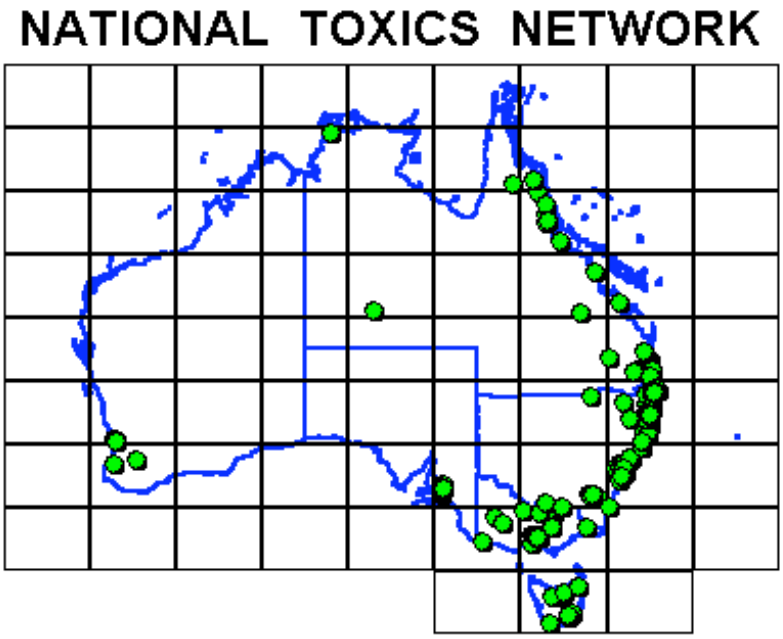

‘Pollution, Risks, and Non-Compliance’ NTN analysis of the SWECO PIC Report on Gunns’ pulp mill.

August 2007

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National Toxics Network – NTN Analysis of SWECO PIC Report

Executive Summary

The SWECO PIC assessment is necessarily inadequate and superficial due to scope and terms of reference established by the Tasmanian Government. This is not an environmental impact assessment but appears to be a political process designed to deliver a pre-determined outcome – which is the approval of the Gunns Limited's Bell Bay Pulp Mill. An approvals process which has at stake 50 years of pollution of the Tamar Valley Airshed and Bass Strait must be transparent, accountable and open to consideration of the best available science.

The current process in which the SWECO PIC report plays a very significant role does not meet the basic requirements for any modern, scientific assessment of the environmental impacts of a very large-scale pulp mill plant in a developed democratic country. NTN regards the current assessment process as highly politicised and entirely improper for an objective evaluation of the impacts of Gunns' pulp mill on the Tasmanian environment.

In order to better inform the Tasmanian people and their Parliamentarians about the impacts of the Gunns' pulp mill before a final decision is taken, NTN has prepared an assessment of the Gunns' pulp mill against key emission requirements using the same format as the SWECO report. Our independent analysis using the available literature demonstrates that the pulp mill is only compliant with 28% of the requirements not 92% as claimed by SWECO. The selective use of literature by SWECO and the assumption that Gunns' claims are all correct at face value are major flaws in the SWECO report.

Contrary to the claims of some commentators on the Gunns' pulp mill process, the SWECO PIC report is not a '*green light*' for the pulp mill. It is so heavily burdened with assumptions and a readiness to commit critical requirements to some future permit system, that it cannot be seen as any sort of approval document. Upon detailed analysis and consideration of the available scientific literature the SWECO report should have recommended the pulp mill not be considered any further for approval.

NTN has identified the pulp mill as being non-compliant with 58 requirements of the Guidance document, with compliance unable to be determined in the case of 14 of the requirements. This effectively rates the Gunns' pulp mill as compliant with only 28 out of 100 requirements.

It is little wonder then that the only recommendation that SWECO PIC offer is that *'based on the assessment of the project against the Guidelines, …the project can proceed to further consideration by the Tasmanian Parliament.*[1]*'*

The SWECO report assumes that all the non-compliant issues are dealt with at some later permitting stage and all the issues not assessed by SWECO (and there are many) are assessed by planning authorities as being acceptable. This heavily qualified statement cannot under any circumstances be seen as a 'green light' for the pulp mill.

[1] SWECO PIC (2007) Assessment of the Gunns Limited Bell Bay Pulp Mill against the Environmental Emission Limit Guidelines. Report Prepared for the Tasmanian Government. July 2007. p.8

On the contrary NTN's analysis has resulted in a resounding *red light* for the Gunns' proposed pulp mill.

It is clear from the reputable scientific literature available that the current configuration of the Gunns' pulp mill will result in air pollution of the Tamar Valley Airshed by;

- Sulphurous compounds that will be highly odorous and will have health impacts on residents at levels below the regulatory ambient air limits.
- Ultrafine particulate matter as well as PM2.5 at levels that would be expected to result in health impacts and additional deaths from respiratory ailments in and around Launceston.
- Dioxins and furans due to inadequate bromine and chlorine control in bleaching chemicals and lack of sophisticated dioxin scrubbing equipment in DNCG and CNCG incinerators and recovery boiler.

It is also clear that the marine environment of Bass Strait will be polluted by;

- Dioxins and furans in the water column and sediment at levels which are likely to result in the closure of fisheries for decades and have implications for human health if seafood from around the outfall is consumed.
- Buoyant pulp mill effluent washing ashore in undiluted form as a result of seawater stratification and inadequate flushing of the dilution zone of the effluent outfall.
- Effluent that has high levels of chemical and biological oxygen demand (COD and BOD) that are known to result in fish kills if insufficient dilution is achieved.

NTN believes that the Gunns' Bell Bay Pulp Mill cannot proceed in its current form without unacceptable impacts on air quality, groundwater and the marine environment in proximity of the Tamar Valley Air Shed (TVAS) and Bass Strait.

Introduction

National Toxics Network (NTN) is a NGO (non-government organisation) network working for pollution reduction, protection of environmental health and environmental justice for all. As the Australian focal point for the International POPs Elimination Network (IPEN), NTN works towards the full implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs) 2001 and other relevant international and regional chemical treaties. NTN has a particular focus on children's environmental health

Why is NTN involved?

The Stockholm Convention obliges countries "to reduce the total releases of the byproducts dioxin and furans from man made sources with the goal of continuing minimization and, where feasible, their ultimate elimination". Article 5 refers to the production of pulp "using elemental chlorine or chemicals generating elemental chlorine for bleaching" as a source of dioxin and furans. Best available techniques and best environmental practices are required, while promoting use of ***substitute*** materials.

In the case of the Gunns' pulp mill, dioxin formation could be avoided by the implementation of a Totally Chlorine Free pulp process. Supposedly Elemental Chlorine Free (ECF) bleaching processes such as that proposed by Gunns continue to create dioxins and furans and are therefore not consistent with the spirit of the treaty obligations. Gunns have a responsibility to prevent dioxin and furan contamination of the Tamar Valley and in Bass Strait where they propose to dump contaminated effluent from the mill.

The chlorine industry continues to promote ECF mills as 'chlorine free' despite their use of chlorine dioxide to bleach pulp. The global pulp and paper industry associations directly fund and produce numerous studies to support the claim that dioxin and furans (and other chlorinated compounds) are no longer a problem if ECF mills are used for pulp bleaching. Independent studies reveal that this is not the case.

Chlorine dioxide manufacture continues to suffer from contamination with elemental chlorine and bromine which is the primary precursor to the formation of dioxins and furans in pulp effluent, stack emissions and solid waste. Its also leads to excessive chloride contamination of effluents and solid wastes rendering them hazardous for land irrigation.

TCF plants using various bleach sequences of ozone, oxygen and peroxide can achieve the same quality of paper as ECF mills. Economically ozone plants can be more capital intensive to establish but in locations where energy costs are low (through biofuel use or hydroelectric generation) ongoing production costs are lower than ECF plants.

TCF plants have numerous advantages in terms of environmental impact and are considered a least polluting option.

Method of Assessment of Gunns' pulp mill.

NTN have assessed the Gunns' pulp mill by examining the same 100 requirements assessed by SWECO using the available literature, Gunns' documentation and expert witness statements, credible submissions to the former Resource Planning and Development Commission (RPDC) process and any other emerging data relating to the proposed pulp mill and its environs.

For ease of navigation by the reader and for comparative assessment, NTN have followed the SWECO report by Table number, page number and by requirement assessed. Having taken into account all relevant literature NTN has classified each requirement as either:

- compliant
- non-compliant or
- unable to determine compliance (due to lack of information provided)

Requirements that are deemed *non-compliant* or *unable to be determined* are accompanied by referenced explanatory statements.

Cascade Effect of Non-Compliant Requirements

Environmental requirements with which Gunns' pulp mill are non-compliant may also have a flow on effect to other assessed factors which can reasonably be assumed to make those factors non-compliant also. One example is the chosen ClO_2 bleach agent manufacturing process chosen by Gunns.

Gunns' experts have admitted the process results in residual contamination with elemental chlorine well in excess of the regulatory limit and other experts have identified contamination of the bleaching agent by reactive bromines. Not only does this render false the claim that this is an elemental chlorine free plant, but it also has significant implications for dioxin and furan contamination in pulp mill air emissions, effluent emissions to Bass Strait, and sludge that Gunns want to spread on farmland. It will also increase the chlorine emissions from the stacks of the pulp mill. In turn this has major implications for the risk assessment of marine contamination, human exposure and terrestrial environmental impact.

SWECO have listed the ClO_2 manufacturing process as non-Acceptable Modern Technology (AMT) and non-compliant but have not assessed the impact that the chlorine and bromine contamination will have on the other emission limits for the mill. It is improper to assess these other factors as compliant when clearly they will be radically altered by the introduction of significant quantities of elemental chlorine and bromine to the pulp mill.

However SWECO have chosen not to assess the implications of non-compliant factors on other requirements but have assessed each factor in isolation and at face value on the basis of documentation provided by Gunns – much of which is now heavily disputed by a range of experts.

Similar issues arise with the inability of the mill to meet sulphur limits (the cause of odour and noxious emissions) for many hours each year and the lack of any evidence

that fugitive emissions will be controlled. SWECO do not then reassess whether the mill will be able to meet the odour limits but turn back to Gunns' initial air modelling where odour limits are apparently only exceeded once every 11 years in a non-populated area. The odour factor is then found to be compliant. Ironically older Scandinavian mills with major odour emissions are found to emit less sulphurous compounds than Gunns' mill will be able to do operating at full efficiency. Reconciliation of these contradictory positions is not possible and the weight of evidence is clear. The Gunns' pulp mill will not be able to control its odour problems for a good deal of the time if at all and the impact is likely to be widespread.

In terms of methodology, SWECO have treated this assessment as a 'report card' and awarded 92 compliances out of a potential 100. The 92% compliance claimed by SWECO sounds impressive (if it were true) but belies the fact that non-compliance of just a few critical requirements may lead to severe, long-term and irreversible impacts on human health and the environment while compliance of other factors are relatively trivial by comparison.

For the SWECO report to have been a useful tool for Parliamentary assessment of the pulp mill the most critical issues should have been identified and the potential for cascade and flow on effects highlighted. The arguments presented in this report draw out these inadequacies and make clear the implications of the non-compliant factors.

The failure to consider the downstream and cumulative process effects of non-compliant factors is a major flaw with the SWECO report that renders it largely superficial and of little value in pulp mill environmental impact assessment.

This report tracks and exposes the faults in the SWECO report and highlight the failure of the Gunns' pulp mill to comply with the same requirements of the RPDC that were assessed by SWECO.

Analysis of Requirements: Compliant, Non-Compliant or Indeterminate.

Table 1
P20-21 D.1.4 Inorganic Chlorinated Compounds – alkaline scrubbers (2x compliant)

D.1.4 TRS

- **Incineration of CNCG gases (unable to determine compliance)**
  It is impossible to determine if all CNCG gases will be destroyed in the recovery boiler or incinerators as no discussion of fugitive emissions and their collection is presented.
- **Backup system for the CNCG (unable to determine compliance)**
  Beca AMEC (independent consultants to the RPDC) have concluded that the level of backup may be insufficient given the sensitive location of the pulp mill.
- **Collection and incineration of dilute NCG gases in the recovery boiler. (unable to determine compliance)**
  Without any discussion or quantification of fugitive DNCG release and collection it is impossible to assess compliance of this requirement. Such releases have been reported to account for the majority of pulp mill odour emissions.
- **Methanol recovery (compliant)**
- **Recovery Boiler computerised combustion and CO measurement (compliant)**
- **Lime kiln oxygen, and low sulphur fuel (compliant)**

P22 D.1.4

- **Dioxin and furan control in Recovery and Power Boiler (non-compliant)**
  Gunns have failed to plan to scrub dioxins and furans from the flue gas of the power and recovery boilers and incinerators using accepted methods such as wet scrubbers, activated carbon injection and Gortex baghouse filtration. Precursors in the bleach such as bromine and elemental chlorine will ensure dioxin pollution to ambient air.

- **Recovery Boiler SO_2 (non-compliant)**
  Guidelines suggest that recovery boiler needs either high dry solids content in black liquor or a stack scrubber to control sulphur emissions. Best practice would require both as the process upsets may result in dry solids dropping below sulphur mitigation levels. In this event the scrubber should be activated. However SWECO argue without substantiation that a scrubber will not be needed because the dry solids content in black liquor will be high enough. From a precautionary perspective (acknowledging that upsets will occur) the scrubber should be included to ensure compliance with the guidelines. Given that the recovery boiler is intended to burn DNCG's and CNCG's (highly sulphurous gases) a scrubber must be used.

- **SO_2 for the CNG incinerators – flue gas cooling & scrubbing (compliant)**[2]

- **Power Boiler – use of low sulphur fuels or scrubbing (compliant)** Technically this requirement is compliant due to the wording of the requirement even though Gunns have no intention of using a scrubber. Best practice would require a scrubber.

- **Recovery Boiler NO_x (non-compliant)** Although technically compliant with the requirement wording, best practice for NO_x reduction in pulp mills is the inclusion of SNRC or select non-catalytic reduction technology. Modern recovery boilers without SNRC controlled Kraft mill emissions are 1-5 lb (0.45 – 2.25kg) NOx/air-dried ton of pulp (ADTP) for the power boilers, 2.25lb (1.01 kg) ADTP for the recovery boiler and 0.6 lb (0.27kg) /ADTP for the lime kiln[3] . In terms of the Gunns' recovery boiler that equates to around 1100 tonnes per annum of NO_x emitted to atmosphere at full production rate. Introduction of SNCR could reduce recovery boiler NO_x emissions by up to 60%.

P24.

- **Lime Kiln NOx control (non-compliant)** The use of high NOx natural gas as fuel in the lime kiln has resulted in the NO_x levels exceeding the requirements. SWECO still claim this is compliant as other fuels may raise levels of different emissions.

- **Power boiler (low NOx design) (non-compliant) -** see discussion of SNCR above. Gunns does not intend to install SNCR.

P24 D.1.4 Particulate matter – Use of ESP's (recovery boiler, power boiler and lime kiln) (unable to determine compliance)

As mentioned previously no estimates of ultrafine particulate contamination have been made by Gunns. While Electrostatic Precipitators (ESP) are moderately effective at removal of PM 10 fractions, no performance parameters for ultrafine particulate are stated by Gunns.

In addition ESP's are vulnerable to power outages and failure of ESP's are common in Australian industry. Under such circumstances 100% of particulate is released. No air quality modelling has been conducted assuming catastrophic failure of scrubbers at the pulp mill. Uniquest (2006) raised this as a major flaw in the health risk assessment and ambient air modelling. Ultrafine particulate has now been identified as a major urban health hazard with no safe level of exposure. For detailed literature on this issue see Moore et al (2004) and Australian management Consolidated (2006).

P 25 D.1.5 Reasonable and Practical Measures to Avoid Emissions to Atmosphere as per the waste hierarchy (non-compliant)

[2] Compliant for SO2 but not for dioxin scrubbing.
[3] USEPA 1994 Kraft Pulp Mills: Controlling Nitrogen Oxides Under the Clean Air Act: A Menu of Options.p.69

In order to minimise avoidable emissions to atmosphere Gunns must adopt least polluting technology. The choice of ECF technology with high residual chlorine levels in the chlorine dioxide means that dioxins and furans will unavoidably be created. The World Bank lists ECF technology as second tier in this regard and considers TCF plants to be least polluting technology.

"The trend is to avoid the use of any kind of chlorine chemicals and employ "total chlorine free" (TCF) bleaching… TCF processes are preferred." [4]

In addition to creating atmospheric dioxin and furan pollution Gunns have failed to plan to scrub dioxins from the flue gas of the various boilers and incinerators using accepted methods such as wet scrubbers, activated carbon injection and Gortex baghouse filtration.

The identification of high NO_x levels from the pulp mill should have resulted in the adoption of SNCR methods which have been found to be effective in NO_x removal.

Other examples such as the complete absence of discussion of fugitive emissions mean that it is impossible for Gunns to be compliant with this requirement.

Table 2
P26 D.1.6…1.8 Recovery Boiler PM (non-compliant)

No evaluation has been conducted of the release of ultrafine particulate from the pulp mill. Modelling based on estimated particulate elimination from mill processes of 99% and better assumes perfect operation of ESP's and no allowance for power outages. The issue of predicted releases in catastrophic process failures has not been addressed by Gunns and has been noted as a major deficiency by independent risk assessors. Uniquest (2006).

P26 D.1.6…1.8 Recovery Boiler TRS (non-compliant)

SWECO acknowledge Total Reduced Sulphur (TRS) from the Recovery Boiler will not be fully controlled in the early years of operation of the Pulp Mill. The maximum permissible emission limit of $7mgH_2S/NDm^3$ @ 3% O_2 must be met by the pulp mill more than 99% of the time.

The fact that TRS emissions will be in non-compliance for the equivalent of at least 70 hours per year. The reality is that breaches in TRS can result in odour impacts beyond the property boundary and that those impacts may occur in blocks of several hours until process upsets at the pulp mill are rectified. If emissions excursions typically required 2-3 hours to correct then off-site odour impacts could be expected to occur on at least 22-35 occasions per year (this is equivalent to the average odour complaints per year for other Australian pulp mills).

SWECO comment that the frequency and significance of these TRS breaches will diminish over the years as operational practices at the mill improve. Over the first five

[4] *World Bank Pollution Prevention and Abatement Handbook, Pulp and Paper Mills*, July 1998.

years of operation of the mill it can be conservatively expected that the recovery boiler will breach the TRS limits for up to 350 hours. To illustrate the potential in terms of social impact for communities around the mill this could result in:

- 175 two-hour duration odour events or
- 70 five hour duration odour events or
- 35 ten hour duration odour events

In reality the duration of these odour events will vary in duration and location of impact depending on wind directions and location of receptors. The longer the pulp mill process upset incidents take to rectify, the greater the duration of the TRS release. In turn the longer TRS releases will result in larger and more resilient sulphurous plumes that have the potential to travel and impact further off-site.

The main point is that SWECO tacitly acknowledge that Gunns cannot fully control odorous sulphur emissions from the recovery boiler stack. This also suggests that such breaches may never be entirely eliminated and that odour impacts from the pulp mill will be a part of its long term legacy.

P27 D.1.6…1.8 Recovery Boiler dioxin (non-compliant)
It is highly unlikely that the recovery boiler will be able to control dioxin to the extent indicated and meet the requirement of 0.1 ng I-TEQm^3 due to the excessive chlorine present in the chlorine dioxide bleach (discussed below) and the lack of any dioxin specific scrubbing equipment in the power boiler flue gas train.

P27-28 D.1.6…1.8 Lime Kiln PM (non-compliant)

No evaluation has been conducted of the release of ultra fine particulate from the pulp mill. Modelling based on estimated particulate elimination of mill processes of 99% and better assumes perfect operation of ESP's and no allowance for power outages (the most common cause of ESP failure which is common in industries such as pulp mills). This issue of predicted releases in catastrophic process failures has not been addressed by Gunns and has been noted as a major deficiency by independent risk assessors Uniquest (2006).

P27-28 D.1.6…1.8 Lime Kiln TRS (non-compliant)

SWECO acknowledge TRS from the lime kiln will not be fully controlled in the early years of operation of the pulp mill.

In the case of the lime kiln SWECO believe that it is unlikely that it will be able to meet its TRS limit for at least 432 hours per annum (18 days per year).

At best practice operation, the lime kiln will be able to reduce its TRS emissions to an average of 5mgH_2S/NDm^3 @ 3% O_2 (with a limit of 16mgH_2S/NDm^3 @ 3% O2) but over five years (the early operational life of the mill) it can be expected that the emissions limit for TRS from the lime kiln will be breached for a *minimum of 2160 hours.* No suggested upper limit estimates for the TRS emissions during these breach periods are provided by SWECO or Gunns so the severity of the odour and pollution impacts during these periods cannot be quantified.

However, the potential impacts of sulphur compound emissions above the required standards are commented upon in sections of the Toxikos Report (part of the Gunns' IIS). While Toxikos note that significant achievements to reduce TRS have been achieved in some Scandinavian mills since the 1990's, this has mainly been confined to stack emissions. Toxikos go on to comment that *non flue-gases (e.g. highly diluted NCG from fibre lines and non-collected gas leaks) can account for up to 40% of total TRS emissions.*[5]

Dr Esa Vakkilainen[6], an expert witness for Gunns, claims that the source of the malodorous compounds (DNCG and CNCG) can be 100% destroyed by the boilers and incinerators of the pulp mill. This is at odds with other Jaakko Poyry consultants (see Gunns' IIS) who have made statements indicating that the recovery boiler has low odour rather than complete destruction as Dr Vakkilainen suggests,

"The recovery boiler will be a modern, low odour type recovery boiler in which all gaseous emissions are mitigated to at least meet prescribed environmental laws and standards."[7]

In other words, the most stringent control and design of process boilers and kilns will not prevent large amounts of odorous TRS escaping the Gunns' pulp mill from fugitive emissions. Indeed Toxikos reinforce this point citing a study of a Finnish pulp mill which found that that *three continuous sources accounted for 90% of TRS measured 2.5 km from the plant; highly diluted NCGs, vent gases from smelt dissolving tanks and flue gases from lime kilns, but that momentary emissions during process disturbances could on occasion also be very high*[8].

As noted previously on this point averaging of emissions for periods of a month or a year does not accurately reflect the peak concentration pollution incidents (spikes) and the corresponding impacts on human health and odour detection.

Toxikos admit that averaging of TRS values across longer time periods does not prevent impacts:

"... data shows that when air concentrations of monitored/modelled compounds that originate from point sources are averaged over longer periods they typically indicate lower average air levels. It is apparent that it is when short term peaks of TRS compounds occur within these averaging periods that odour thresholds for individual compounds are likely to be exceeded. The occurrence, magnitude and frequency of short term peaks will be a function of the effectiveness of technologies employed to control emissions and the degree of mixing with ambient air that occurs as determined by local meteorological conditions."[9]

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[5] *(Gunns IIS Toxikos report Section 11.2 p.95)*
[6] Dr Esa Vakkilainen (2007) Expert Witness Statement for Gunns. p.8
[7] Gunns IIS Jaakko Poyry REV D Vol 6 App 7p121
[8] Järvensivu et al. 2000 cited in *Gunns IIS Toxikos report Section 11.2 p.95*
[9] Gunns IIS Toxikos Report, Section 11 p.101

One of the few comprehensive studies of pulp mill air pollution impacts on nearby communities was conducted in Finland[10]. The *South Karelia Air Pollution Study: Changes in Respiratory Health in Relation to Emission Reduction of Malodorous Sulfur Compounds from Pulp Mills*, was part of a series of health studies correlating TRS emissions from pulp mills and health impacts on neighbouring communities (using a non-exposed community as a control).

Toxikos cite this series of studies with a clear focus on odour detection thresholds rather than health impacts, however the authors of the study reveal a number of health concerns attributable to TRS emissions *'at levels commonly present in the vicinity of pulp mills'*.

The study examined components of pulp mill TRS emissions such as H_2S (Hydrogen Sulfide) and CH_3SH (methyl mercaptans) in ambient air and reported health impacts in nearby towns. These two compounds make up the majority of TRS emissions.

The annual mean airborne concentrations of H_2S and CH_3SH in the most affected town of Imatra were 8 _g/m^3 and 2-5 _g/m^3 respectively. DPIWE design criteria for TRS is outside of Gunns' pulp mill is 1.5 _g/m^3 as 3 min average.

Although the annual mean in Imatra is less than the level at which Toxikos concede that health impacts occur (30 _g/m^3 TRS), sharp spikes in daily means of up to 100 _g/m^3 and 50 _g/m^3 for H_2S and CH_3SH respectively averaged with days of little or no impact clearly resulted in health impacts for the community.

Jaakkola et al. note that "*the mean intensity of headache, depression, tiredness, and nausea in adults was greater on days during which the daily mean concentration of total reduced sulfur (TRS) (i.e., used to summarize the complex pollution mixture) exceeded 30 _g/m^3* [H_2S] and *20 _g/*m^3[CH_3SH]."

The two findings of the South Karelian Air Pollution study that Toxikos failed to cite in the Gunns' IIS are that:

- Reducing TRS pollution from the mills resulted in a corresponding reduction in the *incidence* of community respiratory infections (but not the *prevalence* or *frequency* of such infections). This raised concerns that long-term exposure to malodorous sulphur compounds may cause irreversible lung damage.
- Long-term exposure increases respiratory tract symptoms '*at far lower levels than could be expected from the current knowledge of the toxicology of these compounds.'*[11]

In terms of Gunns' predicted odorous TRS emissions it is known that:

- Stack emissions of TRS will be exceeded to an unknown level many times each year for at least five years and probably indefinitely.
- Inevitable process upsets will result in short emissions of sulphur that can be very high and are not captured by the incinerators or recovery boiler.

[10] Jaakkola J.J., et al (1999) Archives of Environmental Health, The South Karelia Air Pollution Study: Changes in Respiratory Health in Relation to Emissions: Reduction of Malodorous Sulfur Compounds from Pulp Mills, July 1999.

[11] Jaakkola., J.J., (1999)

- Fugitive emissions of TRS will be substantial and ongoing even though Gunns claim there will be none. (SWECO and Toxikos acknowledge fugitive emissions)
- Gunns will exceed mill-wide sulphur emissions of older Finnish mills such as those described in the South Karelian Air Pollution study which documents long term health impacts on communities 4km from the pulp mills.
- The long term sulphur exposures will induce respiratory problems in proximity of the Gunns' pulp mill at lower levels that the toxicological basis for the DPIWE established limit of 1.5 _g/m^3 as 3 min average.

It is clear from both the SWECO report and the South Karelian Air Pollution study that sulphur emissions from the Gunns' pulp mill exceed sulphur emission levels that would be expected from a modern ECF pulp mill. It cannot be claimed that the pulp mill meets AMT in relation to sulphur emissions.

P 28 D.1.6…1.8 Dioxin Emissions from Lime Kilns (non-compliant)

This applies also to other emissions from the lime kiln. Dr Vakkilainen as an expert witness for Gunns relies extensively on dioxin and furan (PCDD/PCDF) emission estimates from the industry based Pulp and Paper Research Institute of Canada[12] who have developed dioxin emission factors for pulp mills well below the emission factors developed by the USEPA and other authorities.

On page 28 SWECO refer to Dr Vakkilainen's evidence and assessment of dioxin discharges from the lime kiln noting that *"magnitudes of PCDD/PCDF emissions from modern lime kilns are typically less than one tenth of the given limit"*

This is at odds with the reference document relied upon by Dr Vakkilainen which states, *'there is no data available in the open literature on dioxin and furan emissions from lime kilns at pulp and paper mills.'*

While the report by Uloth (2002) notes results of some dioxin test results for 4 lime kilns in the US it does not describe the test method or other relevant factors. Uloth (2002) recommends an emission factor 9 ng TEQ/tonne whereas the USEPA recommend 290 TEQ ng/tonne of product recommended by the EPA[13] for cement (lime) kilns not burning hazardous waste and which have been subject to extensive dioxin monitoring.

Given the lack of any literature on the dioxin emissions for lime kilns it is incorrect for SWECO to regard this factor as compliant when the weight of evidence suggests otherwise.

P29 D.1.6…1.8 CNCG Incinerator TRS (non-compliant)
The incinerator will exceed sulphur limits to atmosphere for many hours every year.

P30 D.1.6…1.8 Power Boiler PM (non-compliant)

[12] Uloth, Vic and van Heek, Ron, 2002, Dioxin and furan emission factors for combustion operations in pulp mills. NPRI Guidance document,
[13] EPA/600/P-98/002Aa, April 1998.

SWECO have not accounted for power outages of quantified the release of ultrafine particulate under catastrophic release scenarios.

P30 D.1.6…1.8 Power Boiler NO_x (non-compliant)
Without the use of SNCR technology it is highly unlikely Gunns will achieve the required NO_x levels.

P30 D.1.6…1.8 Power Boiler dioxin (non-compliant)
The power boiler has no scrubbing equipment for the removal of dioxin.

P31 D.1.6…1.8 Sulphur - all sources (non-compliant)

Finnish Mills average 0.3kg S/ADt and Swedish Mills 0.4kg S/ADt (ie 33% higher).

Gunns will only be able to achieve 0.34kg S/ADt.

The Scandinavian mills are older, use softwood and operate at higher sulphidity levels and have higher sulphur emissions than new hardwood mills according to SWECO.

The fact that Gunns' pulp mill will not be able to reduce sulphur emissions below the average Finnish mill is a concern. It strongly suggests that least polluting technology is not being employed or that their configuration of AMT is less effective than Gunns claim. Given the limits achieved in Finland the requirement should be lowered to at least 0.3kg S/ADt

The fact that Gunns have not quantified (or even discussed) fugitive TRS emissions for the pulp mill, which can be very substantial, it can not be argued that the given emission total is compliant.

See further discussion of sulphur compounds below.

P31 D.1.6…1.8 NO_x all sources (non-compliant)

Requirement: NO_x all sources 1.3 $kgNO_2/ADt$
(except power boiler – $200mgNO_2NDm^3$ with 3% excess O_2)

SWECO claim following design capacities for Gunns' pulp mill;
Plantation Eucalypt 1.26 $kgNO_2/ADt$
Native Eucalypt 1.56 $kgNO_2/ADt$
Pine 1.64 $kgNO_2/ADt$

In other words Gunns will be unable to meet the guideline limits for NO_x air emissions when processing only pine or native forests. When operating at best practice with optimum performance the pulp mill will only just be able to meet the NO_x standard using plantation eucalypt. However with the addition of the NO_x emissions from the power boiler (which are excluded from the total site NO_x output) it is unlikely that the pulp mill will be able to meet the 1.3 $kgNO_2/ADt$ limit at any time during its operation unless it employs SNCR technology.

The lime kiln has been demonstrated as *not compliant* with NO_x emissions standards that have separately been devised for it.

SWECO make concerning statements regarding NO_x emission comparisons between the Gunns' pulp mill and Scandinavian mills.

On page 32 SWECO admit that pine pulping results in the highest NO_x emissions of **1.64** $kgNO_2$/ADt. Pulp mills using a combination of soft and hardwoods (such as Gunns) achieved **1.4 – 1.7** $kgNO_2$/ADt which would not meet the limits required in Tasmania of **1.3** $kgNO_2$/ADt.

SWECO point out that at least two Scandinavian mills using natural gas in their lime kilns can achieve levels as low as 1.1 $kgNO_2$/ADt. Given that the Scandinavian pulp is predominantly pine (which according to SWECO usually results in higher NO_2) how are Scandinavian mills using pine and natural gas able to achieve 1.1 $kgNO_2$/ADt when Gunns' pulp mill cannot achieve the more generous limit of **1.3** $kgNO_2$/ADt using lower NO_2 yielding hardwoods? Clearly the design of the mill does not meet the same technical standards as those older mills in Finland. The Gunns' mill design is clearly not able to meet the best practice employed in Scandinavian mills.

SWECO clearly state that the pulp mill will not be able to meet the NO_x emission limits in the early years of the mill using native forests but that it 'may be reasonable to pursue that limit' when moving on to plantation eucalypt in later years.

Air emission limits are generally regarded as ceiling levels that are not to be exceeded. SWECO's suggestion that they are to be 'pursued' as some sort of goal is an admission of failure in the design of the pulp mill and confirms that NO_x emissions will not be properly controlled.

Furthermore SWECO relies on the fact that annual averages will hide the high spikes of NO_x emissions to atmosphere that will occur when pine is processed (as well as sulphur). Averaging of air emissions across long periods hides the peak concentration in atmospheric emissions. However receptors such as humans and animals do not respire in averages but breathe in peak concentrations when exposed to them and suffer the impacts of the high concentrations.

In relation to sulphur and odour SWECO indicate that odour is considered as part of the mill-wide *sulphur* limit as most of the classical Kraft mill odours are generated by sulphurous emission compounds. SWECO consider this aspect to be compliant.

However, at pages 26-28 SWECO acknowledge that TRS emissions will not be able to be completely controlled at both the lime kiln and the recovery boiler for hundreds of hours every year. This will result in the release of large quantities of odorous sulphur emissions.

SWECO point out that the annual average sulphur emissions from Finnish mills was 0.3 kgS/ADt. (better than Gunns will achieve even leaving the TRS issue aside) and that the annual average sulphur emissions from Swedish mills was 0.4 kgS/ADt (slightly worse than Gunns' pulp mill).

At this point SWECO's comments indicate that the Gunns' pulp mill will have a worse performance in terms of sulphur emissions than the old Scandinavian mills "*which are older, use mostly softwood, and operate at clearly higher sulphidity levels, thus having higher sulphur emissions than new hardwood mills."*(SWECO 2007 p.31)

As a 'new hardwood mill' Gunns' proposed mill inexplicably has a higher sulphur (i.e. odour) emission than the old pine pulping Scandinavian mills. It is impossible to reconcile this revelation with claims that the Gunns' mill will achieve AMT. Clearly they will create more sulphur pollution than old mills using pine product – even if they meet the total Sulphur limits. If old high-sulphidity pine-pulping Finnish mills can achieve 0.3 kgS/ADt - why can't Gunns achieve lower levels?

P34 D.1.6…D.1.8 Inorganic Chlorinated Compounds. (non-compliant)

In terms of inorganic chlorinated compound air emissions the guideline limits are $50mgCl_2/NDm^3$ respectively for the:

- Bleach plant scrubber
- H2 scrubber at the ClO2 plant
- Hypo/ClO2 scrubber at the ClO2 plant
- HCl scrubber at HCl synthesis plant
- 'Other' possible chlorine emitting sources.

SWECO claim that Gunns' pulp mill will easily meet these limits and also comment that the licence limits for at the old high-sulphite Finnish mills are $30mgCl_2/NDm^3$. This being the case the Cl_2 limits should be reviewed and set at a limit which reflects BAT – whether this be $30mgCl_2/NDm^3$ or lower. Indeed, Gunns claim their total emissions from the sources listed at the dot points above will be below $20mgCl_2/NDm^3$.

Further, SWECO estimates that chlorine from the main stack will be a paltry $2mgCl_2/NDm^3$ and for the other combined sources a maximum of 16 mg Cl_2/NDm^3. Presuming this is correct, the limits for chlorine emissions for the above 6 sources totals $300mgCl_2/NDm^3$ while Gunns claim they will emit less than a total of $20mgCl_2/NDm^3$ from all sources.

This presumes that the regulatory limit of elemental chlorine in the ClO_2 of 0.2 g/l will not be exceeded. However as is noted below the non-AMT ClO_2 manufacturing process proposed to be used by Gunns cannot achieve that value and on average exceeds that value by more than two fold. The impact that this will have on chlorine releases from the various pulp mill stacks is unquantified but clearly will increase emissions of chlorine significantly.

Cl_2 emission limits for these point sources should be revised downward significantly given the claims by Gunns that they will emit only $20mgCl_2/NDm^3$ from all sources.

Table 3
P35 D.1.9 Avoidance of synthetic precursors

- **Avoidance of chlorinated wood treatment in feedstock (compliant)**
- **Exclusion of polychlorinated defoamers (compliant)**

- **Avoidance of polychlorinated phenols in paint (non-compliant)**

Yes paint may be avoided but chlorophenolics are probably the most hazardous chemical group in pulp and paper mill effluents. The substitution of chlorine dioxide for elemental chlorine in some bleaching process stages significantly increases chlorophenolic production[14]. Whether it is from paint or the bleach is irrelevant. In order to be compliant with this requirement TCF plants would have to be used.

P.37 Wood handling and pulp washing (5 x compliant)

The guidelines require that Gunns avoid synthetic precursors that lead to dioxin formation. In particular they are required to avoid dioxin laden anti-foaming agents and wood chips that have chlorinated contamination from preservation processes. Gunns have also committed to avoiding salt laden hog (wood waste fuel) from coastal areas which are well documented as producing high levels of dioxin from boilers and effluent in Canadian pulp mills. The mechanism for this elevated dioxin production is bromine salts deposited on the timber by coastal winds and other natural processes.

Brominated chemicals both naturally occurring and synthetic have been identified as key catalysts in dioxin formation in thermal processes such as those proposed at the pulp mill. Toxikos on behalf of Gunns claim that brominated pre-cursors of dioxin will not be present in pulp liquors and have excluded bromine for the dioxin risk assessment on the basis that there is no 'source of reactive bromine'[15].

However, Uniquest in its review of the pulp mill risk assessment note *"that $NaClO_2$ used on site to make ClO_2 will contain bromine."*[16]

Again the fact that reactive bromine *and* elemental chlorine will be present in the process liquors as a result of the on-site manufacturing of ClO2 will elevate the creation of dioxins and furans in air emissions, effluent and solid wastes from the pulp mill.

Yet again this raises the issue of cascade effects through other factors (such as compliance with dioxin emissions) that SWECO deem to be 'compliant' after only face value consideration and assuming that Gunns have presented correct information, when in reality they fail compliance due to a lack of full disclosure of flow on effects through the pulp mill.

P37 Guideline D.1.9
Chemical Recovery and Handling of Accidental Discharges (non-compliant)

Gunns are noted by SWECO to be *non-compliant* with this requirement. The design of the pulp mill does not include detailed management plans for control and monitoring of spills, leakages and accidental releases of process liquids or solids including hazardous chemicals.

[14] The Technical and Economic Aspects of Measures to Reduce Water Pollution Caused by the Discharges From the Pulp and Paper Industry, Final Report, Commission of European Communities, November 1989, P.70
[15] Gunns IIS Vol 10 p.34
[16] Uniquest (2006) Peer Review Regarding an Integrated Impact Statement, Part B – Review of Volume 10 of the Gunns' Report. November 2006, p.11

Given the close proximity of the proposed pulp mill to the Tamar River and aquaculture industries this is completely unacceptable. Chlorine dioxide is highly toxic to aquatic life and a major spill, explosion or accident at the chlorine dioxide manufacturing plant or the main mill could reasonably be expected to result in pollution of the Tamar River.

This aspect of the operation requires a full Hazop analysis and detailed response and mitigation plans. There are also implications for public health in the event of Tamar River pollution including recreational users of the river, commercial operators and those taking fish and molluscs from areas subject to pollution for personal consumption.

Loss of process liquors or effluent to the Tamar River from either the pulp mill or the effluent pipeline could result in major fish kills from direct chemical exposure or as a result of catastrophic oxygen loss from COD and BOD of the effluent. Examples of major fish kills around South African and Finnish pulp mills from ECF effluent BOD have been reported.

In our previous submission NTN raised the serious issue of leak detection in the effluent pipeline which will be largely buried and is not therefore subject to visual inspection and controls. Gunns have still not addressed the question of how effluent pipeline leaks will be detected, contained and remediated. Any approval issued to operate a pulp mill with these matters unresolved is environmentally negligent and would not meet the basic requirements for the assessment and approval of a hazardous/noxious industry.

P38 D.1.9 Excess capacity to handle spills and recycle bleach liquors (non-compliant)

Further to this Gunns are required to have adequate excess capacity in the black liquor evaporation plant and in the recovery boiler to handle additional liquor and dry solids loads arising from spills and recycling of selected bleach plant effluents. SWECO have noted that Gunns are compliant in this case when clearly they are not.

The pulp mill will only have sufficient capacity to accommodate spill and recycling of bleach liquors when it is operating at its minimum output. The plant is non-compliant when operating at its predicted design capacity of 1.1M tonnes. It may also be non-compliant well below maximum capacity but no threshold is indicated by SWECO.

This requirement has not been met and contributes significant concern as to how such spills will be managed when in-house capacity is clearly unavailable when operating above minimum design production levels.

P38

- **Stripping and reuse of foul condensates (compliant)**
- **Collection and reuse of clean cooling and sealing waters (compliant)**
- **Efficient washing of lime mud (compliant)**

P 39 Bleaching

ECF (non-compliant)

SWECO are required to indicate whether the Gunns' pulp mill is compliant with the description of either an ECF or TCF pulp mill. Clearly Gunns' pulp mill is not a TCF mill.

While Gunns claim that it is an ECF mill, information that has emerged about the proposed experimental chlorine dioxide manufacturing method casts significant doubt as to whether this is the case. As noted below the IDP process has not been able to meet regulatory limits for chlorine contamination. The chlorine contamination of the process effluents will have a cascade effect throughout the entire facility in relation to dioxin in stack emissions, effluent and ash (solid waste) which is likely to render a range of other factors in this assessment as non-compliant when SWECO have deemed them to be compliant.

As an example, the incinerators and boilers of the pulp mill have not been fitted with dioxin scrubbers (combination of wet scrubbers, activated carbon injection, Gortex baghouse filters etc) on the assumption that dioxin creation will be very low due to the absence of elemental chlorine in the system. It is now clear that the chlorine dioxide manufacturing process adopted by Gunns will contaminate the process liquors with chlorine and bromine which will in turn provide the precursors for dioxin formation in the boilers and incinerators. As a result the compliance of these boilers with PCDD/PCDF air emission limits cannot be deemed compliant.

With the chlorine dioxide manufacturing plant proposed for this pulp mill, it cannot be categorised as an ECF plant.[17]

P39 D.1.9

- **EOP bleaching (compliant)**
- **High shear chemical mixing (compliant)**
- **Partial bleach plant enclosure (non-compliant)** on the basis that SWECO have commented that it may be a future option rather than a current proposal.
- **Efficient washing of pulp (compliant)**

Page 40-41 D.1.9 Bleaching Chemical Preparation
Option 1 IDP (non compliant)

Excess Chlorine in IDP (Integrated sodium chlorate - chlorine dioxide plant)
Because the proposed process for the manufacture of chlorine dioxide is new to the pulp industry and has only been used for the manufacture of sodium chlorite, there is no guarantee that the process will reduce chlorine levels to those of existing pulp mills which use established technologies. In fact, data presented by Gunns' expert witness[18]

[17] Dr Andrew W. Wadsley (2007) A Reply to Gunns Limited: Response to Submissions, Appendix A Response on submission citing dioxin calculation concerns Australian Risk Audit. p.6
[18] Expert witness statement of Mr Edward Joseph Bechberger, Expert for Gunns Limited. http://www.gunnspulpmill.com.au/iis/supp/edward bechberger ews.pdf

shows that chlorine in the chlorine dioxide solution fails to meet the recommended residual concentration.

'Measurements from the Quebec chlorite mill, on which Gunns' proposed IDP is based, show that over a 12 month period the residual chlorine concentrations in the chlorine dioxide solution averaged 0.53 g/l. Regulatory limit is 0.2 g/l residual chlorine.' *(average of 2.65 times higher and up to 3.3 times higher at max contamination recorded of 0.66 g/l)*[19].

Option 2 ClO_2 plant (non-compliant)
While Gunns have indicated that they intend to install the IDP plant that fails to meet the residual chlorine limit (and is not considered AMT), SWECO nevertheless deem the pulp mill to be compliant on the basis of a second option ClO_2 plant which Gunns have no intention of installing. The second option ClO_2 plant may well be compliant if it were to be used which is not the case. This approach to categorisation of compliant factors is obviously unacceptable.

Page 41 Effluent treatment

- **Primary and secondary biological treatment (compliant)**
- **Anoxic selector for chlorate reduction (compliant)**
- **Storage provision for contaminated effluent (non-compliant)**

The requirements of AMT pulp mills are such that there is sufficient storage basin capacity in the effluent treatment plant (ETP) to ensure that untreated effluent can be stored in the event of mechanical failure in either the pulp mill proper or the ETP itself. If this is not done, there is a high risk that the ETP will be overloaded with highly contaminated effluent which will be discharged to ocean outfall, exceeding emission limits and likely causing environmental impact.

SWECO raise strong concerns that while the single-line ETP has *components* that would meet AMT the overall system lacks the extra capacity required to remove the risk of effluent contamination in the inevitable event of mechanical failure in the plant. The requirement to mitigate this risk is a double-line aeration basin which Gunns have not proposed.

SWECO have again distorted the compliance assessment and deem the ETP to be compliant when clearly it falls short in terms of risk of operation during mechanical failure. Again this is a criterion which if not met carries the risk of a cascade effect that impacts upon the compliance of other criteria (such as meeting the discharge limits for effluent to the marine environment.)

P42 Recycling of cooling water (compliant)

Table 4
P 43 D.1.9 Emission limits to the Marine Environment (non-compliant)
In order to be compliant with this requirement of the guidelines Gunns must ensure that *'pollutant discharges to the environment should be reduced to the maximum*

[19] Expert witness statement of Mr Edward Joseph Bechberger (cited in Wadsley 2007, footnote 9 p.17) My calculations in italics.

extent that is reasonable and practical having regard to best environmental management.'

SWECO assess compliance in this section for both pine and eucalypt and find it compliant. However, as noted earlier adoption of TCF technology would have ensured compliance this aspect of the guidelines. As it stands the Gunns' pulp mill will bleach both pine and eucalypt with chlorine and bromine contaminated bleach which will lead to increased AoX in effluent as well as dioxin and furans in air emissions that exceed the international regulatory standards of 0.1ng I-TEQ Nm^3 .

If the TCF option had been chosen the pulp mill would have been compliant and representative of best practice environmental management.

P 44-45 D.1.12 Effluent contaminant limits (5 requirements 1 compliant, 1 non-compliant, 3 unable to be determined)

The compliance of Gunns' mill effluent with a number of the stated parameters cannot be determined due to the risks outlined by SWECO in the inadequate single-line ETP. If the inevitability of mechanical failure of some process components is accepted then SWECO make it clear that the single line ETP proposed by Gunns will lead to untreated effluent discharges into Bass Strait.

The compounds that would be discharged include the regulated analytes COD, BOD, TSS, AOX and Colour.

In order to meet the emission limits the ETP must remove the following percentages of contaminants. Gunns and SWECO believe that if the ETP is *working correctly* it will remove at least:

- 56 % of COD
- 87% of BOD
- 80% of TSS
- 57% of AOX

In the event that the ETP is flooded with untreated effluent due to the lack of dual-line capacity in the treatment system (see discussion of this issue above) it follows that untreated effluent will be discharged with around;

- Twice the acceptable COD and AOX
- Four times the acceptable levels of BOD and TSS

This being the case it will be impossible for the pulp mill to be compliant with these emission limits during process failures with a single line ETP. As the frequency of such process failures cannot be readily predicted it is impossible to assess compliance of these factors.

According to SWECO 'Colour' is not changed by ETP and process failure would be unlikely to change colour discharge and at face value is compliant.

Quite separate from the issue of ETP failure, chlorine and bromine contamination of the process liquors will result in AOX levels that exceed the guideline requirements rendering this factor non-compliant.

P 46 D.1.13 Effluent Colour affecting beaches (non-compliant)

A recent report by Dr Stuart Godfrey (former Chief Research Scientist at CSIRO Marine and Atmospheric Research) examined site-specific hydrodynamic modelling of marine stratification and other factors affecting effluent transport[20] at the proposed discharge site for the Gunns' pulp mill. The report found that water polluted with effluent from the pulp mill will certainly be washed up on beaches near the outfall at relatively high concentrations and under certain conditions will be drawn to the mouth of the Tamar River.

The report assesses aspects of hydrodynamic modelling conducted by Gunns such as model limitations, dilution and fate of effluent discharges and non-compliance with requirements. Dr Godfrey's assessment of Gunns' hydrodynamic modelling found it so seriously deficient that he has requested the Federal government disallow approval of the pulp mill on this basis alone.

Dr Godfrey conducted modelling of the pulp mill effluent plume using data that had been omitted by the Gunns' assessment. It clearly addresses issues of ocean stratification and fast flowing upper water layers than can carry water polluted with high concentrations of effluent onto beaches. Both SWECO and Dr Godfrey note that Gunns' hydrodynamic modelling is inadequate and non-compliant with a number of requirements that are critical to accurate modelling of the effluent plume.

In particular, ocean stratification and warming of surface layers were not taken into account by Gunns. The warming of surface layers of sunny days with light winds creates conditions where concentrated effluent in water can be carried to shore and as far as the Tamar River estuary. A recent incident at a pulp mill at the Nye Beach outfall in the State of Oregon is discussed in the report which includes an aerial photo of the mill effluent plume that clearly washes ashore impacting on the beach 1.2 km's away. Dr Godfrey uses the incident to illustrate the behaviour of warmer surface layers and their capacity to transport pollutants large distances in short periods at high concentrations[21].

Gunns' response to Dr Godfrey's analysis added no information that would discount the conclusions he reached. In addition Gunns confirmed many of the actions and omissions in their work which produced the hydrodynamic modelling deficiencies.

In terms of Gunns' ability to meet the requirement to *ensure that the colour emissions will not affect the visual amenity of the local beaches and environs',* it is clear from Dr Godfrey's analysis that Gunns is not compliant.

Table 5

[20] Godfrey. S., (2007) Inadequacies in the Hydrodynamic Modelling performed for Gunns Pulp Mill IIS, August 2007

[21] Godfrey. S., (2007) p.4

P 47 D.1.14 Toxicity of effluent.

Acute and chronic toxicity (unable to determine compliance x2)
In order to rate this requirement as compliant, SWECO PIC have made two key assumptions. The first is that the effluent samples used by Gunns (sampled from a Thai pulp mill) are representative of proposed effluent from the mill. Some concerns have been raised in submissions that the sampling and analysis arrangements for this effluent have not been independent or transparent. On the information available through Gunns' IIS it is not possible to determine if the sample is representative. QA/QC for sampling and holding times are an essential basis for sound science in sampling and analysis procedures. NTN has no confidence that these standards have been met.

The second assumption is that there will be a 1:100 dilution of effluent at the edge of the mixing zone in Bass Strait. At least three independent, qualified submitters have demonstrated that the dilution for effluent at the edge of the mixing zone has been overestimated by Gunns due to a number of technical errors, omissions and bias. Wadsley (2007), Godfrey (2007) and Patterson Britton (2007)[22].

In all cases the underestimation of dilution will result in marine life being exposed to higher concentrations of effluent than SWECO or Gunns have reported. As a result of the problems associated with these two key assumptions it is not possible to quantify the acute and chronic toxicity of all contaminants in the effluent (though quantification of PCDD/DF levels are provided by Wadsley (2007).

D.1.14 2,3,7,8 –TCDD in effluent (non-compliant)
As explained in detail in Wadsley (2007) Gunns' estimates of dioxin impacts from discharged effluent (including the congener 2,3,7,8 –TCDD) are seriously deficient. In a detailed assessment of Gunns' dioxins impacts on the marine environment Wadsley notes that Gunns have seriously underestimated dioxin impacts due to:

1. Their transcription error of September 2006 underestimated dioxin concentrations in the effluent by a factor of 45;
2. The incorrect application of the US EPA protocol underestimated dioxin concentrations reported in the Human Health Risk Assessment by a factor of 338; and,
3. Their incorrect use of site specific parameters underestimates dioxin concentrations in Five Mile Bluff flathead by a factor of 140.[23]

The net result of Gunns' errors and omissions is that the likely concentrations of dioxins will lead to unacceptable impacts on marine life including dioxin residues in flathead of 13,200 pg/kg more than twice the Australian action levels of 6000 pg/kg.

Our analysis demonstrates that in the case of dioxin contamination the likely impact

[22] Patterson Britton and Partners Pty Ltd, Review of Documents Re: Hydrodynamic Modelling of Effluent from Proposed Offshore Effluent Outfall for Gunns Pulp Mill, Tasmania, 30 March 2007.
[23] Wadsley (2007) p.p. 19-20

on the Tasmanian coastal and Commonwealth marine environments will be sufficient to pose a risk to marine life, to commercial and recreational fisheries, and to human health. (Wadsley 2007 p.22)

Clearly the there are implications for the compliance of other requirements related to modelling and toxicity of effluent in the work of Wadsley (2007) and Godfrey (2007).

P 48 Effluent concentrations

D.1.14 2,3,7,8-TCDF (non-compliant)
For reasons outlined above it is clear that the effluent will be non-compliant with this requirement.

Chlorate (non-compliant)

Having regard for the issues associated with the single line ETP process and chlorine contamination of the bleaching liquors it is not likely that this requirement will be met.

Trihalomethanes (non-compliant)

Again chlorine contamination of the bleaching liquors will result in elevated trihalomethanes in effluent.

P 49 D.1.14 Oil and Grease in Effluent (unable to determine compliance)

No quantification is provided as to the sources or expected loads of oil and grease in effluent. Gunns just claim that it will not be visible. There are no clear guidelines on monitoring frequency or sampling methodologies for TPH or other grease and oil indicators in the Gunns' IIS.

Table 6
P 50 D.2.1 AMT for the Reduction and Handling of Solid Waste (non-compliant)

SWECO talk around the issue of contaminated ash and sludge disposal (solid waste) without providing comparative analysis of TCF operations which the World Bank regard as a first tier technology in terms of waste minimization and environmental impact[24]. ECF pulp mills (even when not operating with chlorine contamination as Gunns will) are regarded as 'second tier' technologies that are less desirable due to increased environmental impacts.[25]

Given the choice between a closed loop TCF process that maximises the re-use and recycling of process materials and Gunns' proposed pulp mill (with over 49 000 tonne per annum of solid contaminated waste) it is clear that Gunns have not chosen technology that minimises waste. SWECO notes that Gunns have been deficient in not providing a waste minimisation plan for the mill to address the problem of contaminated solid wastes and how they are to be avoided. This is no small issue

[24] "The trend is to avoid the use of any kind of chlorine chemicals and employ "total chlorine free" (TCF) bleaching… TCF processes are preferred." *World Bank Pollution Prevention and Abatement Handbook, Pulp and Paper Mills*, July 1998
[25] World Bank Group *Pollution Prevention and Abatement Handbook, Pulp and Paper mills*, July 1998 page 2

given that the mill will generate a quarter of a million tonnes of this waste over the expected life of the mill.

It is implied in both the Gunns' IIS and the SWECO report that the solid waste will at some time be able to be spread on forest or farming land as a 'soil amendment'. Some would argue that the natural forest floor has evolved over millennia without any need for 'amendment' with contaminated industrial waste while no doubt others will argue that such waste may act as a fertiliser on farms. The international experience with the use of dioxin contaminated ash as a soil amendment has been one which has lead to many environmental impacts. In Sweden sludge and ash disposal to farmland has been banned due to soil contamination and concerns over residue in farm products.

SWECO hint at these problems with the comment that *'Use of certain waste fractions as a soil amendment can be finally assessed only after analysis of the waste actually produced' p.50*

The reason SWECO raise this issue is that fly ash (particularly from ESP scrubbers) contain high levels of dioxins and furans attached to fine particulate. The ash also contains elevated levels of carcinogenic polyaromatic hydrocarbons (PAH). When applied to land fly ash and scrubber wastes leach contaminants into the soil and groundwater. Bottom or grate ash also contains these compounds but at lesser concentrations. The role of scrubbing devices is to capture and concentrate as much contamination as possible before it leaves the stack. It is environmentally irresponsible to take that concentrated toxic material and then dump it on land under the pretence of 'soil amendment'. While there may indeed be some compounds in the waste that are beneficial to plants, the risk of widespread contamination of forest, pasture and farm produce significantly outweighs any theoretical benefits.

Separate collection and storage of waste fractions at source (unable to determine compliance)

SWECO note that detailed descriptions of process waste handling, dewatering, weighing, analysis and transport of solid wastes have not yet been provided by Gunns.

P 51 Incineration of non-hazardous organic matter (unable to determine compliance)

Gunns do intend to incinerate biomass residues and effluent sludge in their boilers and incinerators. As noted previously none of the thermal treatment technologies proposed by Gunns have any specific dioxin removal scrubbers. Unless a clear statement is issued by Gunns as to the characteristics of the bio-sludge and effluent sludge they intend to incinerate it cannot be stated that the material is 'non-hazardous'. The sludges are likely to contain metals such as mercury as well as AOX and even dioxin. All of which will lead to increased hazardous air emissions when incinerated.

P 51 No Organic or Putrescibles Material to Landfill (non-compliant)

SWECO note that organic putrescible material such as canteen waste should not be dumped in the landfill (this is a requirement of the guidelines). However Gunns

clearly intend to dump putrescibles in the landfill at the rate of 5000m^3 per year and have clearly labelled this waste putrescible[26].

It is very difficult to see any logical way in which SWECO have been able to find this requirement compliant given Gunns clear statements

P 52 Dioxin Contaminated Power Boiler and Recovery Boiler ash not to be spread on land (non-compliant)

Gunns have also flagged that they will seek future approvals to spread this contaminated ash, sludges and other solid wastes as 'fertiliser' on plantations[27]. Dioxin and heavy metal contamination of sludge and ash is common, and other hazardous pollutants have been identified in ECF plants residues[28].

Despite this requirement to preclude the spreading of ash on land, SWECO and Gunns persist with arguments that it should be permitted subject to further analysis of the wastes once the mill is operational. It is clear that Gunns have always sought and continue to seek land application of their sludges and wastes as a cost-cutting waste disposal measure.

- **Washing of green liquor dregs to minimise caustic leaching (unable to determine compliance)**
  SWECO considers the proposal compliant with this factor even though they do not address the question of caustic leaching. SWECO argue that the technology proposed performs equally or better in terms of dreg dryness than AMT but do not comment on the levels of caustic remaining in the 50% dry dregs and its capacity to leach caustic in the landfill which will inevitable damage the HDPE liner of the landfill causing it to leak.

Gunns do raise this issue in the IIS where they admit that the waste they will be depositing in the landfill cells from mill process will have a very high alkalinity due in part to the lime residues and caustic. The estimated leachate pH of 9.5 – 12 is highly alkaline. Concern is also expressed by the landfill designers (Pitt and Sherry) that the wastes may generate significant heat if not hydrolysed prior to dumping and that this is likely to damage liners. It also raises the question of how this will be achieved without dumping the waste in a liquid or slurry form.

P 53

- **Washing of lime mud to minimise the formation of hydrogen sulphide during drying (compliant)**

[26] Gunns IIS 2006 Executive Summary p.23

[27] IIS 2006 Vol 1 p368-369

[28] A 1998 analysis of sludge from a British Columbia ECF pulp mill by Enviro-Test Labs in Canada using appropriate QA/QC requirements and analysis methodology (modified EPA method 8240 with automated headspace and GC/MSD/SCAN analysis) found at least forty complex volatile and semi-volatile contaminants including ploy-aromatic hydrocarbons, phenols, benzaldehydes and chlorinated napthalenes.

- **External Use of residuals/wastes as substitutes in forestry, agriculture or other industries (non-compliant)**

As discussed above this will not be possible due to the high levels of contamination that will be present in the residues.

- **All waste will be managed in accordance with the waste hierarchy (non-compliant)**

(a) avoidance
(b) reuse
(c) recycling
(d) recovery of energy
(e) treatment
(f) containment
(g) disposal

The waste hierarchy primary goal is *avoidance*. If Gunns were to be compliant they could have adopted partially or fully closed TCF pulp mills which avoid the generation of PCDD/DF wastes and megalitres of chlorine and dioxin contaminated effluent. As the Guidelines note TCF plants are not required to report AOX in effluent because they don't create it. As noted previously the World Bank do not consider ECF plants (even without chlorine and bromine contamination) to be the least polluting technology option.

The disposal of solid wastes should be minimised by various means (non-compliant)

SWECO have acknowledged that Gunns have not provided evidence as to how they will achieve solid waste minimisation and that *'further clarification on how separate collection and storage will be handled'* is required. As no evidence has been presented on how this will be achieved it is again difficult to see how this requirement has been deemed compliant.

P 54 D.2.5 Dioxin formation to be inhibited while burning wood wastes (non-compliant)

As discussed earlier, dioxin formation in the pulp mill power boiler and recovery boiler will be unavoidable due to the combustion of materials containing elevated levels of chlorine and bromine (pre-cursors to dioxin formation) and the lack of dioxin-specific scrubbing equipment will ensure that dioxins are vented to atmosphere through the stacks.

D.2.6 Dewatering of solid waste prior to disposal to landfill (non-compliant)

The de-watering processes described in the Gunns' IIS (a centrifuge) appears to be insufficient to render the liquid wastes such as green liquor wastes suitable to meet waste acceptance guidelines to landfill. The maximum achievable level of dryness is 50% for such waste and more likely to be around 40%. This means that the green liquor dregs are more likely to be a slurry and as such not acceptable for solid waste landfill. SWECO acknowledge that the waste can be dewatered further and that

Gunns have not included a back up for the centrifuge. If the centrifuge fails or requires maintenance and no back up is available then green liquor dregs may have to be sent to landfill in liquid form. Hydrolisation of wastes prior to landfilling may also render them unfit for disposal in dry landfill.

P55 D.2.7 Landfill design (non-compliant)

Gunns have not complied with the requirements set down in the guidelines. Details of monitoring bore locations (if provided), groundwater relief systems and leachate modelling and landfill decommissioning plans are not presented. Detailed analysis of the inadequacies of the proposed landfill are included in NTN's previous critique of the Gunns' IIS[29]. On the basis of the information provided NTN estimates that the landfill will leak immediately after waste is dumped in the first cells and for the life of the landfill. Estimated leakage of around 10 000 litres a year of toxic leachate is predicted based on leakage rates provided by liner manufacturers.

P 56 Filled sections of the landfill should be covered and sealed (non-compliant)

Gunns' current proposal to landfill putrescibles waste mean that this condition cannot be complied with unless methane production estimates and control technologies are introduced. The development of methane in rotting putrescible matter generates sufficient pressure to create blow-outs and fissures in the walls or caps of sealed landfill sections resulting in the release of noxious odour, leachate and hazardous gasses. SWECO urge Gunns not to proceed with the landfilling of putrescibles but at this stage this condition remains non-compliant.

Liquid wastes are not permitted to be disposed of at a landfill (non-compliant)
Gunns have not provided sufficient redundancy in the dewatering of green liquor dregs to ensure that the waste is other than a liquid when transported to the landfill (as discussed above). As it stands waste with 50% moisture content after treatment may not be considered 'solid waste'.

Table 7
P 57 Meteorological studies

D.3.4 Study of Meteorological and topographical characteristics of site based on 12 months data, combined with emission stack design (compliant)

D.3.5 Where several sites are being considered for their suitability… meteorological characteristics… will be required to discriminate between the sites (non-compliant)

In the first instance Gunns have not considered 'several sites' or provided any data regarding any other proposed sites for the development of this pulp mill other than Bell Bay. To regard this issue as compliant is incorrect.

[29] National Toxics Network. (2006) Gunning Down the Spin: The Dirty Reality of Pulp Mill Pollution. pp.5-10

D.3.6 Standards and meteorological parameters (unable to determine compliance)

As noted below serious concerns over modelling methodologies and differences in outcomes between PAE and GHD (consultants for Gunns) air modelling suggests that divergence from standards has occurred. The lack of explanation for these differences leaves us unable to determine compliance.

P 58

D.3.7 Meteorological data and background levels (non-compliant)

Gunns have failed to account for background concentrations of TRS in the Tamar Valley according to SWECO. This is a key class of pollutant that gives rise to the distinctive odour of pulp mills and which increases with the pulping of pine.

D.3.8 Meteorological data and dispersion model (non-compliant)

SWECO refer to the models produced by both PAE and GHD as evidence of compliance with this requirement and note that *'the proposed data input has been incorporated into the dispersion model as required.'*

However, independent assessment by the CSIRO noted there were also "significant and unexplained" differences between model results from the GHD report and Pacific Air and that "poor agreement" between Pacific Air and Environment's modelling and observations at Gunns' monitoring site reduced the level of confidence that could be associated with the models.

Given the lack of consistency between the dispersion models of Gunns' consultants it is clear that different input factors have been used and are therefore at odds with the requirements.

Table 8

P 59 Air Quality Design Criteria

While most of the following ground level design criteria may appear to be compliant at ground level concentrations at face value, underlying conflict with the modelling that relates to inversion layers, lack of data for ultrafine particulates, conflicts between consultants models and missing data make the SWECO assessment somewhat meaningless.

Independent assessments of air quality impacts of the pulp mill note that

- fugitive emissions (especially TRS) must be considered in ambient models and risk assessment yet have not been considered[30].
- Estimates of odorous sulphur compound release during plant upsets is absent.[31]

[30] Uniquest (2006), CSIRO (2006), Beca AMEC (2006)

- Modelling of ambient air impacts in the event of catastrophic breakdown of mill systems is absent.
- Data sets use in modelling are inadequate as other industries in Bell Bay have not provided their emission profiles for cumulative modelling.
- No information on the contribution of ultrafine particles (a major health risk) has been presented.[32]
- Many key pollutants from the pulp mill and other Bell Bay industries that contribute to cumulative and synergistic impacts of air pollution have been excluded from the assessment.[33]
- The modelling to date has low predictive confidence.

As Uniquest note on the final point above *'Risk to health is associated with the total exposure and not with the subset of emissions likely to be produced by the pulp mill.'*

Given the wide range of deficiencies associated with the modelling of air pollution from the proposed pulp mill theoretical compliance with sub-standard modelling should be treated with a low level of confidence. In other cases (such as the TRS component) compliance with the ambient design concentrations may still result in health impacts.

In all cases the compliance or otherwise of the pulp mill is dependent of optimal functioning of the mill and 'predictions' of the emissions that will result. NTN has little confidence that the predicted ambient levels of pollutants will be achieved given the experience with other Australian pulp mills and Scandinavian mills (which also predicted very low emissions and odour before construction).

The ranking of any of the following predictions as compliant should be noted in this context.

P 59 D.3.9 PM10 (compliant)

D.3.9 NO_2 (compliant)

P 60 D.3.9 SO_2 (non-compliant)
On the basis of the failure of Gunns to present information on fugitive sulphurous emissions (which can comprise the majority of the odorous compounds from the mill) this requirement is non-compliant.

D.3.9 TRS (non-compliant)
On the basis of the failure of Gunns to present information on fugitive sulphurous emissions (which can comprise the majority of the odorous compounds from the mill) this requirement is non-compliant.

D.3.9. Inorganic Chlorinated Compounds (non-compliant)
NTN has no confidence that the pulp mill will be able to meet the 3 minute average of 10ug/m^3 as it is predicted to operate at 9.9 ug/m^3. As noted in Uniquest p.11, there is

[31] Uniquest (2006)
[32] Australian Management Consolidated (2006) A Joint Submission to the Resource Planning and Development Commission on Gunns' Pulp Mill Proposal Draft Integrated Impact Statement. p.6
[33] Uniquest (2006) p.4

no estimate of ClO_2 emissions from the IDP plant which will contribute significantly to total chlorine emissions. In addition, the chlorine releases have been calculated without assuming the high levels of contamination of elemental chlorine in the proposed ClO_2 bleach.

Table 9
P 62 D.3.11 Stack Height (non-compliant)

Table 10
P 63-66 Hydrodynamic Studies
The recent hydrodynamic reports by Dr Stuart Godfrey and Dr Andrew Wadsley invalidate the Gunns' hydrodynamic models to the extent that they predict almost certain major impacts by pulp mill effluent. The reports are extremely critical of the errors, omissions and bias in Gunns' work and are the basis on which NTN submits that none of the hydrodynamic studies conducted by Gunns are compliant. SWECO acknowledge that 3 of the 6 requirements are non-compliant.

Dr Godfrey at p.15 comments:

Thus for the intended practical purpose of predicting dispersal of pollution, Gunns' Ltd entire Hydrodynamic Modelling Report – all three volumes of it – is a pure modelling exercise, completely unsubstantiated by observation.

In respect of the dilution modelling and health risk assessment of dioxin in the pulp mill effluent Dr Wadsley concludes;

The error is such that the quantitative ecotoxicological analyses with respect to dioxin, prepared for assessment of the pulp mill project under the EPBC Act by Toxikos, are invalid. Our analysis demonstrates that in the case of dioxin contamination the likely impact on the Tasmanian coastal and Commonwealth marine environments will be sufficient to pose a risk to marine life, to commercial and recreational fisheries, and to human health. p.22

D.3.13 Studies shall be conducted to predict…dispersion of effluent …and effluent plume distribution (non-compliant)

D.3.14 "It is expected that the studies will require the use of a hydrodynamic model and appropriate wind, current and water density measurements to determine the effluent dispersion characteristics under a variety of weather conditions, and allow for seasonal variability."(non-compliant)

D.3.15 The Hydrodynamic studies will need to provide an adequate level of detail to determine an appropriate mixing zone and an appropriate post commissioning monitoring programme (non-compliant)

D.3.16 Data from the hydrodynamic studies should be utilised to define a mixing zone for the dilution of mill effluent at the point of discharge (non-compliant)

D.3.17 Hydrodynamic studies should be utilised to assist demonstration that these (water quality) objectives can be met at or beyond the edge of the mixing zone (non-compliant)

D.3.18 Colour, reflectance, optical quality of receiving water (non-compliant)
Gunns have presented no data on reflectance and Dr Godfrey has demonstrated the impacts of effluent on the beaches and as far as the Tamar River mouth due to stratification. This will clearly breach the colour requirements.

International Experience with Pulp Mill Pollution

The international experience with ECF pulp mill pollution does not reflect the claims of Gunns or the compliance rating of SWECO PIC for this pulp mill proposal. At best the Gunns' pulp mill may achieve compliance of emission limits for some compounds for some of the time. The day to day reality of pulp mill operation will result in long periods of odour impacts, particulate pollution and effluent impacts on marine life and beach users. The landfill will leak, significant amounts of dioxin will be released and air quality in the TVAS will be compromised to the point that health impacts are likely to occur.

It does not take a great deal of effort to locate environmental impacts from ECF pulp mills around the world, including mills in Sweden and Finland where SWECO are based. SWECO avoided comparisons with these pulp mills for obvious reasons.

The study by Olsson et al. *High Concentrations of Dioxins and other Contaminants outside Swedish Cellulose Industries Indicate Ongoing Pollution.*, discusses the high levels of contamination resulting in the Baltic Sea as a result of pulp mill effluent and notes;

Recent results also indicate increasing concentrations after the bleaching process for the pulp industry was changed from chlorine gas to chlorine dioxide in the early 1990s (2). The high concentration in fatty fish from the Baltic has led to serious restriction on the marketing of fish products and thus the problem is of serious concern for countries around the Baltic.p.1431

The researchers conclude;

'Our preliminary results indicate that the bleaching process using chlorine dioxide as well as the sewage treatment technique used at the pulp mills might influence the degree of dioxin pollution outside the industries.'

In addition to dioxin pollution the biological and chemical oxygen demand of effluent has caused major impacts. According to the Uruguay Centre for Human Rights and Atmosphere,

Two of the Botnia's five (5) plants in Finland discharge toxic waste into lakes. These discharges have resulted in the emission of pungent foul odours affecting nearby communities (Aanekoski) and, in 2003, the contamination of Lago Saimaa with 7500 cubic meters of black liquor causing a large fish kill, increasing acute respiratory infections, difficulties with vision and neuropsychological disorders.

During a visit to Finland in August 2004 by a Representation of the Government of Entre Rios and other Uruguayan institutions at the invitation of Botnia, 4 kilometers from the Botnia plant of Aanekoski the delegation experienced such strong sulphurous odors that it was difficult to breathe.

This is of course not unlike the experience of the RPDC delegates who recently travelled to Finland to inspect major advances in odour control at a state of the art Finnish ECF pulp mill only to be driven back by the offensive odour to a town 6km away where the odour remained strong and offensive[34]. According to the report,' *the officials were visiting Skoghall mill near Karlstad -- regarded as an example of the latest odour control technology by Finnish forestry giant Stora Enso.* '[35]

In the US in 1994, the Weyerhaeuser Co was fined tens of thousands of dollars by The Washington State Department of Ecology accidental release of chlorine, chlorine dioxide and non-condensable gasses from its Longview pulp mill.

In addition NTN is aware that the Tumut pulp mill in NSW and the Maryvale Paper Mill in Morwell, Victoria receive around 60 and 20 odour complaints per annum respectively. Neither of these mills produces more than 300,000 tonnes of pulp per annum compared to the predicted 1.1 million tonnes that Gunns intend to produce.

Clearly the claim by Gunns that this is some kind of low-odour low pollution mill lacks credibility as does much of the industry based literature generated to support such claims.

There is little doubt that construction of the Gunns' pulp mill will have major pollution impacts upon the Tamar Valley Air Shed and in Bass Strait.

Conclusion

SWECO PIC has been set an extremely limited scope for the analysis of compliance emissions from the Gunns' pulp mill. Even so SWECO have neglected to take into consideration key literature, submissions and international experience of pulp mill emissions in their evaluation. To present the mill as 92% compliant is completely inaccurate and totally at odds with available data.

NTN's assessment is that Gunns are *non-compliant* with 58 of the 100 requirements of the RPDC Guidelines and that 14 requirements are unable to be determined on the information available. Gunns are only compliant with 28 out of 100 requirements (see table 1 below).

As a result NTN recommends that the Gunns' pulp mill not be approved.

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[34] Bevilacqua, S., *Visitors flee pulp factor.* The Mercury. April 29, 2007 http://www.news.com.au/mercury/story/0,22884,21639083-921,00.html

[35] ibid.

Table 1 Compliant and Non-Compliant Requirements of the Gunns Limited's pulp mill.

Parameter	Compliant	Non-compliant	Unable to determine compliance*
1) AMT for the reduction of Emissions	7	6	4
2) Emission limits to atmosphere	0	13	0
3)AMT for the reduction of emissions to the Marine Environment	16	8	0
4) Monthly average and Daily Discharge Limits to the Marine Environment	1	3	3
5) Discharge limits for each Biologically Treated Effluent Sample Analysed	0	4	3
6) AMT for the reduction and Handling of solid waste	1	11	3
7) Meteorological Studies	1	3	1
8) Air Quality Design Criteria	2	3	0
9) Stack Height	0	1	0
10) Hydrodynamic Studies		6	0
Total	28	58	14

*** on the basis of the information presented in the Gunns' IIS, supporting documents and SWECO PIC report.**

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