEN PROPERTIES PTY LTD FOR AND ON BEHALF OF LATANZI NOMINEES TRADING AS TOWER BRICK

ORIGINAL A1

BSD CONSULTANTS
CONSULTING ENGINEERS
TOWN PLANNERS
PROJECT MANAGERS
ENVIRONMENTAL CONSULTANTS

Date 20.04.94 — Scale 1:1500 — Designed KT — Drawn KT — Approved JS — Local Authority SHIRE OF SWAN — Sheet 1 of 1

Project Number P98022 — Drawing Number P413-S01 — Revision 1

Appendix 4

Department of Environmental Protection Advice to Environmental Protection Authority

Department of Environmental Protection

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Perth, Western Australia 6842

Mr Bernard Bowen
Chairman
ENVIRONMENTAL PROTECTION AUTHORITY

Dear Bernard

DEP REVIEW OF EXISTING SWAN VALLEY BRICKWORKS

The Department of Environmental Protection (DEP) provided its advice on Saracen Properties Pty Ltd's environmental impact assessment on 26 November 1998, at Environmental Protection Authority (EPA) Meeting number 699. I now wish to confirm that matters raised during the assessment of that proposal, relating to air emissions from existing brickworks in the Swan Valley, are being investigated.

The review to be undertaken will consider the operations of the existing brick and tile manufacturers, all of which are licensed under the provisions of Part V of the *Environmental Protection Act 1986*. The DEP has already spoken with personnel from these plants and has reflected that the review will occur in the 1998/99 licences issued for these plants.

The DEP is committed to protection of the Swan Valley and to ensuring that discharges to the environment are managed so as to protect its environmental values. The review will include:

- more detailed investigations of how local meteorology and topography affect the dispersion of brick and tile plant emissions;
- refinement of modelling techniques to take account of building wake effects and achieve an improved understanding of high levels observed at monitoring stations close to existing brick and tile plants;
- review of methods for measuring ambient hydrogen fluoride concentrations;
- review of the variability of stack emission rates; and
- review of licence conditions.

Additionally, a programme of monitoring hydrogen chloride emissions will be undertaken.

Components of the above review have already started and I will ensure that the results of this work are reported back to the EPA.

Yours sincerely

(Dr) Bryan Jenkins
CHIEF EXECUTIVE OFFICER

3 December 1998